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ABSTRACT

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

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 students from less advantaged family backgrounds graduate during a recession they 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.

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

Keywords: graduate employment, socio-economic gap, recession

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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, nearly 40% have a university degree. Despite the introduction of student fees in the early 2000s, and a steep increase in their value in 2012, there has been a steady upward trend in the enrolment of students from low income families and a reduction in the socio-economic gap in participation (Murphy *et al.*, 2019).

These changes 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 the case, as graduates have better labor market outcomes than non-graduates and are less severely affected by negative shocks (Henehan, 2020). However, it is still unclear whether a university degree is enough to guarantee that individuals from different socio-economic backgrounds enjoy the same labor market rewards later on in life.

Graduates' career prospects are affected by factors other than family background, such as labour market conditions at time of graduation. Indeed, the first job has been found to affect overall employment prospects (Von Wachter & Bender, 2006), and recent research has shown that the state of the business cycle at the time of graduation matters for early and long-term graduate careers (Kahn, 2010; Oreopoulos *et al.*, 2012; Oyer, 2006). One aspect that has received less attention in the literature to date is whether a recession has different impacts on students from different family backgrounds. If this were the case, graduating in a tough labour market could widen socio-economic gaps in graduate outcomes over a long period of time.

One reason why the effects of a recession might depend on a student's family background is that the latter influences the process of human capital accumulation. Higher SES students are more likely to graduate with better grades or from more prestigious universities. Furthermore, students from high SES families might engage in a wider range of extra-curricular activities, such as participation in team sport or volunteering, and accumulate additional skills (e.g. teamwork or negotiating skills) valued by employers. So, differences in human capital could be an important reason why students from high SES families might be less affected by a recession at graduation.

Apart from differences in human capital, there could be at least two other possible mechanisms at play. One is through the impact of the recession on geographic or spatial mobility. The other

is through the effect of the recession on access to and effectiveness of social and professional networks. Both these factors relate to the process of job search.

Although the relationship between economic downturns and labour mobility is still debated (Levy *et al.*, 2017), recent evidence shows that the Great Recession might have reduced opportunities for geographical re-location due to its effect on the housing market (Brown & Matsa, 2020). Geographical mobility is generally positively correlated with better earnings (Clarke, 2017), even among recent UK graduates (Kidd *et al.*, 2017). It is therefore possible that during a recession students from less advantaged families - who are more likely to study closer to home (in our data 57% of low SES students study in the same region as their family home compared to 27% of high SES students) - might find themselves restricted to their local labour markets. If these local labour markets are also more vulnerable to an economic downturn this will lead to widening socio-economic inequalities in outcomes. Indeed, a recent report from the Social Mobility Commission points to a strong relationship between social deprivation and geography, with evidence that areas of social disadvantage are clustered in rural and coastal towns and former industrial towns and cities (Social Mobility Commission, 2017). Evidence shows that these areas were disproportionately hit by the 2008 recession and did not experience a significant recovery even afterwards (Beatty & Fothergill, 2020; Townsend & Champion, 2014).

Another explanation is that individuals from more advantaged SES groups might have access to wider and more effective social and professional networks, and this might facilitate the process of finding a job match. The network literature has emphasised the importance of relationships with other employed individuals living in the same neighbourhood (Bayer *et al.*, 2008), or working in the same firm (Cingano & Rosolia, 2012). These relationships can differ by family background if individuals from different SES groups have access to different networks (Trimble & Kmec, 2011). Most importantly, the same networks can be less effective for low SES students during a recession if a downturn has a more damaging impact on workers with lower levels of education or in non-professional occupations. Evidence from the UK shows that this was indeed the case during the 2008 recession, with low-skilled jobs being disproportionally more affected (Coulter, 2016).

This paper provides new evidence about the relationship between SES and the effects of an economic downturn on the early labor market outcomes of several cohorts of students graduating from English universities. Our empirical strategy exploits the change in labor demand due to the Great

Recession to investigate whether graduates from different SES groups were 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?

The 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 unemployment rates defined by field of study in order to investigate the influence of the business cycle during the period between 2002/03 and 2011/12 on early graduate careers. Our main focus is on labor market outcomes 6 months after graduation, although we offer some evidence that effects persist 3 years after that using a smaller longitudinal sample.

We show that the costs of entering the labour market during a recession are unequally spread. Compared to graduates from an advantaged socio-economic background, disadvantaged graduates are less likely to enroll in postgraduate courses and more likely to become unemployed when graduating in bad economics conditions. 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 more likely 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 conditions 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 the heterogeneous effects of the recession by SES. 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 intend to offer different contributions to the literature in labour economics.

Many studies have considered the effects of graduating in a recession (e.g. Altonji *et al.*, 2016; Kahn, 2010; Oreopoulos *et al.*, 2012). These previous analyses have emphasised the importance of field of study or career prospects in increasing or decreasing the penalty of graduating during bad economic times. To the best of our knowledge, this is the first paper that focuses on differences by socio-economic status instead. This is very important from a policy perspectives, as it helps us to understand whether students from more disadvantaged backgrounds need additional support not only during the transition from school to higher education, but also in moving from university to the labour market. Evidence of widening SES differentials in graduate outcomes during a recession would be a strong argument in favour of government schemes that support graduates from disadvantaged backgrounds during an economic downturn, for example.

A second important contribution of this paper is that we are able to offer an analysis of some of the mechanisms which might explain why a recession differently affects graduate labour market outcomes depending on graduates SES. Our data is sufficiently rich to allow us to consider the role of geographic mobility and social and professional networks while controlling for other differences across individuals, such as economic conditions at the time of enrollment, the university attended, and the degree classification achieved. Other papers in this literature have pointed out that a recession can have differential effects according to field of study (Altonji *et al.*, 2016), ethnicity, or gender (Schwandt & von Wachter, 2019), but have not been able to examine the mechanisms by which these differences come about. A notable exception is the work by Oreopoulos *et al.* (2012). Here the authors show that students graduating in subjects associated with slower wage growth suffer disproportionately and provide evidence about the the role of job mobility in reducing the effects of bad econonmic conditions at entry.

Another difference between this paper and other existing work on this topic is that we exploit variation in labour market conditions at entry determined by differences 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 variation by field of study is more appropriate in our context because the geographical mobility of graduate students is very high in the UK, with students often moving very large distances between their family home and university, as well as between university and the first place of work.

2 Empirical strategy

Our identification strategy is similar to what has been commonly used in the literature on the effect of graduating in a recession (Altonji *et al.*, 2016; Cockx & Ghirelli, 2016; Kahn, 2010; Liu *et al.*, 2016; Oreopoulos *et al.*, 2012), 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 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. Our principal interest is to establish whether there is any impact of unemployment on graduate destinations. To capture the macroeconomic condition at graduation we use the rate of unemployment at the level of unit j, which represents either the region where graduates resided before entering HE or the field of study. The idea here is to proxy the labour demand conditions of graduates with an indicator of regional unemployment related to the place of their family residence or the rate of unemployment of older cohorts of graduates from the same field of study, irrespective of their geographical location. Our initial specification is:

$$y_{ijt} = \alpha + \beta U_{j,t-1} + \gamma SES_i + \delta U_{j,t-1} \times SES_i + \theta X_i + \mu_j + \mu_j \times t + \nu_t + \rho_h + \omega_{ijt}, \qquad (1)$$

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 date. We further include fixed effects for each unit j (μ_j, representing either region or field of study), time trends specific to unit j ($\mu_j \times t$), as well as year of graduation dummies (ν_t), and university fixed effects (ρ_h).[1] 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

[1] Specifications with regional unemployment also include field-specific dummies but not field-specific time trends; specifications with unemployment by field of study include geographic indicators but not geography-specific time trends.

as recommended in Cameron & Miller (2015).

