For Some, Luck Matters More: The Impact of the Great Recession on the Early Careers of Graduates from Different Socio-Economic Backgrounds*

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Abstract

This paper uses variation in unemployment caused by the 2008 recession to analyse socio-economic gaps in graduate outcomes. Our data comes from a survey which collects information on several cohorts of students from all English universities and reports their destinations at 6 months after graduation. The results show that when graduating in a recession students from less advantaged family backgrounds are more likely to become unemployed, to work part-time, and to earn less than students from more advantaged families. There is evidence that professional networks established while at university are important in explaining some of these socio-economic gaps in outcomes.

Keywords: graduate employment, socio-economic gap, recession

JEL classification: E32, I23, I24, I26, J62

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1 Introduction

Higher Education (HE) participation has increased dramatically in the UK in the last few decades. Among the cohorts born in the '60s, only around 10% graduated from university. Among those born in the early '90s, and entering the labor market in recent years, nearly 40% have a university degree (Clegg, 2017). Despite the introduction of student fees in the early 2000s, there has also been a steady increase in the enrollment of students from a low income families and a reduction in the socio-economic gap in HE enrolment (Crawford, 2012).

These changes in HE participation rates have been encouraged by the belief that education has an important role in reducing the inter-generational transmission of advantage and in promoting social mobility. This may well be tha case as there is clear evidence that graduates have better labor market outcomes than non-graduates (Figure 1.a), and are less severely affected by negative shocks (Figure 1.b). However, it is still unclear whether a high level of education is enough to guarantee that individuals from different socio-economic backgrounds enjoy the same labor market rewards later on in life.

This paper aims to provide new evidence about the relationship between family socio-economic status (SES) and the early labor market outcomes of several cohorts of students graduating from English universities. The first job plays a crucial role in one's life because it affects overall employment prospects (Gibbons & Waldman, 2004; Von Wachter & Bender, 2006). Indeed, it has been found that the state of the business cycle at the time of graduation matters for early and long-term graduate careers (Baert *et al.* , 2013; Kahn, 2010; Oreopoulos *et al.* , 2012; Oyer, 2006, 2008).

Here we focus on the way in which socio-economic background interacts with labor demand conditions at entry to determine the initial labor market destinations of new graduates. To do so, we exploit the change in labor demand due to the Great Recession to investigate whether graduates from different SES groups have been affected in different ways by the economic downturn. In other words, if luck matters - because those entering into the labor market in a recession are disadvantaged for no reason other than bad timing - does this affect graduates with different socio-economic opportunities in the same way?

Our empirical analysis is based on the UK Destination of Leavers from Higher Education survey, which collects information on the labour market destinations of a large sample of students graduating from all UK Higher Education institutions. We match this dataset with graduate unem-

ployment rates defined by field of study in order to investigate the influence of the business cycle dureing the period between 2002/03 and 2011/12 on early graduate careers. Our main focus is on labor market outcomes 6 months after graduation.

We show that the costs of entering the labour market during a recession are unequally spread. Graduates from an advantaged socio-economic background respond to bad (economic) conditions by staying longer in education, especially by enrolling into academic postgraduate programmes. Disadvantaged graduates are more likely to become unemployed instead. The widening of the SES gap during periods of high unemployment is large - compared to high SES graduates, low SES graduates are less likely to stay in education by 8.6% and to be unemployed by 7.4% - and robust to controlling for a rich set of student demographic characteristics and indicators for human capital, such as degree classification and university attended. We further show that even among those graduates who become employed, tight labor demand condition at graduation widen SES differences in access to full-time positions, professional occupations, graduate jobs, and salary.

We investigate some of the possible mechanisms which could explain why family SES is associated with the labor market outcomes of graduates. The most important result here is that graduates from low SES backgrounds who enter the labour market during a recession are less likely to find a job with a new employer, and (correspondingly) more likely to continue working with a previous employer. In most cases, this means that they continue working in a non-placement job, that is a job not related to their qualification. This suggests that differential access to professional networks, particularly university job-placements and internships, is an important channel through which SES differences in outcomes may persist in the long run.

With this paper we contribute to two different literatures in labour economics. One is the literature which looks at the effects of graduating in a recession (Altonji *et al.* , 2016; Kahn, 2010; Oreopoulos *et al.* , 2012). Our main objective here is to add a new focus on differences by family socio-economic status, whereas previous papers have emphasised the importance of field of study or career prospects in increasing or decreasing the penalty of graduating during bad economic times. Our analysis is also relevant to the literature on higher education and social mobility. Here many studies show that, conditional on past academic outcomes, students from low SES families spend more time looking for a job after graduation, are less likely to enter higher earnings occupations, and accumulate less wealth (Arcidiacono & Koedel, 2014; Bailey & Dynarski, 2011; Crawford,

2014a; Macmillan *et al.* , 2015; Meschede *et al.* , 2017). These studies however do not explore how changes in labour market conditions exacerbate the observed socio-economic differentials at graduation.

Our second contribution is related to our empirical strategy. We exploit variation in labour market conditions at entry determined by variation in unemployment by field of study. All the studies which look at the penalty of graduating in a recession tend to use geographical variation instead. We argue that in our context the variation by field of study is more appropriate as the geographical mobility of graduate students is very high, and the UK institutional context is such that field of study is exogenous to labour market conditions at graduation, as it is determined in advance of university enrolment.

Other aspects which make our setting different from previous work are to do with the richness of our data. Specifically, we are able to condition on many indicators of student human capital by including information on the university attended, and the degree classification achieved. The latter is a very important parameter used by employers when selecting graduates for a job interview (Association of Graduate Recruiters, 2016). Finally, we have information on the role of social and professional networks in relation to job search, although this is so only for graduates who become employed after graduation. This information is not available from administrative datasets used in some of the related studies and by analysing it we shed new light on the mechanisms which may explain some of the socio-economic gaps in graduate outcomes.

2 Institutional settings

There are two main potential threats to the identification of the effect of the business cycle on graduate labour market outcomes. First, we need to consider whether students can respond quickly to changes in macroeconomic conditions by, for example, changing their field of study, as this would make their labour market outcomes endogenous. Second, we need to discuss whether there was any overlap between variation in the business cycle and changes to the HE system that might have affected student destinations during the period covered in our analysis.

In England, students typically enroll at university when they are 18 years old.[1] The choice of

[1]The deadline for applying is usually in mid-January of the last year of secondary school.

field of study is conditional on the subjects and marks that students obtain during the previous stage of education, when they are 16-18 years old. For example, programmes with an important scientific content, such as Economics, often require having studied Mathematics earlier on. Students are also required to have achieved a particular mark in the subjects taken during the last stage of their secondary school (A-level exams), although the specific threshold usually differs across different HEIs. Similarly, in order to study a certain subject during the last years of schooling, students need to have performed well in related subjects during the previous stage of education (age 14 to 16). This means that specialization into an area of study and indeed the decision to continue into HE usually occurs quite early in the school cycle - usually by age 16 (Morando, 2020).[2]

Once enrolled, dropout is much less of a problem in the UK than in other countries, ranging from 6 to 7% on average. Switching institution or course of study is also relatively uncommon, with only 3% of students affected.[3] Furthermore, each university course is usually associated with one or two specific fields of study, and no general curriculum is offered initially, as in the case in the US and to an extent in Scotland. A bachelor degree usually lasts three years, and its duration is fixed because students cannot choose when to take exams, unlike what happens in other European countries. These features make the educational system in England an ideal setting in which to investigate the role of the business cycle on graduate labor market outcomes, as students are largely unable to react to changes in labor demand conditions.

During the period analysed in this paper, there have been significant changes to the system of HE financing. Most significantly, in 2006/7 student fees increased from £1,000 to £3,000 p/y and became repayable after graduation through an income contingent loan scheme. At the same time, maintenance grants were increased for students from low income families.[4] These changes could impact both the number and socio-economic composition of those going to university and since they took place shortly before the 2008 recession they could confound our analysis.

A number of studies show however that the change in the UK HE financial system in 2006/7 had no significant consequences on HE participation. A comprehensive analysis by Dearden *et al.*

[2]The setting here described refers to students who choose an academic track while at secondary school. It is also possible to enroll at university after obtaining a vocational qualification and the procedure is very similar. However, the vocational route is by far less common than the academic route. 7% of undergraduate students in 2014 have entered university in such way (https://www.ucas.com/sites/default/files/2014-end-of-cycle-report-dec-14.pdf).

[3]See (Vignoles & Powdthavee, 2009) for further details.

[4]As from the academic year 2012/13 tuition fees increased again to £9,000 p/y but this last increase in fees does not affect the cohorts studied in this paper.

(2011) found that tuition fees had a negative effect on participation, while maintenance grants had a positive effect, resulting in no overall change. In a related study, Crawford (2012) shows that the increase in tuition fees and student support had negligible consequences also on the socio-economic gap in HE participation rates. Similar results are also found by Murphy *et al.* (2017).

As a response to the change in tuition fees, students might have sorted into different types of degrees and HE institutions. Azmat & Simion (2017) provide new evidence on this point. They consider the effect of the 2006/7 fee change on distance to university, choice of institution, and field of study but find no impacts overall and small effects across different socio-economic groups. They also show that the reform increased dropout rates for low SES students, but the magnitude of this change was less than 1% (see also Bradley & Migali (2019)).

Overall, the empirical evidence to date suggests that the 2006/7 change in tuition fees and maintenance support did not have a significant impact on many aspects of HE participation, from enrollment to field of study, to the choice of university and dropout behaviour, and might have caused only very small changes in the composition of graduates according to SES. As we are interested in the effect of the recession on students from different SES backgrounds, our empirical specification always captures changes in the outcomes of low SES students compared to those of high SES students, taking into account any variation in cohort composition by SES. To further alleviate any concerns, all our models condition on (i) field of study and (ii) academic institution attended, as we will see in the next section.

3 Empirical strategy

The effect of graduating in a recession has already been investigated in other studies (Altonji *et al.* , 2016; Cockx & Ghirelli, 2016; Kahn, 2010; Liu *et al.* , 2016; Oyer, 2006; Oreopoulos *et al.* , 2012). Our identification strategy is similar to what has been commonly used in this literature, although it takes into account specific features of the UK labor market and introduces a focus on the SES gap.

Our unit of analysis is a graduate i, who obtained a degree in field of study f, from a HE institution h (this subscript is omitted for simplicity), and is observed at time t, 6 months after graduation. Our proxy of socio-economic background, SES, is a categorical variable indicating

whether students are from a high, middle, or low SES.[5] Our principal interest is to establish whether there is any impact of unemployment on graduate destinations. To capture the macroeconomic condition at graduation we first use regional rates of unemployment calculated using the domicile where graduates resided before entering in HE. Our initial specification is therefore the following:

$$y_{ifrt} = \alpha + \beta U_{r,t-1} + \gamma SES_i + \delta U_{r,t-1} * SES_i + \theta X_i + \kappa_r + \varepsilon_r * t + \nu_t + \mu_f + \rho_h + \omega_{ifrt}, \quad (1)$$

where the subscript r denotes the region of original domicile. Here the coefficient of interest is δ, which captures the way in which unemployment has a different effect on the outcome according to the SES of the individual. Notice that unemployment is measured in the last twelve months before the survey (the survey takes place 6 months after graduation) to take into account the fact that most students start sending their job applications well in advance of their graduation. We further include region fixed effects and region-specific time trends (κ_r and $\varepsilon_r * t$), as well as year of graduation dummies (ν_t), field of study dummies (μ_f), and university fixed effects (ρ_h).

