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 analyses the impact of the 2008 recession on the socio-economic gap in graduate outcomes. We use a large dataset with information on several cohorts of graduates from all English universities. We relate their labor market outcomes to changes in unemployment rates over time. When graduating in a recession, students from less advantaged family backgrounds are more likely to be 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 determining the unequal costs of a recession.

I 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. Of those born in the '70s, the graduation rate was around 20%. Among those born in the early '90s, and entering the labor market in recent years, nearly 40% have a university degree (Figure 1). Despite the introduction of student fees in the early 2000s, there has been a steady increase in the enrollment of students from a low socio-economic background. Indeed, in recent years the participation of students from less well-off families has risen more than that of more advantaged students (Crawford, 2012), reducing the socio-economic gap, one of the main policy goals of successive UK governments (Education Great Britain, 1964; Great Britain Committee of Inquiryinto Higher Education, 1997; Department for Education and Skills, 2003, 2006).

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. Figure 2.a shows that in the UK graduates have generally better labor market outcomes than non-graduates. Indeed, individuals without a degree experience the highest unemployment and inactivity rates across all years considered (1992-2017). Furthermore, graduates are less severely affected by changes in macro economic conditions. For example, graduates experienced a relatively smaller jump in unemployment following the 2008 recession compared to non-graduates and inactivity increased for the latter but not for the former (Figure 2.b).

Although this suggests that a university degree improves market outcomes, 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. A large number of studies documents a strong association between parental socio-economic status and children outcomes. These studies are usually focused on the early years and school achievement (see Francesconi and Heckman, 2016, and references therein). By contrast, research on the direct impact of family background on adult outcomes after conditioning on prior education is a topic much less explored

(see Blanden, Gregg, and Macmillan, 2007, for an exception). This paper aims to provide new evidence in this respect, and focuses on 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 and Waldman, 2004; Raaum and Røed, 2006; Von Wachter and 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, Cockx, and Verhaest, 2013; Kahn, 2010; Oreopoulos, von Wachter, and Heisz, 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. 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 (DLHE) survey. This survey contains a rich set of socio-demographic and labor market characteristics of students graduating from all UK Higher Education institutions between 2002/3 and 2011/2, and who were interviewed 6 months after graduation. We match this dataset with graduate unemployment rates defined by field of study in order to investigate the influence of the business cycle on early graduate careers. Our main focus is on labor market outcomes 6 months after graduation. We show that the costs of a recession are unequally spread. Graduates from an advantaged socio-economic background respond to bad (economic) times by staying longer in education, especially by enrolling into academic postgraduate programmes. Disadvantaged graduates are more likely to be unemployed instead. The widening of the SES gap in the Great Recession are large in magnitude; 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%. These findings are robust to controlling for several observable individual characteristics - such as demographic variables, degree class, and institutional time-invariant characteristics. Additionally, they do not seem to be sensitive to including business cycle conditions at the time of enrollment. 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.

When looking at sub-groups, we find a significant degree of heterogeneity across subject studied. Specifically, we find that the Great Recession has increased the SES gradient among graduates in STEM subjects (Science, Technology, Engineering, and Mathematics) and this is to a large extent explained by the fact that many of these subjects provide access to a narrower range of occupations.

We further investigate some of the possible mechanisms which could explain why family SES is associated with the labor market outcomes of graduates. We do not observe individual search behaviour, but we have information on the postcode of the job held at 6 months after graduation and the one of family residence. We use this information to analyse patterns of geographic mobility. We also look at the channels through which a job is found, to understand more about the role of social or professional networks. Our results indicate that graduates from low SES backgrounds who find their first graduate job during a recession are more likely to move away from their place of family residence and to work in an area closer to the university attended. They are less likely to find a job with a new employer, and correspondingly more likely to stay with a previous employer. Interestingly, this is usually an employer for which they worked in a non-placement job, that is a job not related to the qualification studied for. We interpret this result as evidence 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 the literature on the effects of entering the labor market in a re-

cession (Altonji, Kahn, and Speer, 2016; Kahn, 2010; Oreopoulos, von Wachter, and Heisz, 2012) in at least two ways. First, we add a new focus on differences by socio-economic status, while existing papers have looked mainly at heterogeneity by initial earning potential. Second, while this literature uses unemployment rates defined by geography to define labor market conditions at entry, we use here unemployment rates by field of study. We argue that this definition is more appropriate for graduate students in the UK context, where geographical mobility is high and may mitigate the negative effects of graduating in a downturn.