All the existing studies in the literature use as their main measure of labour demand an indicator of unemployment which varies according to the geographical location of the student. Very often this is the state or the region where the student is observed in her first employment destination (see for example Oreopoulos *et al.*, 2012). We think that the use of regional unemployment might not be appropriate in our context, however. 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 very geographically mobile (Faggian *et al.*, 2007; Hoare & Corver, 2010; Machin *et al.*, 2012). Indeed, in the UK students move very large distances even to attend their preferred HE institutions (in our data this is on average 110km, with more than 50% of the sample travelling 84km or more).

We propose to use instead *field-specific* graduate unemployment rates. This assumes that the labor market of graduates is national in geographic reach but segmented across different sectors defined by 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.

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 A.1 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). There is clearly a lot of heterogeneity across fields of study. Degrees such as Medicine and Education are associated to few occupations or industries. Others, such as Biology and Physics, see their graduates employed across a wider range.

One potential issue of our strategy is 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; Tumino & Taylor, 2015). Conditioning on observable socio-demographic and academic character-

istics of graduates (X) including gender, ethnicity, disability status, and degree classification, might not be enough to mitigate this concern. Thus, we additionally condition on labor market demand at the time of enrollment. To do so we use the unemployment rate at the Local Authority District (LAD) level.[2] We consider that this is the relevant proxy of the labor market circumstances affecting students and their families before university decisions are made since the geographical mobility of school leavers is much more restricted than that of graduate students (Clarke, 2017).

The LAD unemployment rate is measured at time of enrollment in HE, $t-4$, and is matched to each student using the area of family domicile (U_d).[3] 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 LAD dummies, τ_d. Our main specification therefore is:

$$\begin{aligned} y_{ijdt} = \alpha + \beta U_{j,t-1} + \gamma SES_i + \delta U_{j,t-1} \times SES_i + \lambda U_{d,t-4} + \sigma U_{d,t-4} \times SES_i + \theta X_i \\ + \mu_j + \mu_j \times t + \nu_t + \rho_h + \tau_d + \zeta_{ijdt}. \end{aligned} \tag{2}$$

There are two other main potential threats to the identification of the effect of unemployment by field of study on graduate labour market outcomes. First, we need to consider whether students can respond to (expected) changes in unemployment by changing the subject studied at university, as this would make their labour market conditions at graduation endogenous. Second, we need to discuss whether students can choose the timing of graduation.

In England, students typically enroll at university when they are 18 years old. The choice of 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 Engineering, 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 universities. Similarly, in order to study a certain subject during the last years of schooling, students

[2] 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.

[3] The data here is from the ONS Claimant Count statistics (`https://www.nomisweb.co.uk/`) and capture unemployment rates for the overall population, including graduates and non-graduates.

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 (UCAS, 2021).[4]

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 (Vignoles & Powdthavee, 2009). 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 US. 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.[5]

3 Data and descriptive statistics

3.1 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 universities.[6] The survey collects information on activity status, occupation, salary and type of contract of each respondent. 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. Other information includes: university grades (degree class), subject, and the HE institution (HEI) attended. The DLHE started in the academic year 2002/3 and in this paper we use information up to year of graduation 2011/2.

[4]This setting refers to students who choose an academic track. It is also possible to enroll at university after obtaining a vocational qualification and the steps are very similar. However, the vocational route is by far less common than the academic route accounting for only 7% of undergraduate students in 2014 for example.

[5]During the period analysed, there have been significant changes to the system of HE financing, including to the amount of tuition fees and support for maintenance costs. These changes could impact both the number and socio-economic composition of those going to university. Our specifications take into account these possible effects by including cohort dummies and SES dummies throughout.

[6]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.

Our interest is the transition from HE to work, so we keep students completing their first degree and exclude postgraduate courses, foundation degrees, HE diplomas and certificates. This represents 82% of the original sample. We consider full-time non-mature students only, as they are less likely to be influenced by family responsibilities, and UK nationals ($> 90\%$) living on the mainland. We further restrict our analysis to English universities because comparisons with the other UK countries would be difficult due to institutional differences in tuition fees, maintenance support, and duration of study.

Some students are in courses which combine different subjects (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.[7] 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 SES indicator, excluding records with missing information on: home domicile (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). This is probably the most controversial selection. We check 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.[8]

3.2 Measuring socio-economic status

To derive an indicator of 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), a categorical variable splitting graduates into five groups according to the rate of HE participation in the neighbourhood of residence at the time of application to university. The third variable is the Index of Multiple Deprivation (IMD), a widely used measure of socio-economic conditions in the UK, which we match to graduates on the basis of the postcode of family residence.

Figure A.1 (a, b, and c), shows the distribution of the IMD, LPN, and school variables across

[7] About 9% of students study for a joint degree (i.e. combination 50-50%). In this case we randomly retain one of the two subjects studied. Excluding these students from our sample does not affect our results.

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

the years. On average, about 13% and 5% of graduates come from the most deprived areas in terms of IMD and LPN, respectively. Almost 90% of graduates instead come from state schools. As documented elsewhere, we see an increase in the HE participation of students from the most deprived areas, with a corresponding narrowing of the SES gap (Crawford, 2012).

Next, we combine these indicators to construct an overall SES index.[9] We split this new index into quintiles, then group the quintiles in the middle to form a unique category (middle SES), retaining the highest and the lowest quintiles to represent high and low SES, respectively. This approach makes use of all the information on SES in the data and allows us to consider compositional changes in the student population, as the index varies over time. Figure A.1.d shows that our SES index changes over time in a way similar to the original indicators, reflecting a reduction of the HE SES-gap over time.

Table A.2 shows the characteristics of graduates broken down by SES (columns 1-3). There are differences across several dimensions. For example, there is significant variation in the type of university attended and the subject studied, although this is not so across all subjects. We also see that high SES students have a higher propensity to move geographically; about 57% of low SES students study in the same region of family residence, compared to 39% and 27% among middle and high SES students.

3.3 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,

[9] Appendix Section B explains in detail how this index is constructed.

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, 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.[10] Table A.3 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 1 and 2 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 things. First, there is a visible SES gradient: high SES graduates perform significantly better than middle, and then low SES graduates. Second, after the recession 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, the percentage of low SES graduates who report being unemployed in the period pre-2008 is on average 7%, compared to 5.7% for high SES graduates (Figure 1.e). In 2008 unemployment jumps up for all three groups, but in 2011 - when the total number of unemployed reached a peak of 2.68m - the percentage of low SES graduates in unemployment is above 11% while this is 7.8% for those in the high SES group. What was a high-low SES gap of about 1ppt before the recession more than doubles a few years later.

[10] 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 6 months after graduation are very similar to what we obtain when using self-reported salaries.