However, the use of regional unemployment might not be appropriate in our context. The UK is much smaller compared to the US or Canada, where most of the other studies are to be found, and the costs of moving from one area to another in search for a job are significantly lower. Moreover, our study focuses on graduate students, and there is strong evidence that individuals with high levels of education are more geographically mobile (Faggian *et al.* , 2007; Hoare & Corver, 2010; Machin *et al.* , 2012). We therefore propose to use instead *field-specific* graduate unemployment rates as a proxy for labour market conditions. This assumes that the labor market of graduates is national in geographic reach but segmented across different sectors defined by field of study.

Using the unemployment rate by field of study has another important feature. It takes into account the potential response of workers moving across sectors and industries (as well geographically) as a consequence of a downturn. This is important if there are some fields of study which are 'naturally' more resilient to downturns because they allow graduates to be employed in a variety of different sectors or industries. To see how important this aspect can be, Table A1 shows the Hirschman-Hirfindahl Index, an index of specialization which indicates whether graduates in a certain field of study work in a wide or narrow range of occupations (Blom *et al.* , 2015). This is

[5] This will be defined more precisely in Section 4.2.

constructed by considering the UK standard classification of occupations and industries (2 digits). It is evident that there is an important heterogeneity across fields of study in terms of concentration in different occupations and industries. Degrees such as Medicine and Education are associated to few occupations and industries. Others, such as Biology and Physics, see their graduates employed in a wider range of jobs.

Our main specification therefore uses unemployment by field of study. As we always include field-specific dummies, the variation we exploit here is variation in unemployment over time *within* field of study. To take into account that individuals who graduate in different fields of study might experience changes in labor demand for reasons that are not related to the recession but reflect instead sectoral shifts in the economy, we also include field-specific time trends.[6]

Although the educational system in England is quite inflexible, there might be still a concern that variation in labor demand might affect the decision to enroll in HE, and therefore the composition of each cohort (Clark, 2011; Meschi *et al.* , 2011; Taylor, 2013; Tumino & Taylor, 2015; Rampino & Taylor, 2012). Conditioning on observable socio-demographic and academic characteristics of graduates (X) including gender, ethnicity, disability status, and degree classification, might not be enough to mitigate this concern. Thus, we introduce a further change to the model and condition on labor market demand at time of enrollment. To do so we use the unemployment rate at the Local Authority District (LAD) level.[7] We consider that this is the relevant proxy of the labor market circumstances affecting students and their families before university decisions are made. The LAD unemployment rate is measured at time of enrollment, $t-4$, and is matched to each student using the area of family domicile (U_d).[8,9] We also consider the interaction of U_d with SES, to allow for different effects on different subgroups of the population. Finally, we also include

[6]Note that all our specifications include cohort (or year of graduation) fixed effects to capture common shocks affecting all individuals at the same point in time. Standard errors are clustered by region/field of study to take into account possible correlation of individual outcomes within geographies or fields over time. Given the small number of clusters, we implement the wild cluster bootstrap procedure as recommended in Cameron & Miller (2015).

[7]To deal with the potential endogeneity issue of the business cycle affecting HE enrollment, Kahn (2010) predicts the national unemployment rate with birth year and state unemployment rate with birth year and state of residence at age fourteen. Our strategy is similar in the sense that we deal with the endogeneity problem by conditioning on the unemployment rate at time of enrollment in the area where students had their domicile before entering HE.

[8]Time from enrollment to graduation is very stable over time and does not vary with unemployment. Nevertheless, to address this concern we only select full-time students.

[9]The local unemployment rates defined at the level of Local Authority Districts comes from the ONS Claimant Count statistics (`https://www.nomisweb.co.uk/`). The within LAD variation in unemployment rate (minimum-maximum value) ranges from 1 (for example, Richmondshire, North Dorset) to 6 percentange points (for example, Copeland, Stoke-on-Trent) with a mean of 2 percentage points and a left-skewed density.

LAD dummies, τ_d. Our main specification therefore is:

$$y_{idft} = \alpha + \beta U_{f,t-1} + \gamma SES_i + \delta U_{f,t-1} * SES_i + \lambda U_{d,t-4} + \sigma U_{d,t-4} * SES_i + \theta X_i + \mu_f * t + \xi_{idft}, \tag{2}$$

where

$$\xi_{idft} = \nu_t + \mu_f + \rho_h + \tau_d + \zeta_{idft}. \tag{3}$$

4 Data and descriptive statistics

4.1 Data and sample selection

Our data comes from the Destination of Leavers from Higher Education (DLHE), which is carried out 6 months after graduation and samples graduates from all UK HEIs.[10] The survey offers a large amount of information on graduates, including: university grades (degree class), subjects studied, and the HEI attended. It also collects information on activity status, occupation, salary and type of contract of each respondent. The DLHE started in the academic year 2002/3 and in this paper we use information up to year of graduation 2011/2. The data is linked to the Universities and Colleges Admissions Service (UCAS) student applications, which contains student demographic characteristics, and some information about students' education before attending university.

Since our main interest is the transition from HE to work, we start by selecting only students completing their first degree and we exclude postgraduate courses, foundation degrees, HE diplomas and certificates. This group represents 82% of the original sample. We consider full-time non-mature students only, who are less likely to be influenced by family responsibilities, and UK nationals ($> 90\%$). The latter restriction is because our main interest is to see how graduates of different SES groups are affected by the business cycle and it would not make sense to compare SES across different countries. As one of the variables defining SES is based on the neighbourhood where students lived before going to university, we include only mainland areas in the UK. We fur-

[10] The response rate of the survey is about 80% for the cohorts considered in this paper. The sample is not fully representative of the population of all UK graduates, instead it is positively selected with higher achieving and more advantaged students being more likely to participate. This means that our findings could be a lower bound of the effects of the recession on the SES graduate gaps in outcomes.

ther restrict our analysis to English universities because comparisons with the other UK countries would be difficult due to institutional differences (in tuition fees, in maintenance grants regime, and duration of study). Our intermediate sample consists of 1,492,290 observations.[11]

Some students appear in the records as studying a combination of subjects or fields (13%). As the percentage of time spent on each subject is recorded in the data, we assign a field of study by considering the courses attended for more than 50% of the time. Another small number of observations (15,650) is dropped because the field of study does not find an equivalent in the Labour Force Survey, which is our source of information on field-specific unemployment rates.

We also drop observations for which we cannot derive an indicator for SES. This means we exclude records with missing information on: domicile before attending university (6,860); type of school attended (private vs. state) or participation in HE at the area level (152,710). Finally, we drop all students included in the issued sample but who did not reply to the survey (247,095). The latter is probably the most controversial selection issue. We consider whether patterns of response by SES differ with conditions at graduation, but we find no evidence that this is the case. Our final sample consists of 1,054,865 records, about 71% of our intermediate sample.[12]

4.2 Measuring socio-economic status

To derive an indicator of family SES, we use three variables observed before students enrol in HE. The first indicates the type of secondary school attended, codified as state vs. private. The second variable is the Low Participation Neighbourhood marker (LPN). This is a categorical variable splitting graduates into five groups and it summarizes the HE participation in the neighbourhood of residence at the time of application to university. This acts as a proxy of the general level of education of those living in the area of family residence a few years before graduation. Finally, we match the postcode of family residence to the Index of Multiple Deprivation (IMD), a widely used measure of socio-economic conditions in the UK.

Figure A1 (a, b, and c), shows the distribution of the IMD, LPN, and school variables across the period considered. On average, about 13% and 5% of graduates come from the most deprived areas in terms of the IMD and the LPN measures, respectively. Almost 90% of graduates instead

[11] To comply with requirements from the data provider observation numbers are always rounded to the nearest 5.

[12] Appendix Table A2 summarizes our sample selection procedure and Appendix Table A3 reports descriptive statistics for the (i) intermediate and (ii) final sample. The latter shows that our selection did not affect students' composition.

come from state schools. It is evident that there has been an increase in the HE participation of students coming from the most deprived areas, with a corresponding narrowing of the SES gap as documented in the existing literature (Crawford, 2012).

Next, we apply principal component analysis to these variables (IMD, LPN and school type) to construct an overall SES index (see also Crawford, 2014b, for a similar approach).[13] We split this new index into quintiles then group the three quintiles in the middle to form a unique category (middle SES), and retain the highest and the lowest quintiles to represent high and low SES, respectively. This approach makes efficient use of the information on individual SES provided by the data and allows us to consider compositional changes in the student population as the index varies over time. Figure A1.d shows that the narrowing of the HE SES-gap over time is reflected in the SES index categories. Overall, Figure A1 suggests that the changes in SES composition occurred smoothly, as a reflection of long-term trends rather than as a response to specific policy changes.

Table A4 shows the characteristics of graduates broken down by SES (columns 1-3). There are significant differences across several dimensions. The highest proportion of non-white students is found in the low SES category, for example. There are also differences in the non-white composition of the population; graduates from India and Pakistan represent 6% of low SES students, but only 2% and 1% of the middle and high SES groups, respectively. This suggests the importance of controlling for ethnicity to avoid confounding SES and ethnicity. In terms of educational achievement, those in the highest SES group perform better. While 71% of high SES students graduate with a first or higher second class degree, this percentage falls to 67% and 59% for middle and low SES groups, respectively. There is no difference by SES in the proportion of graduates studying STEM subjects compared to non-STEM (39% of graduates in each SES group graduated in a STEM subject) but there is variation by SES within STEM and non-STEM groups.[14]

One of the most striking differences across SES groups is the type of university attended. As we can see, 29% of high SES graduates attend a Russell group university and 9% of them attend a Golden Triangle university, the most selective groups.[15] These percentages are much lower for low SES graduates: 14% and 4% (20% and 7% for middle SES), respectively. Finally, we see

[13] Appendix Section B1 explains in detail how this index is constructed.

[14] STEM subjects are: Medicine & related subjects, Biological science, Physical science, Maths & Computing, and Architecture & Engineering. Non-STEM subjects are: Social studies, Business studies, Communication, Languages, Arts, Humanities, Education.

[15] For a description of the various groups see Appendix Section C1.

that there is a clear SES gradient in the propensity of students to move geographically, with high SES students having significantly higher degree of mobility. For example, about 57% of low SES students study in the same region of where they are originally from, compared to 39% and 27% of middle and high SES students.

4.3 Outcomes

We present all our results separately for (i) activity status, and (ii) job attributes. This is to highlight the fact that in the second group of outcomes we consider only students in full-time or part-time employment at the time of the survey. We do not model this selection, as we lack a credible identifying condition. A similar approach is followed in many other studies in this literature (e.g. Altonji *et al.* , 2016; Kahn, 2010).