The paper also contributes to the literature which focuses 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 and Koedel, 2014; Bailey and Dynarski, 2011; Crawford, 2014a; Macmillan, Tyler, and Vignoles, 2015; Meschede, Taylor, Mann, and Shapiro, 2017). These studies are mainly based on evidence from a single cohort of graduates or, when more than one cohort is considered, do not explore how labor market conditions at graduation contribute to the observed socio-economic differentials.

Finally, our analysis suggests that higher levels of unemployment at graduation are associated with significant socio-economic differences in access to professional networks, specifically those generated by internship and job-placement opportunities. This result indicates that 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 recognised 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 and Siedler, 2014), and a limited understanding of why students differ in their levels of extra-curricular engagement (Delavande, Del Bono, and Holford, 2019; Milner, Cousins, and McGowan, 2016).

The rest of the paper is organized as follows. Section II presents the English educational system

and its relevant institutional features. Section III discusses the empirical strategy and Section IV presents the data and the main variables of interest. Section V goes through the main results. We then analyse the possible mechanisms underlying our findings in Section VI and conduct several robustness checks in Section VII. Section VIII concludes.

II Institutional settings

The main objective of this study is to understand whether labor market conditions at graduation have a different impact on the destinations of graduate students from different socio-economic backgrounds and, specifically, if a higher than average level of unemployment at the time of entering the labor force widens the SES gap. Before we show how we identify the relationship between the business cycle and graduate destinations we need to consider (i) whether and how quickly students can respond to changes in macroeconomic conditions by, for example, changing their patterns of enrollment into HE or their field of study, and (ii) whether during the period covered in this analysis there were changes to the HE system that might have affected student destinations. In England, students typically enroll at university when they are 18 years old.[1] The choice of field of study is conditional on the subjects and marks that students obtain during the previous stage of education, called Key Stage 5 (KS5), 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 are taken at the end of KS5), although the specific threshold usually differs across different Higher Education Institutions (HEIs). Similarly, in order to study a certain subject at KS5, students need to have performed well in related subjects during the previous stage of education (age 14 to 16), called Key Stage 4 (KS4). This means that specialization into an area of study and indeed the decision to continue into HE

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

usually occurs quite early in the school cycle - usually by age 16 (Morando, 2019).[2,3]

Once enrolled, dropout is much less of a problem in the UK than in other countries.[4] Figure A1.a shows dropout rates among first-year undergraduate students (this is the year where most dropout takes place) by year of enrollment. The time trend is stable around 7%, with a hint of a decrease over the period shown. Switching institution or type of award (that is course of study) is relatively uncommon, as we can see in Figure A1.b.[5] Furthermore, each university course is usually associated with one or two specific fields of study, and students begin their programme starting from their first year. No general curriculum is offered initially as in the US.[6] 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. All these features make the educational system in the UK, and in England specifically, an ideal setting in which to investigate the role of the business cycle on graduate labor market outcomes, as students are not able to react to changes in labor demand conditions by swiftly changing their field of study or institution.[7]

The second institutional aspect we need to consider has to do with changes in the system of HE

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[2]For example, to study Mathematics at KS5, most schools require students to have achieved the highest two marks in Mathematics at KS4 (A*/A).

[3]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 through the Business and Technology Education Council (BTEC) and the procedure is very similar. However, the vocational route is by far less common than the academic route, with only 7% of undergraduate students in 2014 having entered university with at least one BTEC (UCAS website: https://www.ucas.com/sites/default/files/2014-end-of-cycle-report-dec-14.pdf).