3.4 Capturing the business cycle

To capture labor market conditions at graduation, we use unemployment by region or field of study. Figure A.2 shows the yearly average unemployment rate by region obtained using the Labour Force Survey. We see 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 using the graduate population aged 21-65. Figure A.3 shows the variation over the period considered. As we can see, 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. The recession clearly affected different sectors of the economy in different ways, and this is what we will exploit in our analysis.

Table A.4 shows unemployment rates for the whole population and by SES. Regional unemployment rate 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. 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 but they do not differ significantly in their choices of degrees (see Table A.2). Finally, Table A.4 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.

4 Results

4.1 The consequences of graduating in a recession

We start by showing in Table 1 how socio-economic status and the business cycle affect the probability of being unemployed 6 months after graduation. We proxy labor market conditions using first the unemployment rate by region of family domicile (columns 1-2), and then by field of study (columns 3-5). All regressions include individual demographics and other characteristics (e.g. gender, ethnicity, disability and degree class), and full sets of dummies for cohort, HEI, field of study, and region (or LADs). Region-specific or field-specific trends are controlled for depending on the measure of unemployment used. The last specification also includes unemployment at the time of enrolment in HE, measured at the level of smaller geographical units (LAD), and its interactions with the SES dummies.

The first thing we notice is that students from middle and low SES families experience higher unemployment than students from high SES families (omitted category). The effects are modest, but statistically significant. Specifically, middle SES and low SES graduates are 0.2 and 1.1ppt more likely to be unemployed 6 months after graduation than high SES graduates. These effects are similar whether we control for unemployment at the regional level or by field of study.

Tough labour market conditions at graduation are associated with a higher probability of unemployment after graduation. Specifically, a 1ppt increase in the regional unemployment is associated with a 0.2ppt increase in the probability of being unemployed. This an effect a bit larger than that found in other studies. 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. When we consider unemployment by field of study (column 3), the effect is about 0.1ppt, more in line with the previous literature.

We also see that there are significant interactions between SES and unemployment. These interactions are also positive, to indicate that labour market conditions at graduation widen SES differences. Indeed, when we introduce these interaction effects, the raw SES differentials become negative suggesting that middle and low SES graduates would be *less* likely to be unemployed after graduation if all students faced the same labour market conditions at graduation irrespective of family background. Allowing for differences in unemployment rates at the end of secondary

school, which might affect the decisions to enrol in HE, does not seem to change much any of these results, as we can see in column (5).

In comparing specifications which use regional unemployment with those that use unemployment by field of study we generally see stronger effects with the former measure. One explanation is that regional distances are small in the UK - especially relative to countries like the US and Canada - and using regional unemployment could overestimate the effect of labour market conditions at entry by not taking into account the mitigating effects of geographic mobility. Another potential issue when using regional unemployment rates is serial correlation. Although there is more variation in regional unemployment rates than in unemployment rates by field of study (Table A.4), unemployment at graduation might be more highly correlated with local (LAD) unemployment levels at enrolment, especially for low SES students who are less geographically mobile (Table A.2). For these reasons, in what follows we report results using unemployment by field of study. We conducted parallel analyses on the main outcomes considering unemployment at the regional level as well, and our findings are qualitatively similar (Table A.5).

Table 2 considers the different destinations of graduates in terms of their *activity status* 6 months after graduation. 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 a decrease of 6.2% on the mean (this is 0.065 as shown in Table A.3). To relate this to the Great Recession, we multiply these numbers by 1.4, which is the average increase in graduate unemployment for older cohorts between 2007 and 2011 (see bottom row in Table A.4), obtaining an effect of 8.6%. 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.

We run some specification checks by considering different definitions of SES and different measures of unemployment. Table A.6 reports the results for our main outcome (unemployment) when we define family background according to an indicator of the general level of education of the resident population (column 2) or according to parental occupation (column 3).[11] We then use a definition of unemployment by field of study calculated only on individuals aged 20-40 to get closer to a measure that might be relevant to young graduates (column 4). In our main specification (column 1) 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, but we also run a specification using unemployment rates 12 months prior to graduation (column 5). Finally, we consider what happens if we were to use a longer-term measure of unemployment at enrolment, taking a 5 year average of the local unemploymenr rate (column 6). All specifications show that higher rates of unemployment have a larger impact on low SES students.

Table 3 shows the effects of unemployment at graduation on different job *attributes*. Notice that these are observed only for students who are either in a part-time or full-time job 6 months after graduation. Consistent with 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 found to be significantly less likely to work in a professional occupation or in a graduate job. Gross annual earnings of low SES graduates (available for full-time workers only) are almost 1% lower than those of high SES graduates.

All our outcomes are measured 6 months after graduation. To check whether the effects we observe in the short term are likely to persist in the long term, we use data from the *longitudinal* DLHE survey, collected 3.5 years after graduation. Only a sub-sample of graduates are contacted for the longitudinal survey and this is carried out biannually, which means we have data on four

[11] Information on parental occupation is available only from 2006 onwards and is missing for more than 16% of students.

cohorts (2003, 2005, 2007 and 2009).[12]

Table A.7 reports the results for the available outcomes at 3.5 years. We do not see many statistically significant coefficients, except on unemployment, where we document an increase in the SES gap when economic conditions at graduation are bad. There is also evidence that the salary of low SES graduates is negatively affected, although the coefficient here is not statistically significant.

4.2 Heterogeneity

Next, we analyse whether graduating during a recession affects some students more than others. There could be differences by gender for example, or by degree class, as a good degree is a positive signal of the quality of human capital and is a safety net when the competition for jobs is tougher. The effects of the recession might also differ by field of study. For example, graduating in a field leading to a high paid job might reduce the negative effects of graduating in a recession, although this was not found to be the case for the 2008 downturn in the US (Altonji *et al.*, 2016).

We perform our heterogeneity analysis by means of a triple interaction, i.e. the SES categories are interacted first with the unemployment rate by field of study and then with the characteristic of interest. We find that field of study is one of the dimensions that matters most. Table 4 shows that low SES graduates who studied in STEM fields are mainly affected by the recession in terms of progression to further study, unemployment, full-time vs. part-time work, access to professional occupations, graduate jobs, and permanent contracts.

We examine this issue further, and separate fields of study according to their degree of specialization defined using the Hirschman-Hirfindahl Index of occupational concentration (see Table A.1).[13] Among the most specialized degrees we have "Medicine & dentistry", "Engineering & technology", and "Architecture, building & planning", which are STEM subjects. We find that low SES graduates in subjects characterised by a high degree of specialization are more likely stay on in further education and to become unemployed during a recession. Among those who find employment, we see a lower probability to be in a graduate job or in a professional occupation. These

[12] We use weights based on individual characteristics observed in the 6 months after graduation survey to account for the different probability of replying to the 3.5 survey. The regression model is the same as the one in the last column of Tables 1, but since we have only 4 cohorts we do not include field-specific time trends.

[13] Here we define "specialised" a field of study with a value of the index above the median (0.15).

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.[14]

5 Potential mechanisms

The observed widening of SES gaps in graduate outcomes associated to bad labour market conditions at entry might arise because of unobserved (to the econometrician) SES differences in human capital. Although we consider here 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, there is still much we cannot control for. For example, there is obviously variation in human capital within a degree class, but we think 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).