In analysing *activity status* at 6 months after graduation, we first distinguish between academic and professional postgraduate programmes. The former are postgraduate research or taught programmes such as masters, while the second group consists of diplomas, certificates, or other professional qualifications (for example the Postgraduate Certificate in Education which gives the opportunity to become a teacher). Notice that these programmes differ in their job market prospects, length, and in the likelihood of getting financial aid. Professional programmes, for example, are more likely to secure a specific job and their students are more likely to benefit from bursaries. We then consider whether graduates are active in the job market either by working part-time or full-time, or because they are unemployed. The final group includes "other" activities such as: voluntary jobs, unpaid internships, working and studying, and other not specified.

We then focus on the *job attributes* for those graduates who are employed 6 months after graduation. We consider: the likelihood of working full-time versus part-time, whether working in a professional or managerial occupation (based on the UK Social Occupation Classification), in a graduate job (students are asked whether their degree is required for the job), and on a contract that is permanent or lasts for more than 12 months. Finally, we consider the (natural log of) self-reported annual gross salary (at 2012 prices), the latter being available for full-time employees only.[16] Table

[16]Annual salary is reported with a large number of missing values (only 308,765 replied to this question out of the 575,870 graduates in a full-time job). Given this, and the fact that this variable is self-reported we test our model on an alternative measure, imputing earnings from the Annual Population Survey (APS). We do this by matching the DLHE with the APS on six dimensions: region, full-/part-time job, number of employees in the workplace, permanent vs. fixed and temporary contract, industry, and occupation (three digits). Our estimates when using the imputed salary at

A5 reports the mean values of these outcomes at 6 months after graduation. On average, middle and low SES graduates have worse outcomes than high SES graduates. For example, while 7% of high SES graduates experience unemployment at six months after graduation, the percentage rises to 9% for low SES graduates.

Figures 2 and 3 show changes in labor market outcomes over time and by SES. The vertical line at 2008 shows the beginning of the recession in the UK. These figures help us to establish three different things. First, for all outcomes there is a visible SES gradient. High SES graduates perform significantly better than middle, and then low SES graduates. Second, when the recession hits there is a change in the trend, and this is true for all SES groups. Third, for most outcomes, the SES-gap widens in the period post-2008. For example, in Figure 2.e the percentage of low SES graduates who report being unemployed in the period pre-2008 is on average 7%, while this is 5.7% for high SES graduates; in 2008 there is a parallel jump in unemployment for all three groups, but at the height of the recession in 2011 the percentage of low SES graduates in unemployment is above 11% while for those in the high SES group this is about 7.8%. What was a high-low SES gap of about 1 percentage point before the recession more than doubles a few years later. Another example is given by the part-time versus full-time gap that we see in Figure 3.a. While in 2003 this was about 5 percentage points, in 2012 the gap is twice as much. These figures clearly suggest that the 2008 recession had an impact on SES inequalities in the first destination of graduate students.

Our main outcomes are measured at 6 months after graduation, so we identify here only short term effects. However, using data from a follow-up survey at 3.5 years after graduation, Appendix Section D1 shows that there is a significant degree of persistence in activity status over time for the cohorts analysed in this study. A complete analysis of longer term effects is unfortunately beyond the scope of this paper as the survey at 3.5 years is carried out only every 2 years.

4.4 Capturing the business cycle

In order to capture variation in labor market conditions, we use regional unemployment and unemployment by field of study.[17] Figure A2 shows the yearly average unemployment rate by

6 months after graduation are very similar to what we obtain when using self-reported salaries in Table 7. (The results of the analysis are available upon request).

[17] All unemployment rates are calculated from six months prior to graduation to six months after graduation to reflect the period in which students search for jobs.

UK region obtained using the Labour Force Survey. We see that the southern regions are those experiencing the lowest unemployment rates, while the northern regions are those suffering the highest unemployment rates on average. In terms of identification, what matters is that there is significant variation in the way different regions respond to the recession, with the highest increases in unemployment found in the north of England.

Field-specific unemployment rates are constructed from the Labour Force Survey considering the graduate population of workers aged 21-65.[18] Figure A3 shows the variation in graduate unemployment over the period considered. Interestingly, there is significant heterogeneity across all fields of study even within the STEM and non-STEM categorization. For example, within STEM subjects "Medicine & related subjects" exhibits a low and relatively constant level of unemployment of around 1%-2%. Instead, for graduates in "Architecture & Engineering" unemployment goes from 2% in the pre-recession years up to 4% in 2012, most likely as a consequence of the drop in activity in the construction sector. These differences are due to the fact that the recession affected different sectors of the economy in different ways, and this is what we will exploit in our analysis.

Table A6 shows the values of the unemployment rates (defined by geographical area and field of study) for the whole population and by SES category. We see that the unemployment rate at regional level is always higher than that by field of study because it includes both graduates and non-graduates, and the latter experience on average higher unemployment (Figure 1.a). Another difference between the unemployment rate by region and by field of study is that, the former differ by SES, while the latter does not. This is because graduates from different SES groups come from different geographical areas (for instance low SES graduates are from poorer areas which are more likely to suffer from higher unemployment) but they do not differ significantly in their choices of degrees (see Table A4). Finally, Table A6 shows that the unemployment rate at time of graduation has almost doubled for those graduating between 2003 and 2012 and it has increased sharply for the cohorts graduating in 2008 and in 2009. The change in unemployment from 2007 to 2011 (2 years before and 2 years after the recession hit) is about 3.2 percentage points for the regional measure and 1.4 percentage points for the field of study measure. These are modest numbers in absolute terms, but represent in both cases an increase of 60% over the pre-recession values.

[18] We also tried using different age groups (21-30, 21-40, 21-50, and 21-65). Our findings, available upon request, are robust to changes in the age of the graduates that we consider in order to construct the unemployment rate by field.

5 Results

5.1 The consequences of graduating in a recession

We start by showing in Table 1 how the business cycle affects the probability of being unemployed 6 months after obtaining a first degree. We approximate the labor market faced by students at time of graduation with different unemployment rates: the unemployment rate by region of family domicile (columns 1-2) and by field of study (3-4). All specifications control for the demographic characteristics of the students, such as gender, ethnicity, disability status, and distance from family residence to HEI institution. We also take into account cohort, degree class, field of study, and HEI dummies. When using the unemployment rate by region we also condition on region fixed effects and region-specific time trends. When we use the unemployment rate by field of study we include field of study fixed effects and field-specific time trends.[19]

When using the regional unemployment rate to capture labor market conditions at graduation we find that a 1ppt increase in the unemployment rate is associated with a 0.2ppt increase in the probability of being unemployed (column 3). This a larger effect with respect to what has been found in the previous literature. For example, Oreopoulos *et al.* (2012) find that the probability of being unemployed goes up by 0.1ppt in response to a 1ppt increase in the local unemployment rate in the first year after college graduation in Canada.[20]

An important issue to take into account is that regional distances are very different in the UK with respect to the Canadian context and allowing for a definition of labor market conditions at graduation that takes into account regional mobility, might matter more for the UK. Indeed, when using field-specific unemployment (column 5) we see that the overall effect of unemployment decreases to 0.1ppt. This seems to support the idea that geographical mobility is an important way in which graduates can respond to local demand conditions and that using regional unemployment rates in the context of an analysis of UK graduates could lead to over-estimate the effects of the business cycle on first destinations. In what follows we will therefore continue by using unemploy-

[19]Given the heterogeneity in the quality of study programs in England, both across and within universities, we consider specifications in which we incude as control the interaction of university and field of study but this does not alter our main findings.

[20]The analysis in Oreopoulos *et al.* (2012) focuses on the changes in experience profiles in several outcomes resulting from province-cohort-specific variation in unemployment rates where the province of first residence after graduation is considered as the relevant labor market for young college graduates. Another difference with our paper is that they consider male graduates only and cohorts that graduated between mid-70s to mid-90s.

ment rates by field of study, with the idea that this is giving a more adequate picture of the labor market conditions faced by graduates in the UK.

The focus of this analysis is to understand the way in which labor market conditions interact with family SES. Columns (2) and (4) show that the interactions are always positive and mostly significantly different from zero. This implies that tight labor market conditions increase the SES-gradient in economic outcomes. Specifically, we see that the effects are larger for low SES graduates, who are at most disadvantage during a recession.

5.1.1 Activity status

Table 2 considers all the different destinations of graduates in terms of their *activity status*. For reasons of space, we report results from two specifications only: the first one corresponds to the last one implemented in Table 1 in column (4), while the second additionally includes the unemployment rate at the time of enrollment, measured at the level of the LAD, its interaction with the SES index and LAD fixed effects. Depending on the outcome considered, the results change slightly across models, but the differences are marginal. We therefore focus our comments on the most comprehensive model, the one that conditions for local unemployment as a control for labor market conditions at the time of entry into higher education.

The first two columns (top panel) of Table 2 show that, with respect to high SES students, low SES students are less likely to enroll in an academic programme when unemployment is high at graduation, and that this effect is statistically significant at the 5% level. More specifically, a 1ppt increase in the unemployment rate at graduation results in a 0.4ppt decrease in the probability that a low SES student will continue studying in an academic programme with respect to a high SES student. This is equivalent to an decrease of 6.2% on the mean (this is 0.065 as shown in Table A5). To relate this to the Great Recession, we multiply these numbers by 1.4 as this represents the average increase in unemployment by field of study for graduates of older cohorts between 2007 and 2011 (see bottom row in Table A6 and section 4.4), obtaining an effect that is 8.6% in magnitude. By contrast, we do not see a significant difference across SES groups in the probability of enrolling in a professional postgraduate programme.

We also see that graduating when unemployment is high increases the probability that low and middle SES students find employment in a part-time job. More specifically, the probability

of working part-time for middle and low SES graduates increases by 0.5 and 0.9ppt, respectively, equivalent to 5 and 7% of the group-specific mean. There is a corresponding (not statistically significant) decrease in the probability that disadvantaged students find a full-time job, and for low SES students only a statistical significant increase in the probability of becoming unemployed. The effect size is 5.3% for each 1ppt increase in unemployment, for a total increase of 7.4% for the period covered by the recent recession.

5.1.2 Job attributes

Table 3 shows the effects of unemployment at graduation on different job *attributes*. Notice that these outcomes are observed only for students who are either in a part-time or full-time job 6 months after graduation. Consistent with our previous results, higher unemployment rates lead to worse outcomes for low and middle SES students across a range of indicators. Specifically, graduating when unemployment is high decreases the probability that an individual from a more disadvantaged family background holds a full-time vs. a part-time job by 0.8 and 1.6ppt for middle and low SES, respectively. Low and middles SES graduates are also significantly less likely to work in a professional occupation and in a graduate job. Gross annual earnings of low SES graduates (notice that this info is available for full-time workers only) are almost 1% lower than those of high SES graduates.

Although our outcomes are measured at 6 months after graduation, these findings are overall very consistent with previous studies on the longer-term effects of graduating in a recession. For example, Kahn (2010) and Altonji *et al.* (2016) find that graduating in bad times increases the length of time in HE. Altonji *et al.* (2016) show that the Great Recession has negatively impacted graduates' labor supply in terms of hours worked. Kahn (2010), Liu *et al.* (2016), and Oreopoulos *et al.* (2012) find that graduating when the unemployment rate is high negatively affects the probability of getting a job that matches the qualification obtained.