[4]Vignoles and Powdthavee (2009) report that in mid-2000 the non-continuation rate from the first year of study to the second year for young, full-time entrants was 7.2% in the whole of the UK and just over 6% in England.

[5]Vignoles and Powdthavee (2009) report that fewer than 3% of students switch institution.

[6]In Scotland the system is slightly different, but our analysis will focus on graduates from English institutions for reasons that will be explained below.

[7]Evidence on the effect of the business cycle on HE choices is very much country-specific. Blom, Cadena, and Keys (2015) show how the business cycle affects degree choice in the US, where the HE system allows ample margins of discretion. On the other hand, Cockx and Ghirelli (2016) find no evidence of the impact of the Great Recession on duration of the degree in Belgium.

financing in the period covered by our analysis. In 1997 Labour was elected on a manifesto which included a commitment to ensure that "the costs of student maintenance should be repaid by graduates on an income-related basis".[8] The newly elected government commissioned a review of the system of HE funding which concluded with the publication of the Dearing report in 1997 and the introduction of means-tested £1,000 student fees through the Teaching and Higher Education Act as from September 1998. In 2006/7 the fees increased to £3,000 p/y and became repayable after graduation for all students through an income contingent loan scheme. At the same time, maintenance grants were increased for students from low income families.[9] These changes could impact both the number and socio-economic composition of those going to university, and this would be something we would need to take into account.

There is to date a number of studies showing that the change in the UK HE financial system in 2006/7 - the main change affecting our cohorts - had no significant consequences on HE participation. A comprehensive analysis by Dearden, Fitzsimons, and Wyness (2011) found that tuition fees had a negative effect on participation (a £1,000 increase in fees resulting in a decrease in participation of 3.9 percentage points), while maintenance grants had a positive effect (a £1,000 increase in grants resulting in a 2.6 percentage point increase in participation), 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, Scott-Clayton, and Wyness (2017). Most recently, Azmat and Simion (2017) show that the 2006/7 fee change reduced overall enrollment by less than 1% and that this decrease was mainly felt by higher income students, where the effects were still a modest 1.6%. No significant change was found for the participation rates of low SES students. In Section IV we will provide further evidence that the SES distribution of graduates in our sample is very stable over the period considered.

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[8]http://www.politicsresources.net/area/uk/man/lab97.htm

[9]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.

Another concern related to the change in the HE financial system could be that because of the cost of acquiring HE changed, students sorted into different types of degrees and HE institutions (Sá, 2014). Azmat and 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. Finally, in the same study they show that the reform might have induced an increase in dropout rates from low SES students, but the magnitude of this change is less than 1%. Similarly, Bradley and Migali (2017) find that the reform reduced dropout rates but these effects are not very different across income groups.

Overall, the empirical evidence to date seems to suggest 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. There is some indication that the reform might have caused changes in the composition of graduates according to SES, although the general consensus is that these changes are very small. Even so, there might be a concern that when we analyse the impact of the recession on graduate outcomes we capture instead the effects of the 2006/7 fee change (graduates enrolling in 2006/7 will graduate in the year 2008/9 a few months after the 2008 recession hits the economy) on the composition of graduates. However, as we are interested here in the effect that the recession might have for students from different SES backgrounds, our empirical specification captures changes in the outcomes of low SES students compared to those of high SES students taking into account any change 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.

III Empirical strategy

The effect of graduating in a recession has already been investigated in other countries and periods (Altonji, Kahn, and Speer, 2016; Cockx and Ghirelli, 2016; Kahn, 2010; Liu, Salvanes, and Sørensen, 2016; Oyer, 2006; Oreopoulos, von Wachter, and Heisz, 2012). Our identification strategy is therefore similar to what has been commonly used in this literature, although it takes into account specific features of the UK labor market and introduces more 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.[10] Our principal interest is to establish whether there is any impact of unemployment on graduate destinations.