More relevant might be differences in qualifications achieved before enrolling at university (mainly A-levels results), as these are observable to employers. Our data does not have information on these qualifications, but only an aggregate indicator - the tariff score - which combines the value of different qualifications according to the grade achieved. The tariff score is only observed for students who graduate from 2004/2005 onwards, so we test the robustness of our results to the inclusion of this variable in a separate sets of regressions. We find that adding tariff score does not change any of our main results, as we can see from Table A.8.

Another possibility is that students from different SES backgrounds differ in the type of extra-curricular experience they accumulate during university. For example, students from high SES families might be more likely to engage in volunteering or take on leadership roles, either because they do not need to take on part-time jobs to help with their maintenance costs or because they have better information about the labour market value of these activities. If these activities provide skills that are valued by employers, and we do not observe them, then we might be attributing these differences in skills to SES differences, thus overestimating the impacts of SES during a

[14]Notice that in general there is a positive correlation between the Hirschman-Hirfindahl Index of occupational concentration and the probability of being in a graduate job, so these types of degrees are generally linked to good labour market outcomes. What we show here is that this might not be the case for low SES students during a period of recession.

recession. However, there is still little causal evidence that these activities positively affect labor market outcomes (Saniter & Siedler, 2014), and recent studies find no evidence that students differ in their engagement in these activities along the SES dimension (Delavande *et al.*, 2020).

As discussed earlier, we might expect that a recession reduces the degree of geographical mobility of job seekers, and that this might be one of the mechanisms which leads to an increase in SES differences in graduate outcomes (Social Mobility Commission, 2017). While our data shows that graduates from a lower SES background find a job closer to the initial domicile, there is no evidence that this is more likely to be the case during a recession. Indeed, our results in Table 5 (column 1) indicate that the distance between the first job after graduation and the domicile actually increases for low vs. high SES students during an economic downturn.[15]

Graduates from different SES groups might have access to different types of social networks (Trimble & Kmec, 2011), and during a recession the role and the effectiveness of these networks differs by SES. 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 5 (column 2) we see that during the recession middle and low SES students are less likely to find a job through social networks. By contrast, there is no evidence of an effect on other job search channels, such as employers' websites or recruitment agencies (columns 3 and 4). This suggests 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, coinciding with the sharp increase in unemployment. 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. The survey asks respondents whether their job at 6 months was with a previous employer and whether it was a placement job.[16] Placement jobs

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

[16] 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.

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. On the basis of this and previous studies on the topic (see 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 we ask here is 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%). 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 2008 recession 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 (see figure A.4).

There is also evidence that the SES gap in access to professional networks increases with the recession. This is what we find in Table 5, where we see that middle and low SES graduates who are employed 6 months after finishing their studies are less likely to be found in a previous placement job and more likely to be in a previous non-placement job (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 (see also column 5). In results not shown we find evidence of a significant and positive association between 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.

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.

6 Conclusion and discussion

In this paper we provide new evidence that entering the labour market during an economic downturn increases SES differentials in graduate outcomes. Specifically, we show that the sharp increase in unemployment experienced in the UK between 2008 and 2011 translated into wider SES gaps across a range of labour market outcomes measured 6 months after graduation, including employment, salary, and access to professional and graduate occupations. This is so after taking into account the effects of compositional changes in the population of graduates, observed and unobserved university characteristics, and economic conditions at the time of enrolment.

We consider different mechanisms through which a recession might widen SES inequalities. We find limited evidence that this is due to differences in human capital or geographic mobility. Our findings suggests that differential access to professional networks might be important instead. For example, we see that during a recession low SES graduates are more likely than high SES graduate to return to their previous employer, particularly where this offered a non-placement job.

We can think of several policy implications arising from this study. The most obvious is that students from more disadvantaged backgrounds should be offered additional support not only during the transition from school to higher education - as it happens now through widening participation programmes - but also when moving from university to the labour market. This could take the form of direct support through subsidised work-placements, assisted job search, re-training programmes, or by providing hiring subsidies to employers.

We also need to 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 plays. Universities might help to reduce 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 the course of study. Additionally, adequate financial support could be provided to disadvantaged students to take on these opportunities, as most placements are unpaid and, because of this, only accessible to high SES individuals (Fournier *et al.*, 2019).

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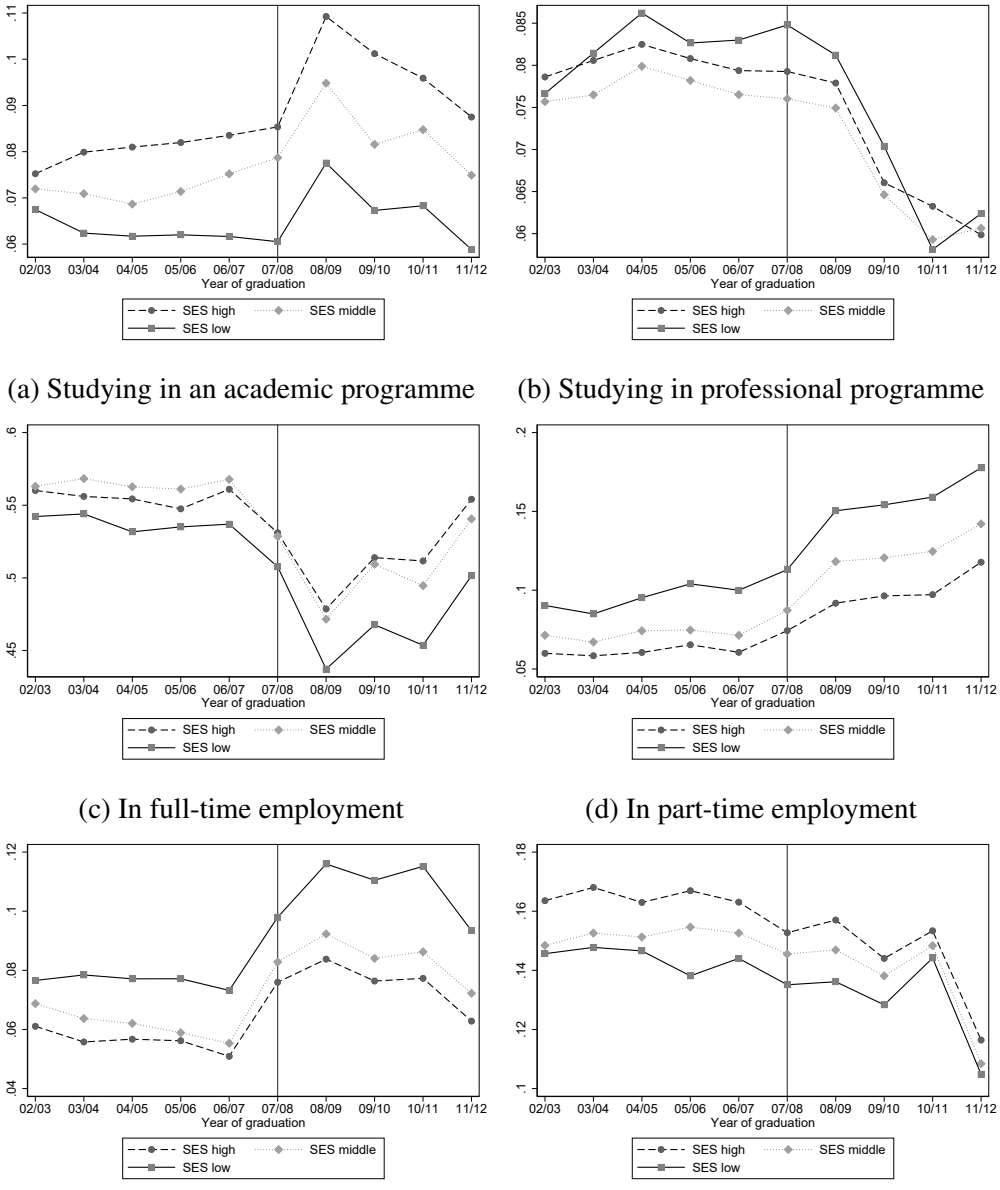
Figures and tables