5.1.3 Heterogeneity

Heterogeneity analysis shows that unemployment at graduation does not impact SES labour market gaps differently according to gender, institution attended, or achievement (degree class), but we see some differences when we group individuals according to field of study. Specifically, we see

that the gaps widen more significantly for students graduating in STEM subjects and in subjects characterised by a high degree of occupational concentration (see Table A1). Thus our findings suggest that the more doors a degree opens (in terms of potential occupations) the more likely low SES students are to escape poor labor market outcomes in periods of high unemployment.

6 Potential mechanisms

The SES gap in labor market destinations might arise because of SES differences in human capital, financial resources, or access to social and professional networks.[21] We think it is possible to rule out explanations in terms of human capital since we consider a population of first-degree full-time graduates, we look at their situation 6 months after graduation, and we condition on university attended and degree class. Although there is obviously still variation in human capital skills within a degree class, this is not easily observable to employers as in the UK context degree class (rather than the actual GPA) is the most important indicator used when selecting candidates for a job interview (Association of Graduate Recruiters, 2016).[22] This leaves us to consider access to financial resources and social or professional networks as possible reasons for the existence of the SES gradient.

Greater availability of financial support (from the family, for example) might lead to a longer period of job search when labor market conditions are tough, resulting in graduates from wealthier families spending longer to find a job. Unfortunately, the survey does not provide information about the length of time it takes an individual to find a job. However, as we saw in Section 5, unemployment is higher for low vs. high SES graduates entering the labor market in a recession, although high SES graduates are more likely to stay in academia to delay their entry in the labor market.

Several studies also find that the lower the SES the more likely individuals are to live close to their families for financial support, and possibly as a strategy against future labor market shocks and job insecurity (Becker *et al.* , 2010; Cobb-Clark, 2008; Kaplan *et al.* , 2009). We would therefore

[21] There is of course the possibility of discrimination, but we do not consider it here.

[22] We test the robustness of our results to the inclusion of tariff scores, equivalent to GPA, obtained at age 18. Unfortunately, tariff scores are available only from year 2004/5 so we need to restrict our sample for this check. We find that the inclusion of the tariff score as a covariate has a negligible impact on the magnitude and the statistical significance of the coefficients of interest.

expect that, if financial support from the family is important, during a recession graduates from low SES should be more likely to find jobs around the area of family residence or domicile. While our data shows that graduates from a lower SES background generally find a job closer to the initial domicile, there is no evidence that this is more likely to be the case during the recession years. Indeed, our results in Table 4 (column 1) indicate that the distance between the first job after graduation and the domicile actually increases for low vs. high SES students after 2008, although this is not statistically significant at the conventional 5% level.[23]

Another possibility is that graduates from different SES have access to different types of social networks and that during a recession the role of these networks becomes more important. We have some direct evidence of this. The DLHE survey asks questions about the channel through which graduates found their first job, and this includes "Personal contacts, including family and friends, networking". In Table 4 (column 2) we see that during the recession middle and low SES students are less likely to find their job through social networks and the estimates are statistically significant. By contrast, there is no evidence of an effect on other channels, such as using employers' websites or recruitment agencies (columns 3 and 4). This might suggest that low SES graduates have less access to social networks during a recession or that their social networks are less effective. However, we are cautious in giving too much emphasis to this finding for two different reasons. First, the survey question on job search channels changed in 2008, and this confounds the effects of the recession. Second, additional analysis (not shown) reveals that jobs found through social networks (as defined here) generally do not lead to better outcomes than jobs found through other channels.

The last aspect we consider pertains to SES differences in access to professional networks. We proxy the latter using information on previous jobs held. The survey asks respondents whether their job at 6 months was with a previous employer and whether it was a placement job.[24] Placement jobs involve an element of training or project work and thus might represent a stepping stone towards good graduate destinations. Some of them are unpaid and usually they are geographically spread out, thus requiring relocation costs. On the basis of this and previous studies on the topic (see

[23]Notice that all regressions control for distance from the domicile and the HEI attended as a proxy for the propensity to be geographically mobile.

[24]A placement job is defined when the student worked on a sandwich placement, on another kind of placement or project work, or on an internship. We also know whether the job was held before, during, or before and during the course of study. In another specification we define a job to be a placement job only if was hold during the course of study. Results do not change with this further restriction and are available upon request.

Faggian *et al.* (2010) and references therein), we would expect high SES graduates to be more likely to end up in a placement job compared to low SES graduates, implying that the former have better access to professional networks. The question is now whether access to professional networks is more important in a recession period.

In our data the vast majority of students find their first job after graduation with a new employer (about 75%), but there is a significant proportion who return to their previous employer, especially in non-placement jobs (about 20%). Figure 4 shows that there are significant SES differences in accessing new employers, with low SES graduates being less likely to do so as compared to middle and high SES graduates. After the beginning of the recession in 2008 there is a sharp decrease in the proportion of students finding a job with a new employer, and a corresponding increase in the proportion going back to previous employers, whether these offered a placement or a non-placement job. There is also evidence that the SES gap in access to previous professional networks increases with the recession. Indeed, this is what we find in Table 4, where we see that middle and low SES graduates who are employed 6 months after finishing their studies are less likely to revert to their previous placement job and more likely to revert to their non-placement jobs (column 3 and 4). This is consistent with low SES graduates finding a job closer to the HEI (column 1) as non-placement jobs held while studying are likely to be geographically close to the HEI attended by students. In results not shown we find evidence of a significant and positive association between the job attributes at 6 months after graduation (full time vs. part time, being in a professional occupation, etc.) and having had a job placement with the same employer during the period of study.

Our interpretation of these findings is that during periods of higher unemployment high SES students are able to rely more heavily on their previous work experience, especially the type of experience that is relevant to their field of study and career. Our data is unable to tell us whether low SES students have fewer opportunities to obtain placement jobs while studying, but according to a recent study (Delavande *et al.* , 2020), only 26.5% of low SES students are able to accumulate non-academic work experience related to their field of study, as compared to 34.5% for high SES students. It seems therefore likely that access to placement jobs could be important in explaining the unequal effects of a recession.

7 Conclusion and discussion

Our findings highlight some possible areas of research for future work on the role of education in promoting social mobility. Specifically, we saw that higher unemployment at graduation penalises mostly students who enroll in degrees with a higher level of specialization (Section 5.1.3). The economic literature has recently focused on the importance of informing students about the wage returns of different educational qualifications and choice of field of study (Arcidiacono *et al.* , 2012; Attanasio & Kaufmann, 2014; Giustinelli, 2016; Wiswall & Zafar, 2017). Our results suggests that providing information about the range of jobs offered by different degrees could be especially important for low SES students.

In addition to this, we need to urgently understand why disadvantaged students seem to have differential access to professional networks at the time of graduation and what role information about the value of job placements or access to these opportunities plays. Investments in non-academic or extra-curricular activities may signal a range of skills and abilities increasingly valued by graduate employers (Association of Graduate Recruiters, 2016). The importance of these activities is recognized through an official system of certifications in the UK (Burgess, 2012), but there is still little causal evidence that they positively affect labor market outcomes (Saniter & Siedler, 2014), and a limited understanding of why students differ in their levels of extra-curricular engagement (Delavande *et al.* , 2020; Milner *et al.* , 2016). Universities might play an important role in reducing socio-economic inequalities by encouraging more students, particularly those from a low SES background, to take on placement and internship opportunities and offering better career advice not only at the time of graduation but also throughout their studies.

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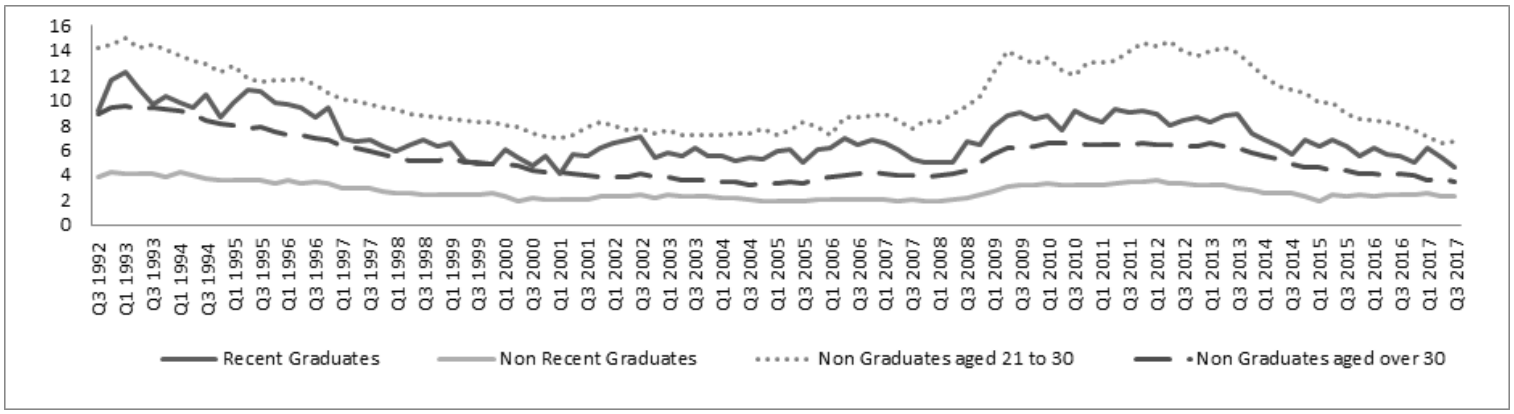
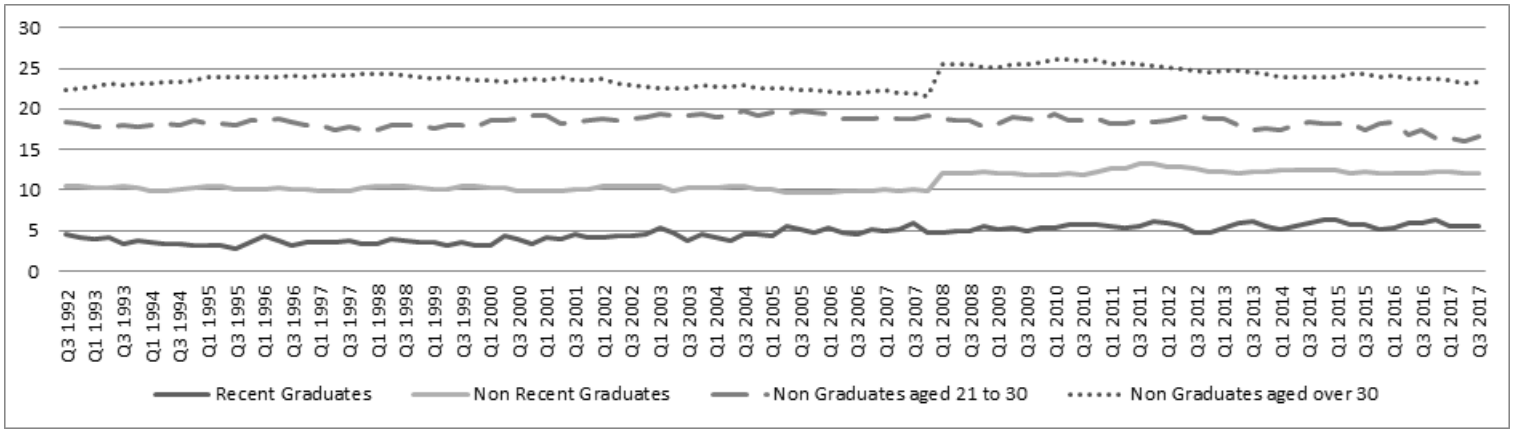
Figures and tables