Figure 1: Labor market outcomes - Activity status



(a) Studying in an academic programme

(b) Studying in professional programme

(c) In full-time employment

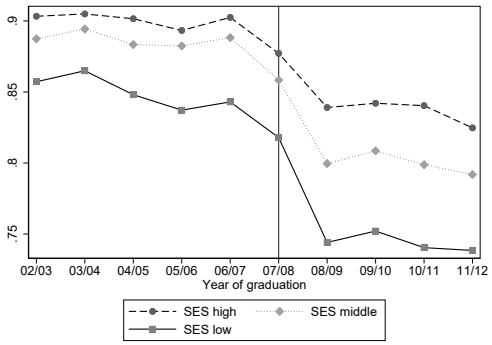
(d) In part-time employment

(e) Unemployed

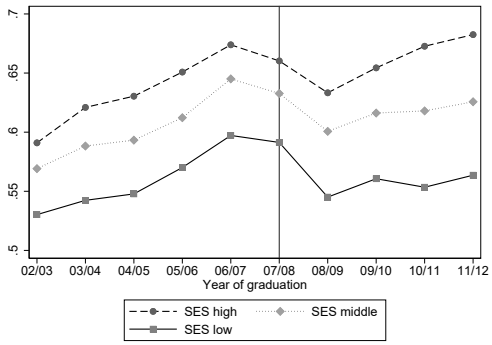
(f) Other activity status

Notes: The outcomes are described in Section 3.3.

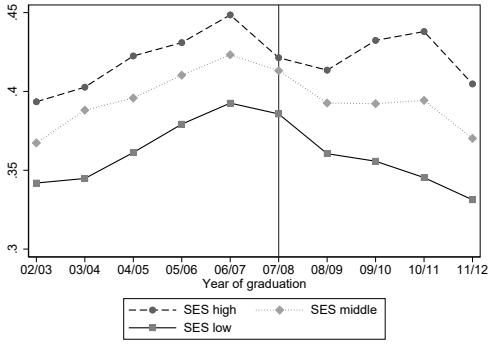
Figure 2: Labor market outcomes - Job attributes



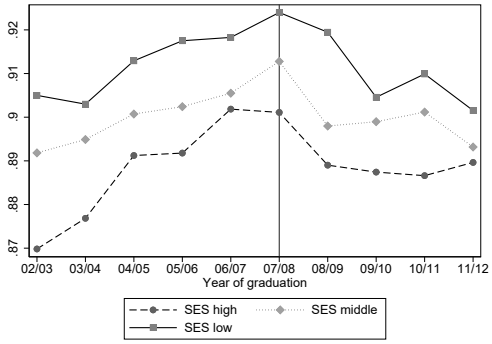
(a) Full-time vs. part-time



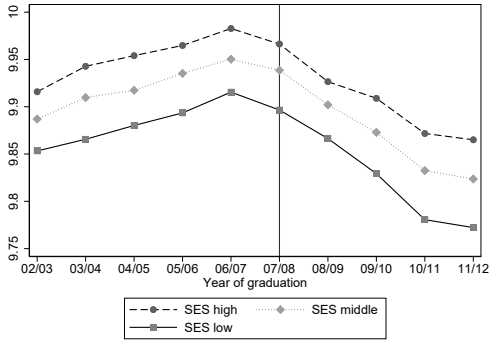
(b) Professional job



(c) Graduate job



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



(e) Salary (ln)

Notes: The outcomes are described in Section 3.3.

Table 1: Unemployment 6m after graduation

	(1)	(2)	(3)	(4)	(5)
Middle SES	0.002**	-0.005+	0.002**	-0.001	-0.006*
	(0.001)	(0.003)	(0.000)	(0.007)	(0.003)
Low SES	0.011**	-0.015**	0.011**	-0.008	-0.016**
	(0.001)	(0.003)	(0.001)	(0.005)	(0.003)
U_{region}	0.002*	0.000			
	(0.001)	(0.001)			
Middle SES$\times U_{region}$		0.001**			
		(0.000)			
Low SES$\times U_{region}$		0.004**			
		(0.000)			
U_{field}			0.001	-0.000	-0.000
			(0.001)	(0.002)	(0.001)
Middle SES$\times U_{field}$				0.001	0.001
				(0.001)	(0.001)
Low SES$\times U_{field}$				0.006**	0.006**
				(0.001)	(0.001)
Individual controls	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes
HEI dummies	Yes	Yes	Yes	Yes	Yes
Field dummies	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	
Region time trends	Yes	Yes			
Field time trends			Yes	Yes	Yes
LAD dummies					Yes
$U_{LAD,t-4}$					Yes
$U_{LAD,t-4}\times$SES					Yes
N	1054865	1054865	1054865	1054865	1054865

Notes: Specifications 1 and 2 use unemployment rate by region of domicile, while specifications 3 to 5 use unemployment rate by field of study. Individual controls: gender, ethnicity, disability, degree classification, log distance between university and domicile. Robust standard errors are clustered by region (1-2) or field of study (3-5) in brackets (wild cluster bootstrap 999 reps). +r < 0:10 *r < 0:05 **r < 0:001.

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

	Academic programme	Professional programme	Full-time employment
MiddleSES$\times$U$_{field}$	-0.002	0.002	-0.005*
	(0.001)	(0.002)	(0.003)
LowSES$\times$U$_{field}$	-0.004*	0.005	-0.011+
	(0.002)	(0.005)	(0.006)
U$_{field}$	0.003*	-0.002	0.000
	(0.001)	(0.003)	(0.000)
N	1054865	1054865	1054865
	Part-time employment	Unemployed	Other activity
MiddleSES$\times$U$_{field}$	0.005**	0.001	-0.001
	(0.001)	(0.001)	(0.002)
LowSES$\times$U$_{field}$	0.009**	0.006**	-0.003
	(0.002)	(0.001)	(0.003)
U$_{field}$	-0.002	-0.000	0.002
	(0.002)	(0.001)	(0.002)
N	1054865	1054865	1054865

Notes: The specification is the same as the one in column 5 in Table 1. 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

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

Notes: The specification is the same as the one in column 5 in Table 1. 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: Heterogeneity

Activity status:	Academic prog.	Prof. prog.	Full-time emp.	Part-time emp.	Unemployed	Other
			I=STEM vs. non-STEM			
MiddleSES×U_{field}×I	-0.001	0.008*	-0.001	0.001	0.001	-0.008**
	(0.002)	(0.003)	(0.006)	(0.002)	(0.001)	(0.002)
LowSES×U_{field}×I	0.001	0.017*	-0.012	0.002	0.004*	-0.011**
	(0.006)	(0.007)	(0.010)	(0.004)	(0.002)	(0.003)
N	1054865	1054865	1054865	1054865	1054865	1054865
			I=High vs. low specialization degree			
MiddleSES×U_{field}×I	0.004*	0.008**	-0.010**	0.002	0.003**	-0.006**
	(0.002)	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)
LowSES×U_{field}×I	0.010**	0.017**	-0.027**	0.006*	0.007**	-0.013**
	(0.004)	(0.006)	(0.008)	(0.003)	(0.002)	(0.004)
N	1054865	1054865	1054865	1054865	1054865	1054865
Job attributes:	Full vs. Part-time	Prof. occ.	Graduate job	Permanent contr.	Log salary	
			I=STEM vs. non-STEM			
MiddleSES×U_{field}×I	-0.003	-0.003	0.001	-0.003+	0.000	
	(0.003)	(0.005)	(0.003)	(0.002)	(0.002)	
LowSES×U_{field}×I	-0.010+	-0.013*	-0.010*	-0.007*	-0.001	
	(0.006)	(0.006)	(0.004)	(0.003)	(0.013)	
N	662085	661210	555265	579815	291990	
			I=High vs. low specialization degree			
MiddleSES×U_{field}×I	-0.005+	-0.013**	-0.010**	-0.003	-0.006	
	(0.003)	(0.004)	(0.003)	(0.002)	(0.005)	
LowSES×U_{field}×I	-0.014**	-0.031**	-0.022**	-0.008*	-0.010	
	(0.005)	(0.008)	(0.006)	(0.004)	(0.008)	
N	662085	661210	555265	579815	291990	

Notes: We report only the coefficient of the interaction between unemployment, SES and and indicator variable I for a field of study which is categorized as STEM or as having a high degree of specialization (defined by the Hirschman-Hirfindahl index). The specification is the same as the one in column 5 in Table 1. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

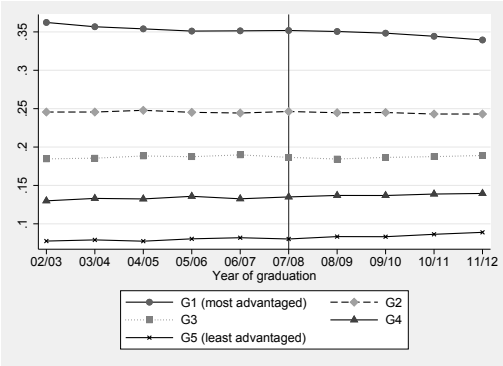
Table 5: Mechanisms

	(1) (log)Distance domicile-workplace	(2) Social network	(3) Employer website	(4) Agency
MiddleSES×U_{field}	0.004	-0.005**	-0.000	0.001
	(0.003)	(0.001)	(0.004)	(0.002)
LowSES×U_{field}	0.020*	-0.014**	0.004	0.004
	(0.008)	(0.002)	(0.003)	(0.004)
U_{field}	-0.025*	0.005**	0.007	-0.003
	(0.011)	(0.002)	(0.007)	(0.002)
N	621685	536925	536925	536925
	(5) (log)Distance HEI-workplace	(6) New employer	(7) Previous employer non-placement	(8) Previous employer placement
MiddleSES×U_{field}	-0.027*	-0.003**	0.008**	-0.005**
	(0.013)	(0.001)	(0.002)	(0.001)
LowSES×U_{field}	-0.051*	-0.005+	0.013**	-0.008**
	(0.022)	(0.003)	(0.004)	(0.003)
U_{field}	0.027+	0.000	-0.005**	0.005+
	(0.015)	(0.001)	(0.002)	(0.002)
N	621750	527890	527890	527890

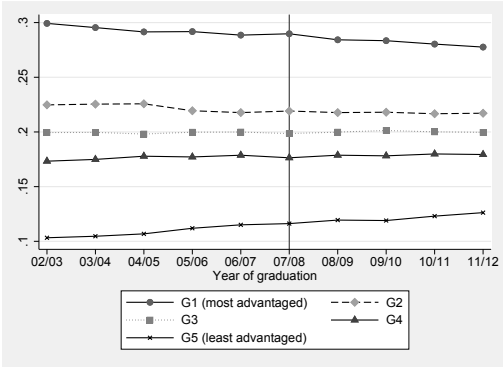
Notes: The specification is the same as the one in column 5 in Table 1. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). +$\rho < 0.10$ *$\rho < 0.05$ **$\rho < 0.001$.

A Appendix Figures and Tables

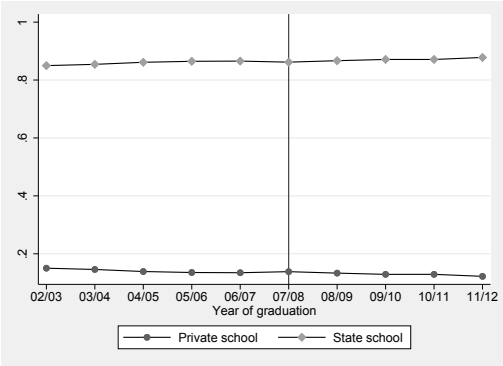
Figure A.1: SES indicators



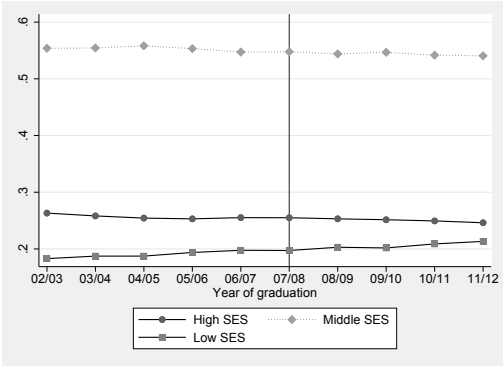
(a) Low Participation Neighbourhood (LPN)



(b) Index of Multiple Deprivation (IMD)