Figure 1: Unemployment and inactivity rates by graduates and non-graduates



(a) Unemployment rates

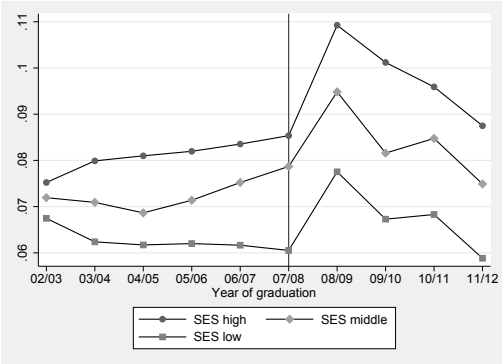


(b) Inactivity rates

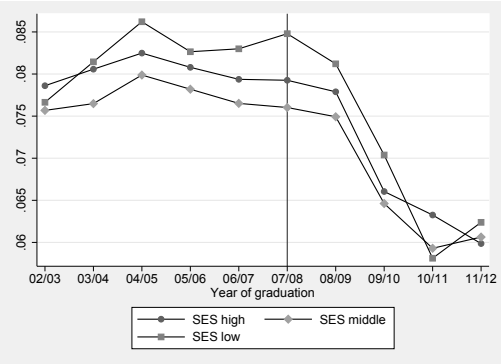
Source: Office for National Statistics.

Notes: A graduate is as a person who is aged between 21 and 64, not enrolled on any educational course and who has a level of higher education above A-level (KS5) standard. A recent graduate is a graduate who left full time education within five years of the survey date. Non recent graduates are graduates who left full time education more than five years from the survey date. The unemployment rate is calculated as the percentage of the labor force within each group that is unemployed. The labor force is the total number either employed or unemployed. The inactivity rate refers to the percentage of people within each group who are out of the labor force. Between 1992 and 2007 this series covers men aged 16 to 64 and women aged 16 to 59. From 2008 onwards the series covers men and women aged 16 to 64.

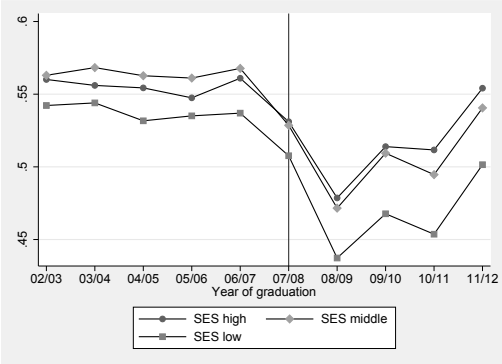
Figure 2: labor market outcomes - Activity status



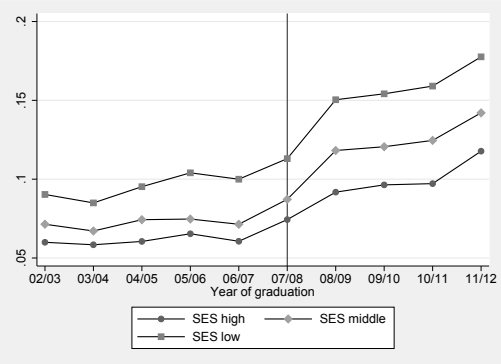
(a) Studying in an academic programme



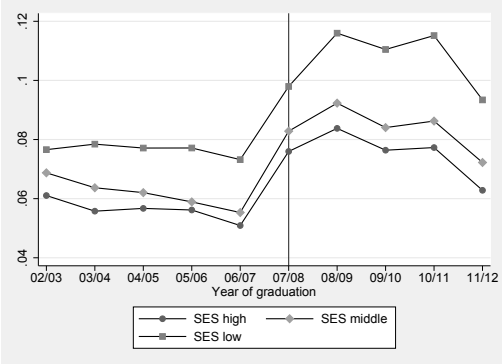
(b) Studying in professional programme



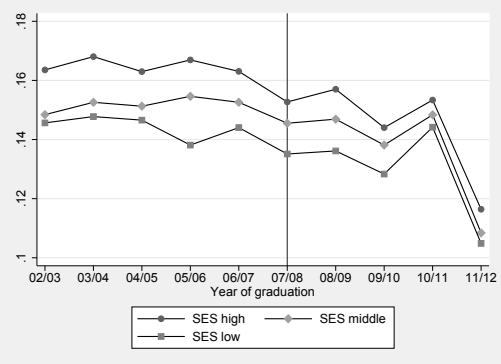
(c) In full-time employment



(d) In part-time employment



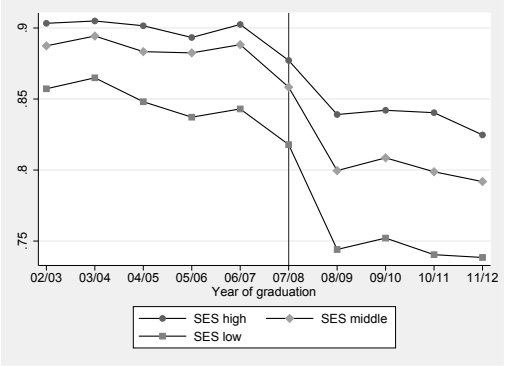
(e) Unemployed



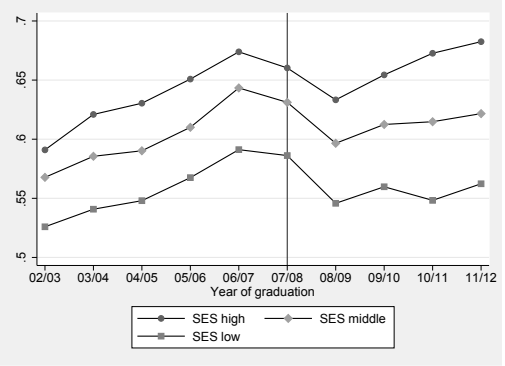
(f) Other activity status

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: The outcomes are described in Section 4.3.

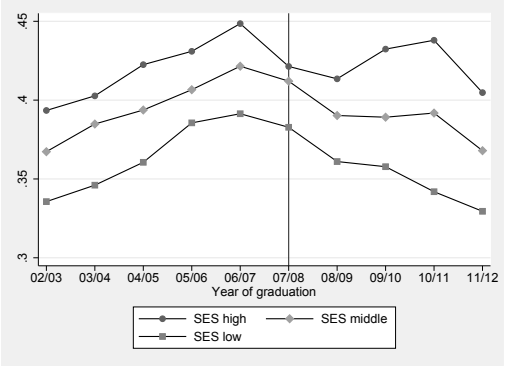
Figure 3: Labor market outcomes - Employed graduates only



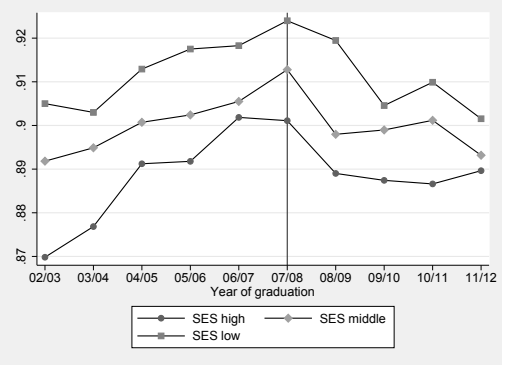
(a) Full-time vs. part-time



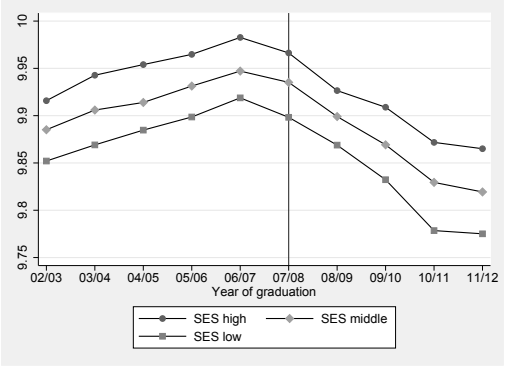
(b) Professional job



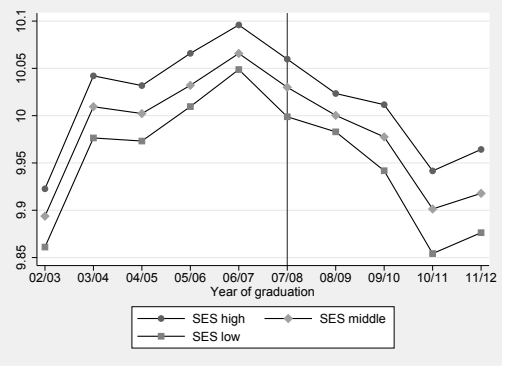
(c) Graduate job



(d) Permanent or long-lasting contract (>12 months)



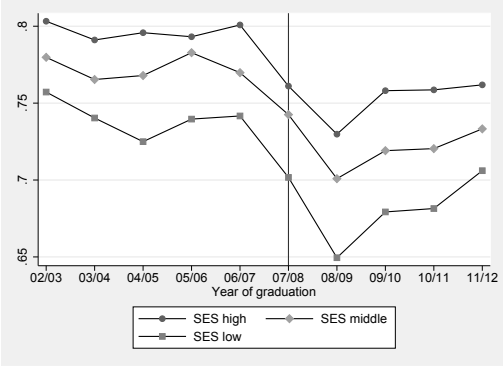
(e) Salary (ln)



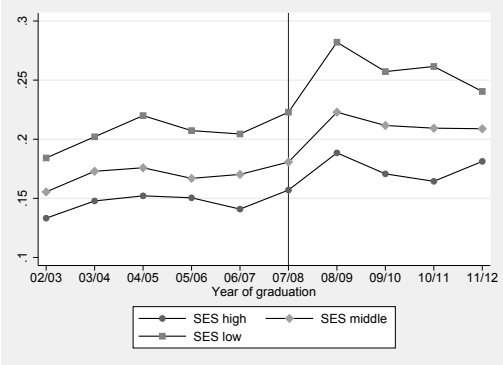
(f) Salary (ln) imputed

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: The outcomes are described in Section 4.3.