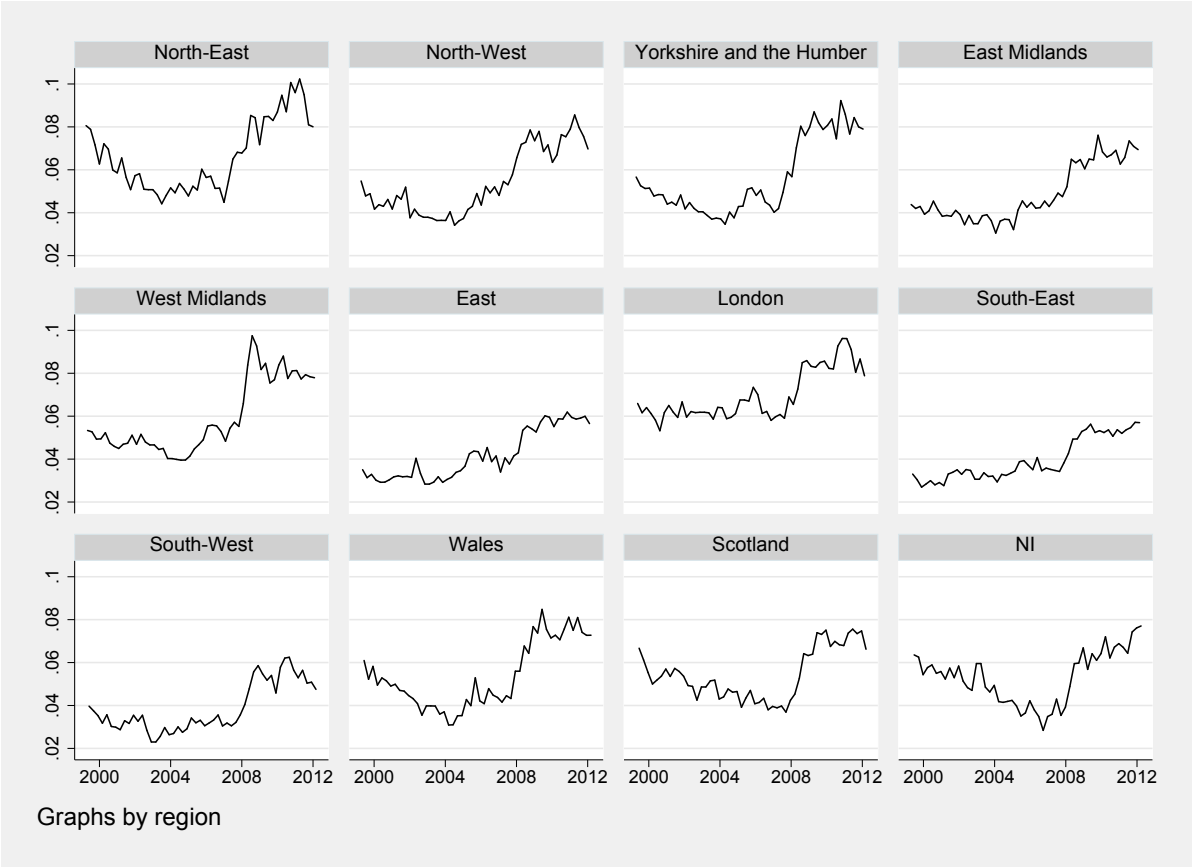
(c) Type of school



(d) SES Index

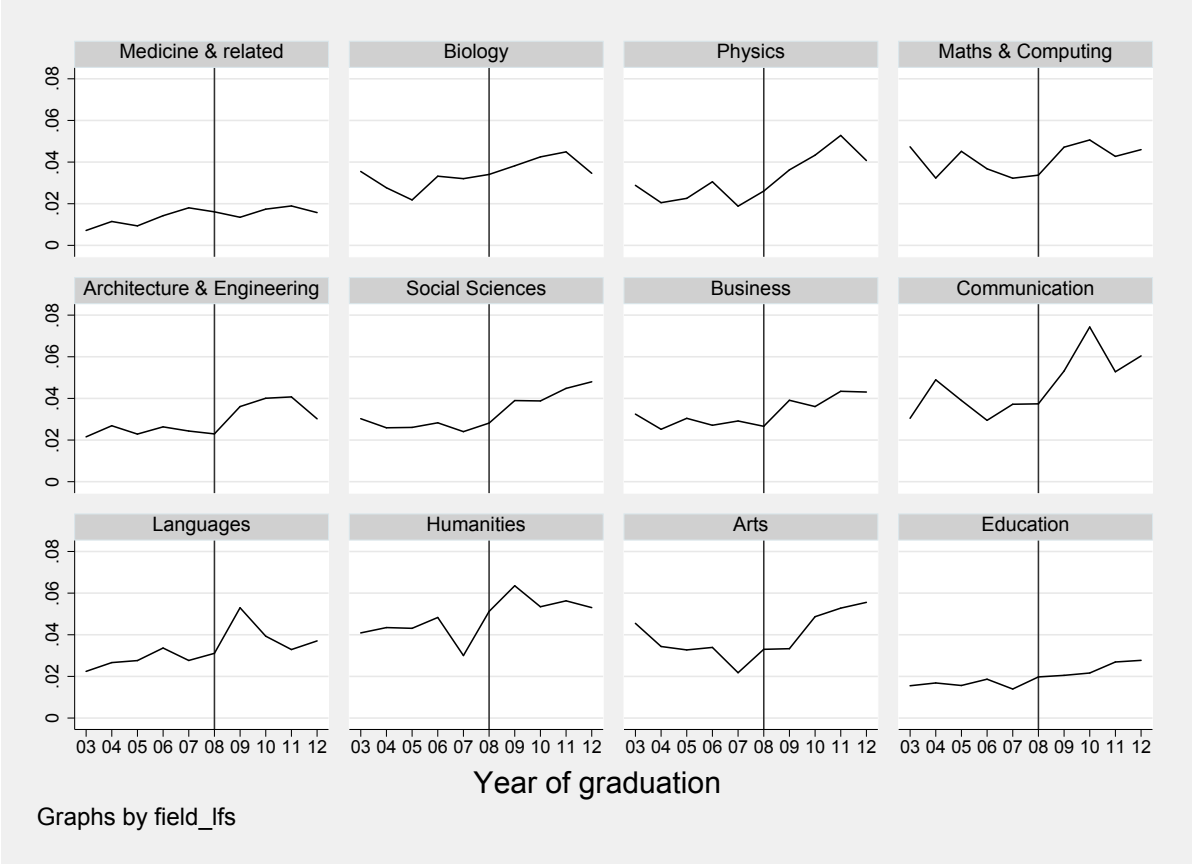
Notes: The variables used to construct the SES index and the method used are described in Section 3.2.

Figure A.2: Graduate unemployment rate by region 2000-2012



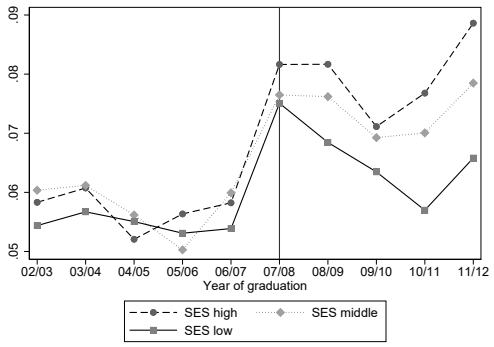
Notes: Labour Force Survey, authors' own calculations of regional unemployment rates.

Figure A.3: Graduate unemployment rates by field of study 2003-2012

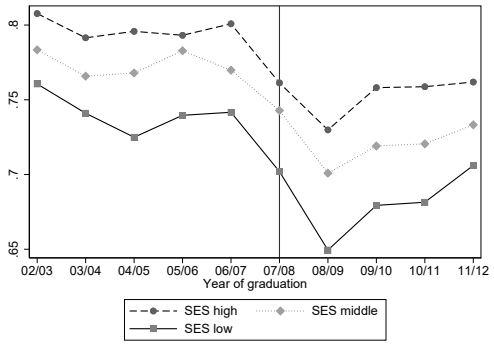


Notes: Labour Force Survey, authors' own calculations of unemployment rates of graduates aged 21-65 by field of study.

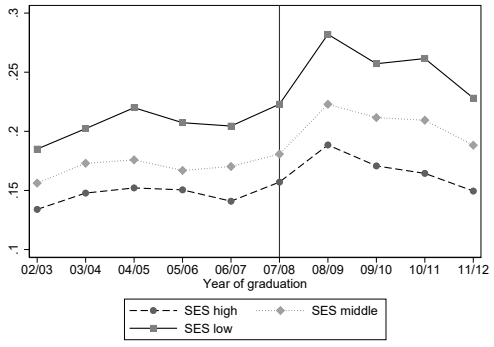
Figure A.4: Whether working at previous employer



(a) New employer



(b) Previous employer: non-placement



(c) Previous employer: placement

Notes: The outcomes are described in Section 5.

Table A.1: 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

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 A.2: 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	

Notes: Summary statistics of graduates' characteristics. Column 4 shows the p-value of a Pearson χ^2 test for categorical variables.

Table A.3: 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

Notes: Activity status and job attributes at 6 months after graduation described in Section 3.3.

Table A.4: Unemployment rates over time and by SES group

		U_{region}	U_{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

Notes: Mean and standard deviation of the unemployment rate measured by region of domicile and by field of study.

Table A.5: Main results with regional unemployment rate

Activity status:	Academic prog.	Professional prog.	Full-time emp.	Part-time emp.	Unemployed	Other
MiddleSES×U_{region}	-0.001**	-0.000	-0.003**	0.003**	0.001*	0.001
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
LowSES×U_{region}	-0.002**	-0.001	-0.005**	0.004**	0.003**	0.001+
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
U_{region}	0.002*	0.001	-0.000	-0.002*	0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	1054865	1054865	1054865	1054865	1054865	1054865
Job attributes:	Full- vs. Part-time	Professional occ.	Graduate job	Permanent contr.	Log salary	
MiddleSES×U_{region}	-0.004**	-0.002+	-0.003**	-0.001	0.001+	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	
LowSES×U_{region}	-0.007**	-0.003	-0.002	-0.001	-0.000	
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	
U_{region}	0.001	0.005+	0.004*	0.001	0.002	
	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	
N	662085	661210	555265	579815	291990	

Notes: The specification controls for graduates individual characteristics (see definition in Table 1), unemployment rate (at LAD level) at time of enrollment, its interaction with SES, LAD dummies; cohort, field of study and HEI fixed effects, and region-specific time trends. Robust standard errors are clustered by region in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table A.6: Unemployment - specification checks

	Baseline	SES = LPN	SES = Parental occupation	U_{field} 20-40 age group	U_{field} 12 months lagged	U_{LAD} 5-year average
MiddleSES$\times U_{field}$	0.001	0.001*	0.002*	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LowSES$\times U_{field}$	0.006**	0.003**	0.003**	0.004**	0.004**	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
U_{field}	-0.000	0.001	0.001	0.000	-0.002*	0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
N	1054865	1054865	796150	1054865	1054865	1046855

Notes: The outcome for each regression is individual unemployment 6 months after graduation. Column 1 represents our baseline specification as in Table 2; column 2 and 3 use the Local Participation (to Higher Education) Neighbourhood marker or parental occupation as measures of SES, respectively; column 4 uses a definition of unemployment rate by field of study at graduation obtained using individuals aged 20-40; column 5 uses a 12 month lagged indicator of unemployment by field of study at graduation; column 6 uses a 5-year average of the unemployment rate at the local area level (LAD) at the time of enrollment. Robust standard errors are clustered by region in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table A.7: Outcomes 3.5 years after graduation

	Activity status					
	Full-time emp.	Part-time emp.	Working & Studying	Studying	Unemployed	Other
MiddleSES×U_{field}	0.003	0.000	-0.003	-0.003	0.005**	-0.002
	(0.006)	(0.089)	(0.003)	(0.004)	(0.002)	(0.003)
LowSES×U_{field}	0.005	0.001	-0.004	-0.007	0.005*	0.000
	(0.015)	(0.002)	(0.004)	(0.005)	(0.002)	(0.001)
U_{field}	-0.008	0.001	0.001	0.008*	0.000	-0.001
	(0.008)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
N	49030	49030	49030	49030	49030	49030
	Job attr.	Education				
	Log Salary	Postgrad. qual.				
MiddleSES×U_{field}	-0.003	0.008				
	(0.011)	(0.006)				
LowSES×U_{field}	-0.012	-0.003				
	(0.018)	(0.004)				
U_{field}	-0.009	0.003				
	(0.011)	(0.006)				
N	36130	21250				

Notes: DHLE longitudinal survey, graduation cohorts 2003, 2005, 2007, and 2009 only. The specification controls for graduates individual characteristics (see definition in Table 1), unemployment rate (at LAD level) at time of enrollment, its interaction with SES, LAD dummies; cohort, field of study and HEI fixed effects. Estimates weighted with the probability of responding at the longitudinal survey (3.5 years after graduation) being a DLHE respondent (six months after graduation). 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 A.8: Main results, controlling for tariff score

Activity status:	Acad. prog.	Prof. prog.	Full-time emp.	Part-time emp.	Unemployed	Other
MiddleSES×U_{field}	-0.002*	0.002	-0.005+	0.005**	0.001	-0.001
	(0.001)	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)
LowSES×U_{field}	-0.004*	0.006	-0.011+	0.007**	0.005**	-0.003
	(0.002)	(0.005)	(0.007)	(0.002)	(0.001)	(0.002)
U_{field}	0.001	-0.005	0.001	0.000	0.001	0.002
	(0.001)	(0.005)	(0.006)	(0.002)	(0.002)	(0.003)
Tariff Q1	0.004	-0.022	0.004	0.016**	0.018**	-0.021**
	(0.004)	(0.017)	(0.021)	(0.005)	(0.003)	(0.007)
Tariff Q2	-0.000	-0.021	0.017	0.011*	0.010**	-0.017**
	(0.003)	(0.014)	(0.012)	(0.004)	(0.002)	(0.005)
Tariff Q3	-0.005	-0.017+	0.019*	0.009**	0.007**	-0.014*
	(0.004)	(0.010)	(0.009)	(0.003)	(0.002)	(0.005)
Tariff Q4	-0.010**	-0.009+	0.017**	0.005**	0.004**	-0.007
	(0.004)	(0.005)	(0.005)	(0.001)	(0.001)	(0.005)
N	687635	687635	687635	687635	687635	687635

Job attributes:	Full vs. Part-time	Prof. occ.	Graduate job	Perm. contr.	Log salary
MiddleSES×U_{field}	-0.007**	-0.010**	-0.005*	0.002+	-0.002+
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
LowSES×U_{field}	-0.014**	-0.014**	-0.008+	0.003	-0.007**
	(0.004)	(0.005)	(0.004)	(0.002)	(0.002)
U_{field}	-0.000	0.006	-0.001	-0.003+	-0.002
	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)
Tariff Q1	-0.021**	-0.047**	-0.044**	0.007	-0.017
	(0.007)	(0.017)	(0.016)	(0.006)	(0.017)
Tariff Q2	-0.011*	-0.031**	-0.032**	0.007	-0.011
	(0.005)	(0.012)	(0.009)	(0.005)	(0.015)
Tariff Q3	-0.010**	-0.020**	-0.026**	0.004	-0.013
	(0.004)	(0.007)	(0.006)	(0.005)	(0.008)
Tariff Q4	-0.004**	-0.009*	-0.020**	-0.002+	-0.008
	(0.002)	(0.004)	(0.003)	(0.001)	(0.006)
N	420480	419970	358060	373410	189620

Notes: Sub-sample of cohorts for which the UCAS tariff score is available (>=2005/2006). The specification is the same as the one in column 5 in Table 1, but it additionally conditions on tariff score quintiles. Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

B 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 B.1 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 B.1: 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

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

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 B.2 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 B.2). 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 B.2: 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

Notes: Cohort of graduates in 2012. 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.