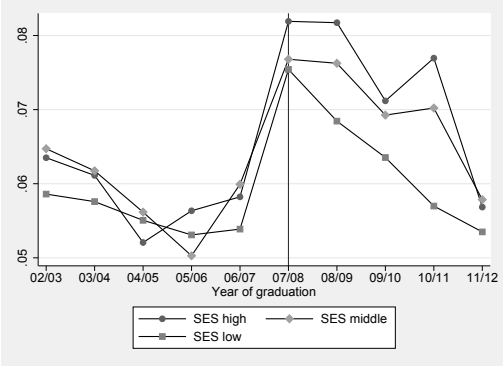
Figure 4: Whether working at previous employer



(a) New employer (by SES)



(b) Previous employer: non-placement (by SES)



(c) Previous employer: placement (by SES)

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.

Table 1: Different specifications: Unemployed

	(1)	(2)	(3)	(4)
Middle SES	0.002**	-0.005+	0.002**	-0.001
	(0.001)	(0.003)	(0.000)	(0.007)
Low SES	0.011**	-0.015**	0.011**	-0.008
	(0.001)	(0.003)	(0.001)	(0.005)
U^{grad}_{home}	0.002*	0.000		
	(0.001)	(0.001)		
Middle SES * U^{grad}_{home}		0.001**		
		(0.000)		
Low SES * U^{grad}_{home}		0.004**		
		(0.000)		
U^{grad}_{field}			0.001	-0.000
			(0.001)	(0.002)
Middle SES * U^{grad}_{field}				0.001
				(0.001)
Low SES * U^{grad}_{field}				0.006**
				(0.001)
N	1054865	1054865	1054865	1054865

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.

Notes: Specification 1 uses unemployment rate by region of domicile, and Specification 2 implements the interaction of the unemployment rate with the SES index. Specification 3 uses unemployment rate at time of graduation by field of study and Specification 4 introduces the interaction of the unemployment rate by field of study with the SES index. All specifications control for demographic characteristics of graduates (gender, ethnicity, disability), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), and cohort and HEI fixed effects. Specifications 1 and 2 additionally condition on regional fixed effects and regional-specific time trends at domicile level. Specifications 3 and 4 additionally condition on field-specific time trends. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table 2: The effect of graduating in bad times by SES - Activity status

	(1)	(2)	(1)	(2)	(1)	(2)
	Academic programme		Professional programme		Full-time employment	
MiddleSES*U^{grad}_{field}	-0.002+	-0.002	0.002	0.002	-0.006+	-0.005*
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)	(0.003)
LowSES*U^{grad}_{field}	-0.004*	-0.004*	0.004	0.005	-0.012+	-0.011+
	(0.002)	(0.002)	(0.005)	(0.005)	(0.007)	(0.006)
U^{grad}_{field}	0.003*	0.003*	-0.002	-0.002	0.000	0.000
	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)	(0.000)
N	1054865	1054865	1054865	1054865	1054865	1054865
	(1)	(2)	(1)	(2)	(1)	(2)
	Part-time employment		Unemployed		Other activity	
MiddleSES*U^{grad}_{field}	0.005**	0.005**	0.001	0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
LowSES*U^{grad}_{field}	0.009**	0.009**	0.006**	0.006**	-0.003	-0.003
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)
U^{grad}_{field}	-0.003	-0.002	-0.000	-0.000	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
N	1054865	1054865	1054865	1054865	1054865	1054865

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: All specifications control for demographic characteristics of graduates (gender, ethnicity, disability, SES group), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), cohort fixed effects, HEI fixed effects, and field-specific time trends. Specification 2 also includes unemployment rate (at LAD level) at time of enrollment, its interaction with SES, and LAD dummies. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table 3: The effect of graduating in bad times by SES - Job attributes

	(1)	(2)	(1)	(2)	(1)	(2)
	Full-time vs. Part-time		Professional occupation		Graduate job	
MiddleSES*U^{grad}_{field}	-0.008**	-0.008**	-0.010**	-0.009**	-0.006**	-0.005**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
LowSES*U^{grad}_{field}	-0.017**	-0.016**	-0.017**	-0.016**	-0.008+	-0.007+
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)
U^{grad}_{field}	0.004	0.003	0.000	-0.000	-0.004	-0.004
	(0.003)	(0.003)	(0.001)	(0.001)	(0.004)	(0.003)
N	662085	662085	661210	661210	555265	555265
	(1)	(2)	(1)	(2)		
	Permanent contract		Log Salary			
MiddleSES*U^{grad}_{field}	-0.001	-0.001	-0.003	-0.003+		
	(0.001)	(0.001)	(0.002)	(0.001)		
LowSES*U^{grad}_{field}	-0.000	-0.001	-0.008*	-0.007**		
	(0.001)	(0.003)	(0.004)	(0.003)		
U^{grad}_{field}	0.001	0.001	-0.005	-0.005		
	(0.001)	(0.001)	(0.004)	(0.004)		
N	579815	579815	291990	291990		

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: All specifications control for demographic characteristics of graduates (gender, ethnicity, disability, SES group), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), cohort fixed effects, HEI fixed effects, and field-specific time trends. Specification 2 also includes unemployment rate (at LAD level) at time of enrollment, its interaction with SES, and LAD dummies. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table 4: Mechanisms

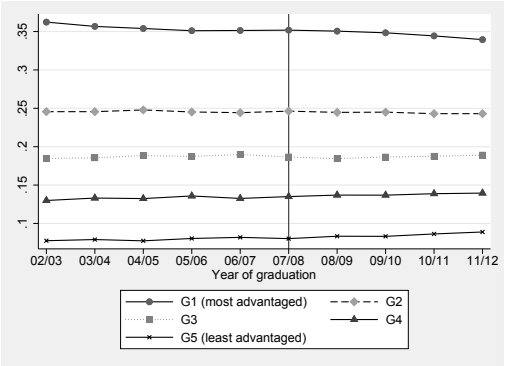
	Social network at domicile			
	(1)	(2)	(3)	(4)
	(log)Distance domicile-workplace	Social network	Employer website	Agency
MiddleSES*U^{grad}_{field}	0.004	-0.005**	-0.000	0.001
	(0.003)	(0.001)	(0.004)	(0.002)
LowSES*U^{grad}_{field}	0.020*	-0.014**	0.004	0.004
	(0.008)	(0.002)	(0.003)	(0.004)
U^{grad}_{field}	-0.025*	0.005**	0.007	-0.003
	(0.011)	(0.002)	(0.007)	(0.002)
N	621685	536925	536925	536925
	Professional network at HE			
	(5)	(6)	(7)	(8)
	(log)Distance HEI-workplace	New empl.	Previous emp.: non-placement	Previous emp.: placement
MiddleSES*U^{grad}_{field}	-0.027*	-0.003**	0.008**	-0.005**
	(0.013)	(0.001)	(0.002)	(0.001)
LowSES*U^{grad}_{field}	-0.051*	-0.005+	0.013**	-0.008**
	(0.022)	(0.003)	(0.004)	(0.003)
U^{grad}_{field}	0.027+	0.000	-0.005**	0.005+
	(0.015)	(0.001)	(0.002)	(0.002)
N	621750	527890	527890	527890

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.

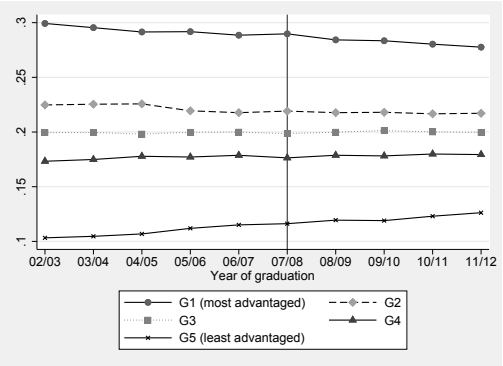
Notes: Controls: demographic characteristics of graduates (gender, ethnicity, disability, SES), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), unemployment rate (at LAD level) at time of enrollment and its interaction with SES, cohort fixed effects, HEI fixed effects, LAD fixed effects, and field-specific time trends. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

A1 Figures and tables in Appendix

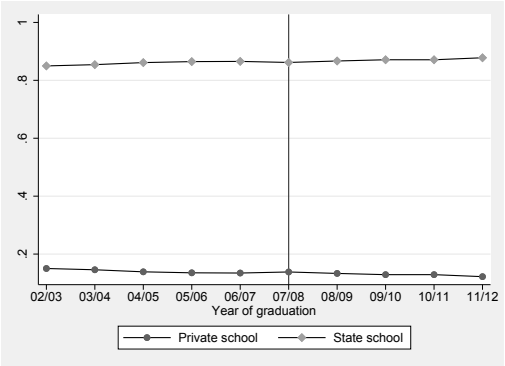
Figure A1: SES indicators



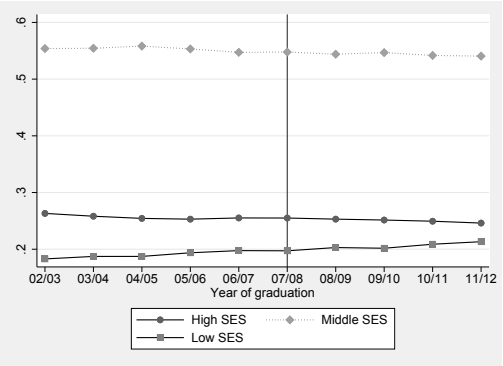
(a) Low Participation Neighbourhood (LPN)



(b) Index of Multiple Deprivation (IMD)



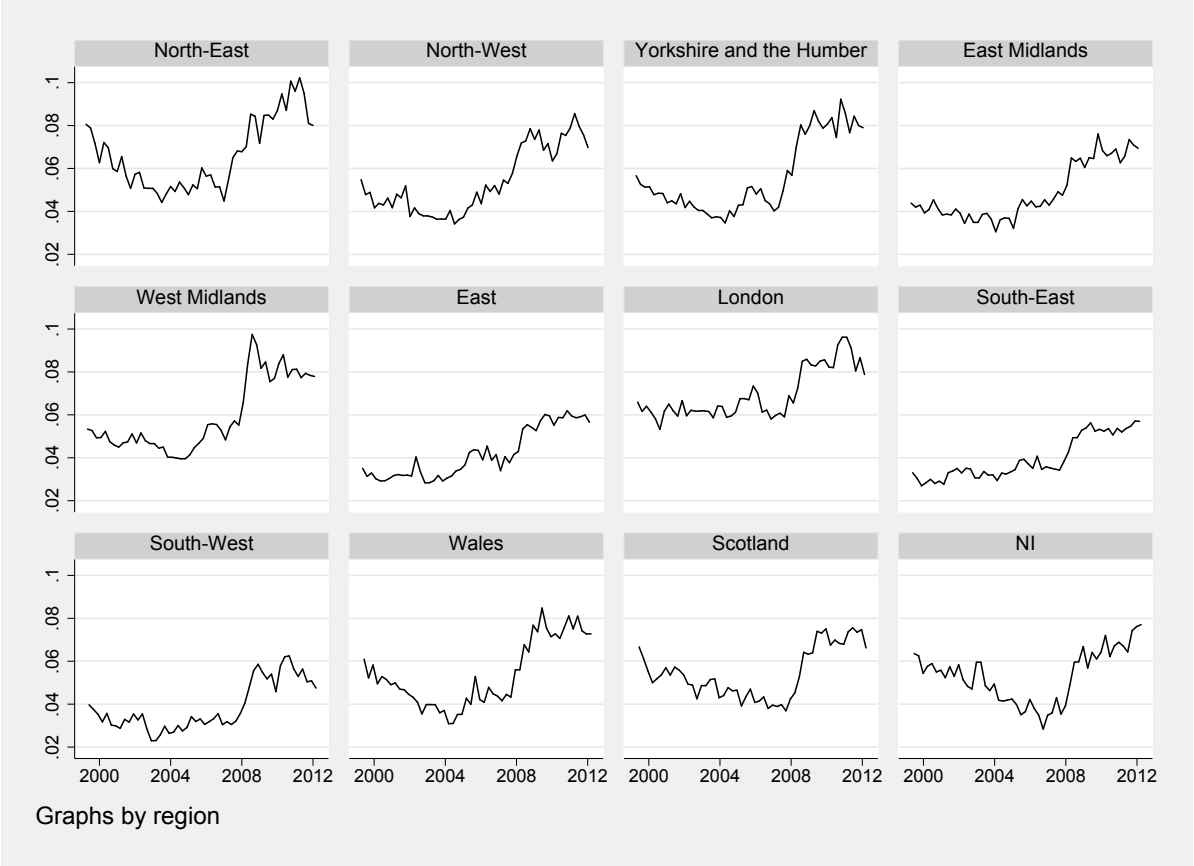
(c) Type of school



(d) SES Index

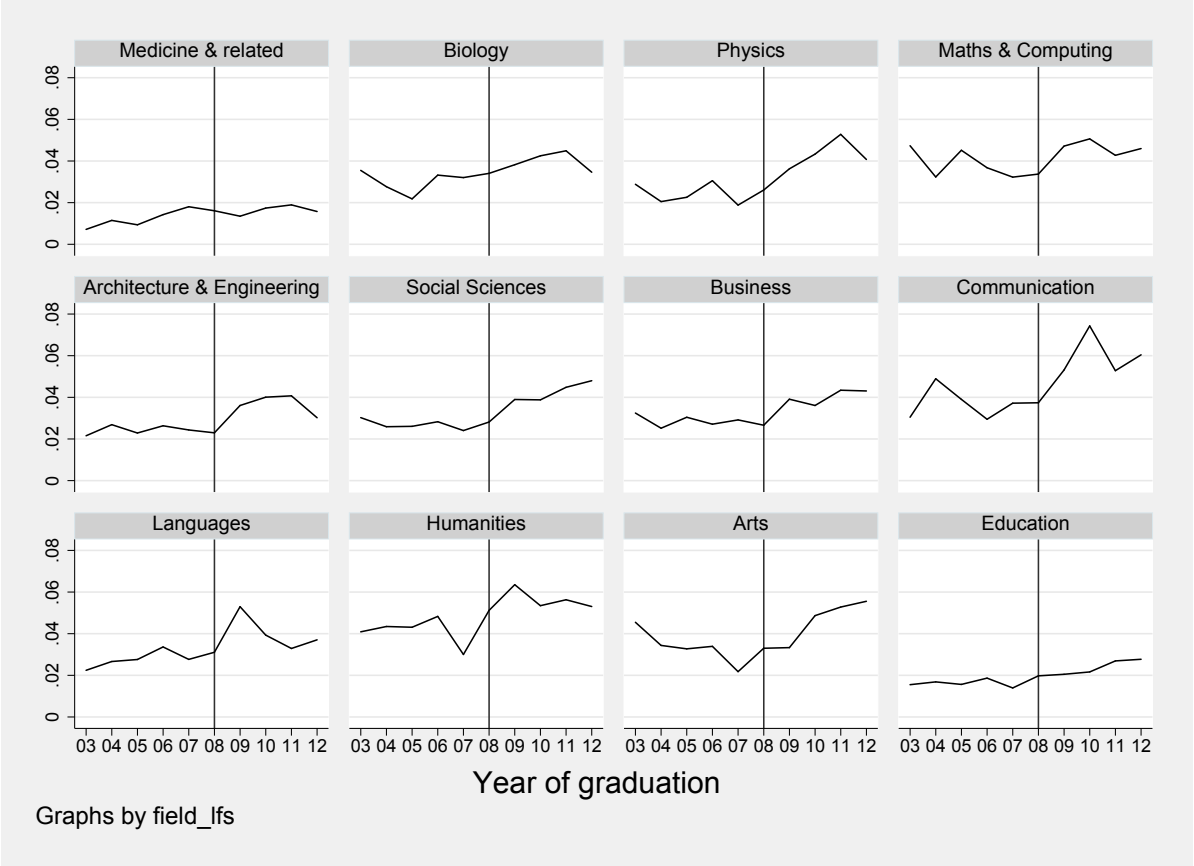
Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: The variables used to construct the SES index and the method used are described in Section 4.2. G stands for Group

Figure A2: Graduate unemployment rate by region 2000-2012



Source: Labour Force Survey.

Figure A3: Graduate unemployment rates by field of study 2003-2012



Source: Labour Force Survey.

Table A1: Hirschman-Hirfindahl Index by occupation and industry

	Occupation	Industry
Medicine & related	0.328	0.588
Biology	0.079	0.095
Physics	0.088	0.079
Maths & Computer sc.	0.125	0.099
Architecture & E	0.165	0.102
Social Sciences	0.115	0.101
Business	0.146	0.088
Communication	0.117	0.102
Languages	0.109	0.095
Humanities	0.108	0.090
Arts	0.127	0.111
Education	0.477	0.506

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: The Hirschman-Hirfindahl Index indicates the degree of specialization in the labor market by field of study. The higher the index the higher the concentration of graduates in a smaller number of occupations or industries. Occupations and industries are based on the 2-digit standard UK classification. The sample of graduates considered is restricted to those cohorts that graduated before the recession ($\leq$2007).

Table A2: Sample selection

Overall number of observations for DLHE years 2002/3-2011/2 **N=3490170**
Keep if first degree graduates (-620680) Keep if studied full-time (-303860) Keep 21-24 years old in June (-483560)
Initial sample **N=2082080**
Keep UK nationals (-296180) Keep if not from Isle of Man Guernsey Jersey (-5165) Keep only English universities (-288450)
Intermediate sample **N=1492290**
Drop if subject studied is undefined (-8665) Drop if there is no subject studied at least 50% (-6440) Drop if the subject has no correspondent in the LFS (-15650) Drop if postcode of domicile unknown (-6860) Drop if LPN and/or school type missing (-152710) Drop if non-respondent (-247095)
Final sample **N=1054865**

Table A3: Descriptive statistics for selected sample

	Intermediate sample	Final sample
Private school	0.1375	0.1351
LPN Q1	0.0832	0.0836
LPN Q2	0.1365	0.1369
LPN Q3	0.1876	0.1880
LPN Q4	0.2450	0.2446
LPNQ5	0.3478	0.3469
Female	0.5548	0.5527
White	0.8257	0.8241
Caribbean	0.0092	0.0093
African	0.0116	0.0118
Other Black	0.0019	0.0020
Indian	0.0530	0.0538
Pakistani	0.0232	0.0235
Bangladeshi	0.0087	0.0088
Chinese	0.0104	0.0104
Other Asian	0.0092	0.0093
Other	0.0305	0.0307
Unknown	0.0166	0.0164
Any disability	0.0860	0.0860
1st class honour	0.1363	0.1361
Upper second	0.5165	0.5180
Lower second	0.2720	0.2727
Third class	0.0426	0.0427
Unclassified	0.0326	0.0305
Medicine & rel.	0.0782	0.0792
Biology	0.1081	0.1099
Physics	0.0532	0.0541
Maths & Computing	0.0730	0.0715
Architecture & Engineering	0.0796	0.0721
Social Sciences	0.1435	0.1457
Business	0.1188	0.1206
Communication	0.0364	0.0371
Languages	0.0811	0.0822
Humanities	0.0589	0.0598
Arts	0.1261	0.1281
Education	0.0389	0.0396
Russell group	0.2024	0.2031
Golden triangle	0.0664	0.0629
Ex-poly-technique	0.0784	0.0796
Alliance	0.2446	0.2458
Million Plus	0.0750	0.0760
Guild	0.0475	0.0471
Non grouped HEI	0.2857	0.2855
N	1492290	1054865

Notes: Mean values of relevant variables in the intermediate and final sample of graduates.

Table A4: Summary statistics of main explanatory variables

	High SES	Middle SES	Low SES	
		Mean		Pearson χ^2
Female	0.531	0.554	0.579	Pr=0.000
Ethnicity				Pr=0.000
White	0.900	0.837	0.700	
Caribbean	0.002	0.008	0.022	
African	0.003	0.009	0.031	
Other Black	0.001	0.002	0.004	
Indian	0.032	0.059	0.073	
Pakistani	0.007	0.017	0.062	
Bangladeshi	0.002	0.005	0.028	
Chinese	0.007	0.010	0.016	
Other Asian	0.007	0.010	0.011	
Other (incl. mixed)	0.026	0.030	0.039	
Unknown	0.015	0.014	0.013	
Any disability	0.096	0.084	0.075	Pr=0.000
Classification degree				Pr=0.000
First class honour	0.153	0.141	0.112	
Upper second	0.552	0.525	0.478	
Lower second	0.228	0.266	0.328	
Third/Pass	0.031	0.040	0.057	
Unclassified	0.036	0.029	0.026	
Field of study				Pr=0.000
Medicine & related	0.081	0.078	0.081	
Biology	0.104	0.113	0.118	
Physics	0.061	0.057	0.046	
Maths & Computing	0.060	0.071	0.088	
Architecture & Engineering	0.080	0.072	0.061	
Social Sciences	0.152	0.143	0.151	
Business	0.113	0.117	0.127	
Communication	0.032	0.037	0.041	
Languages	0.098	0.083	0.067	
Humanities	0.074	0.061	0.046	
Arts	0.116	0.126	0.124	
Education	0.029	0.041	0.050	
HEI group				Pr=0.000
Non-grouped	0.286	0.298	0.254	
Russell	0.285	0.201	0.139	
Golden	0.093	0.066	0.036	
Ex-polytechnics	0.055	0.077	0.114	
Alliance	0.201	0.238	0.303	
Million Plus	0.039	0.067	0.108	
Guild	0.041	0.052	0.047	
Distance domicile-HEI (Km)	128.975	111.429	77.283	
N	267,185	577,990	209,690	

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data. Notes: Summary statistics of graduates' characteristics. Column 4 shows the p-value of a Pearson χ^2 test for categorical variables.

Table A5: Descriptive statistics of outcomes at 6 months after graduation

		Academic prog.	Professional prog.	FT empl.	PT empl.	Unemployed	Other act.
All sample	mean	0.078	0.073	0.527	0.101	0.076	0.144
	sd	0.268	0.260	0.499	0.301	0.265	0.351
	N	1054865	1054865	1054865	1054865	1054865	1054865
High SES	mean	0.089	0.074	0.535	0.081	0.067	0.153
	sd	0.285	0.261	0.499	0.273	0.250	0.360
	N	267185	267185	267185	267185	267185	267185
Middle SES	mean	0.078	0.071	0.533	0.099	0.074	0.143
	sd	0.268	0.257	0.499	0.299	0.262	0.350
	N	577990	577990	577990	577990	577990	577990
Low SES	mean	0.065	0.075	0.500	0.129	0.094	0.135
	sd	0.246	0.264	0.500	0.336	0.292	0.342
	N	209690	209690	209690	209690	209690	209690

		FT vs. PT empl.	Professional occ.	Graduate job	Permanent contract	Log Salary
All sample	mean	0.840	0.611	0.394	0.899	9.889
	sd	0.367	0.487	0.489	0.301	0.297
	N	662085	661210	555265	579820	291995
High SES	mean	0.868	0.650	0.422	0.889	9.922
	sd	0.338	0.477	0.494	0.314	0.301
	N	164565	164295	137005	143660	74495
Middle SES	mean	0.843	0.612	0.394	0.900	9.889
	sd	0.364	0.487	0.489	0.300	0.296
	N	365545	365070	306985	320140	162670
Low SES	mean	0.794	0.561	0.358	0.911	9.844
	sd	0.404	0.496	0.479	0.285	0.291
	N	131970	131845	111280	116020	54830

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: Activity status and job attributes at 6 months after graduation.

Table A6: Unemployment rates over time and by SES group

		U^{grad}_{home}	U^{grad}_{field}
All sample	mean	0.067	0.031
	sd	0.019	0.010
High SES	mean	0.065	0.031
	sd	0.019	0.010
Middle SES	mean	0.066	0.031
	sd	0.019	0.010
Low SES	mean	0.071	0.031
	sd	0.019	0.010
2002/03	mean	0.048	0.028
	sd	0.013	0.010
2003/04	mean	0.047	0.025
	sd	0.013	0.007
2004/05	mean	0.052	0.026
	sd	0.011	0.009
2005/06	mean	0.057	0.027
	sd	0.013	0.007
2006/07	mean	0.053	0.024
	sd	0.009	0.006
2007/08	mean	0.065	0.026
	sd	0.012	0.007
2008/09	mean	0.079	0.034
	sd	0.013	0.011
2009/10	mean	0.080	0.036
	sd	0.014	0.011
2010/11	mean	0.085	0.038
	sd	0.016	0.009
2011/12	mean	0.080	0.036
	sd	0.012	0.010
Difference 2011-2007		0.032	0.014

Source: DLHE data on the selected sample described in section 4.1 linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: Mean and standard deviation of the unemployment rate measured by region (of domicile and of HEI) and by field of study.

B1 The SES index

Private secondary schools are associated with a high SES as their attendance requires the payment of high fees.

The Local Participation Neighbourhood (LPN) is formed by ranking 2001 Census Area Statistics wards by the HE participation rates of people who were aged 18 between 2000/2004 and entered HE aged 18 or 19 between 2000/1-2005/6. This gives five young participation quantile groups of areas each representing 20 percent of the whole UK young cohort. Students have been allocated to the neighbourhoods on the basis of their postcode before entering HE by the Higher Education Statistics Agency.

The Index of Multiple Deprivation (IMD) is derived by combining several domains of deprivation such as income, employment, crime and education. It is based considering the the whole population (not only young people as for the LPN) residing in a delimited geographical area. For example, in England and Wales the IMD is based on local super output areas, LSOA, which are areas with at least 1000 inhabitants and the mean population is composed of 1500 inhabitants. We use the 2010 IMD for students residing in England and Northern Ireland, the 2009 one for students residing in Scotland, and the 2011 one for students residing in Wales. The way in which the IMD is constructed differs slightly by country. To limit this concern, we transform the continuous variable in quintiles. We then attribute each quintile to each student based on their postcode before entering HE. Note that although the IMD is measured in the recession period (2009, 2010 and 2011) this is a relative measure and is expressed in quintiles. This means that those neighbourhoods that were at the lowest quintile before the recession are unlikely to move to a higher quintile during the recession, as those are the neighbourhoods that have been mostly negatively affected by the downturn (Hoynes *et al.* , 2012).

In Table B1 we show the polychoric correlation matrix between the LPN, IMD and school variables which are all discrete. We also include a variable identifying the socio-economic classification of graduate parents at the time of HE enrolment. We do this for cohorts graduating in 2006 to 2012 as the latter variable is available only from cohort 2005/6 (this is why we do not use it for building our SES index). Nevertheless, we consider the socio-economic classification of parents additionally to the other variables as it is a further indicator of the SES measured at individual level so that we can have a better picture of the correlation between aggregate and

individual characteristics depicting the socio-economic background of graduates. There is a positive correlation between all variables. The strongest one (corr=.55) is among the two measures of SES measured at aggregate level, that is LPN and IMD. Nevertheless, the correlation between variables measured at individual and aggregate level is also relevant, for example, between LPN and school type it is equal to .35.

Table B1: Correlations of SES variables

	School	SEC of parents	LPN	IMD
School	1			
SEC parents	.286	1		
LPN	.350	.244	1	
IMD	.201	.253	.549	1

Source: Cohort of graduates from 2006 to 2012.
Notes: polychoric correlation matrix.

We implement principal component analysis on the IMD, LPN and school type variables by using the command "polychoricpca" in Stata (Kolenikov *et al.* , 2004). For this, we retain the last cohort of graduates (the one with the smallest amount of missing information on SES variables) and we take the loadings attributed by the first principal component to each category within each SES variable. For all our cohorts, we then predict a score based on the loading obtained. Table B2 shows how each of the SES measures relates to the composite SES index. In panel A we first show the polychoric correlation matrix. There is evidence of one principal factor (eigenvalue>1) which explains about 60% of the variance in our data (panel B of Table B2). From this we obtain the scoring coefficients in panel C. These coefficients weight each category in the SES measure and we use them to predict an overall SES index for all cohorts of graduates. This is divided into quintilies, then the three SES groups in the middle are grouped to form a unique category (middle SES), and we retain the highest and the lowest groups to represent high and low SES, respectively.

Table B2: SES index

	A Polychoric correlation matrix		
	IMD	School	LPN
IMD	1		
School	.242	1	
LPN	.560	.380	1

	B Principal components		
PC	Eigenvalues	Proportion explained	Cum. Explained
1	1.803	0.601	0.601
2	0.780	0.260	0.861
3	0.417	0.139	1.000

	C Scoring coefficients of PC1	
IMD	1	-0.740
	2	-0.210
	3	0.094
	4	0.398
	5	0.893
School	0	-0.812
	1	0.107
LPN	1	-0.716
	2	-0.103
	3	0.242
	4	0.560
	5	1.056

Source: Cohort of graduates in 2012.
Notes: Panel A shows the correlation between the three variables of interest. Panel B shows the three principal components obtained by the principal component analysis. Panel C shows the scoring coefficient of the first principal component for each variable and value.

C1 University groups

- *Golden Triangle Group*: elite universities located in the cities of Cambridge, London and Oxford.
- *Russell Group*: prestigious British public research universities.
- *Ex-Polytechnics*: tertiary education teaching institutions turned into independent universities with the Further and Higher Education Act 1992.
- *University Alliance*: group of 'business engaged' universities that claim to drive innovation and enterprise growth through research and teaching.
- *Million Plus*: group of universities (mainly ex-polytechnics and university colleges) forming a think-tank, seeking to solve complex problems in the HE sector.
- *Guild HE*: some of the most recently designated universities and university colleges, specialist colleges and other bodies providing HE programs.

D1 Persistency of labour market outcomes

To check whether employment conditions after graduation are a good proxy of longer term economic outcomes, we use the *longitudinal* DLHE survey, collected 3.5 years after graduation. Only a sub-sample of graduates are contacted and the survey is carried out biannually (so we have data on four cohorts, those graduating in the years 2003, 2005, 2007 and 2009).[25] Table D1 reports the mean values of the outcomes of interest at 3.5 years after graduation. This shows a persistent SES gradient in longer-term labor market outcomes. While 2.5% of high SES students are unemployed at 3.5 years after graduation, the percentages are higher for middle and low SES graduates, 2.9% and 3.7%, respectively.

Table D1: Descriptive statistics of outcomes at 3.5 years after graduation

		Total	High SES	Middle SES	Low SES
Full-time	mean	0.752	0.763	0.752	0.738
	sd	0.432	0.425	0.432	0.440
Part-time	mean	0.044	0.033	0.044	0.060
	sd	0.206	0.179	0.205	0.237
Work & studying	mean	0.056	0.057	0.054	0.056
	sd	0.229	0.233	0.227	0.230
Studying	mean	0.094	0.099	0.096	0.083
	sd	0.292	0.299	0.294	0.276
Unemployed	mean	0.030	0.025	0.029	0.037
	sd	0.170	0.156	0.169	0.190
Other	mean	0.021	0.021	0.022	0.022
	sd	0.145	0.142	0.146	0.145
	N	49030	12310	27060	9660

Source: DLHE data on the subsample that has been surveyed 3.5 years after graduation for cohorts graduating in years 2003, 2005, 2007 and 2009.

Table D2 shows the correlation matrix between activity at 6 months and 3.5 years after graduation. As we can expect, about 83% of those working full-time at 6 months are also working full-time at 3.5 years. This percentage is significantly lower for those working part-time as their first destination, given that only 70% of them make it into full-time employment a few years later. And

[25] We compare the characteristics of individuals who reply to the 6 month and the 3.5 years survey and we find that these are generally not statistically different. Two characteristics (that are ethnicity and degree classification) are not perfectly balanced across the two samples, although the difference is small and those characteristics are not important in explaining the SES-gap as we show in Section 5.1.3.

only about 68% of those unemployed at 6 months gain a full-time position, with almost 9% still looking for a job 3.5 years later. This indicates a significant degree of persistence in activity status over time (the diagonal of the matrix) in our sample.

Table D2: Activity status at 6 months and 3.5 years after graduation

		3.5 years						
		FT emp.	PT emp.	Study	Work & Study	Unemployed	Other	Unknown
		75.19%	*4.43%*	*9.42%*	*5.55%*	*2.99%*	*2.14%*	*0.27%*
6 months								
FT emp.	*50.41%*	82.74%	2.8%	5.3%	5.23%	1.89%	1.79%	0.27%
PT emp.	*8.01%*	69.23%	11.42%	7.55%	4.83%	4.04%	2.62%	0.31%
Study	*17.63%*	62.48%	3.63%	23.72%	5.36%	2.82%	1.8%	0.19%
Work & Study	*9.34%*	73.53%	4.3%	8.52%	9.61%	1.97%	1.79%	0.28%
Unemployed	*8.27%*	68.15%	8.07%	7.25%	4.27%	8.83%	3.13%	0.3%
Other	*6.34%*	69.64%	6.28%	9.06%	5.32%	4.71%	4.51%	0.48%

Source: DLHE data on the subsample that has been surveyed 3.5 years after graduation for cohorts graduating in years 2003, 2005, 2007 and 2009 (N=49,030).
Notes: Correlation matrix of activity status at 6 months and 3.5 years after graduation. FT stands for full-time and PT for part-time.