As the 2008 recession hit the UK economy as a whole, we start with a simple model looking at whether year of graduation (ν_t) is associated with the outcome of interest, y, for example whether graduate is employed vs. unemployed at 6 months after graduation:

$$y_{ift} = \alpha + \nu_t + \gamma SES_i + \theta X_i + \omega_{ift}, \tag{1}$$

where the composite error term includes field of study dummies (μ_f) and HE institution dummies (ρ_h) in addition to an idiosyncratic term, that is $\omega_{ift} = \mu_f + \rho_h + \zeta_{ift}$.

We then interact time at graduation with the socio-economic background of graduates to obtain some *prima facie* evidence that the recession had a different effect on different groups of the graduate population:

$$y_{ift} = \alpha + \nu_t + \gamma SES_i + \nu_t * SES_i + \theta X_i + \omega_{ift}. \tag{2}$$

However, in equation (2) year of graduation dummies confound time and cohort effects. A better

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[10]This will be defined more precisely in Section IV.B.

way to capture macroeconomic conditions at graduation would be to use regional rates of unemployment (Cockx and Ghirelli, 2016; Kahn, 2010; Liu, Salvanes, and Sørensen, 2016; Oreopoulos, von Wachter, and Heisz, 2012). We will follow this literature and consider, separately, the regional unemployment rate defined by i) the domicile where graduates resided before entering in HE, and ii) the location of the HEI attended.

Our next specification is therefore the following:

$$
\begin{aligned}
y_{ifrt} = \alpha + \beta U_{r,t-1} + \gamma SES_i + \delta U_{r,t-1} * SES_i \\
+ \theta X_i + \varepsilon_r * t + \kappa_r + \mu_f + \rho_h + \omega_{ifrt},
\end{aligned}
\tag{3}
$$

where the subscript r denotes the region of original domicile (or HEI attended). Region fixed effects and region-specific time trends are also included. Unemployment rate is measured in the last twelve months before the survey (the survey takes place 6 months after graduation) to take into account of the fact that most students start sending their job applications well in advance of their graduation. In this specification 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. However, we argue that this approach is not appropriate in the UK context, because this country 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 lower. Indeed, there is strong evidence from the UK as well as other European countries that individuals with high levels of education are very geographically mobile (Hillmert (2008) in Germany, Faggian, McCann, and Sheppard (2007), Faggian and McCann (2009) Hoare and Corver (2010) in the UK, and Machin, Salvanes, and Pelkonen (2012) in Norway). Hence, capturing labor market conditions by using local area unemployment rates (either by referring to the area of family residence or the area where the HE institution is located) would be less appropriate in our setting. We use instead *field-specific* graduate unemployment rates. This is equivalent to assuming that the labor market of

graduates is national in geographic reach but segmented across different sectors defined by field of study.

Notice that 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 would not be the case if we defined unemployment according to the industry in which most graduates of that field of study are employed. This also implies that our measure of unemployment takes into account that 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, an element that we analyse further later on. To see how important this aspect can be, Table 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, Cadena, and Keys, 2015). This is 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. For example, 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 next specification is therefore the following:

$$y_{ift} = \alpha + \beta U_{f,t-1} + \gamma SES_i + \delta U_{f,t-1} * SES_i$$
$$+ \theta X_i + \mu_f * t + \omega_{ift},$$

(4)

The error term here includes field-specific dummies, so the variation which we exploit here is variation in unemployment over time *within* field of study. As different fields of study might experience changes in labor demand for reasons that have nothing to do with the recession but might reflect instead sectoral shifts in the economy, we also include in equation (3) field-specific time

trends, $\mu_f * t$.

To sum up, we first capture the year-on-year-variation in macroeconomic conditions using a set of time dummies; then we use region/field-specific unemployment rates. When using region/field-specific unemployment we control for region/field-specific time trends. All our regressions cluster the standard errors by region/field of study to take into account possible correlation of individual outcomes within geographies or subjects over time. Given the small number of clusters, we implement the wild cluster bootstrap procedure as recommended in Cameron and Miller (2015).[11] Although we saw that the UK educational system is relatively inflexible, there might be still a concern that variation in labor demand might affect the decision to enroll in HE altogether, and therefore the composition of each cohort. 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.[12,13] We consider that this is the relevant proxy of the labor market circumstances affecting students and their families before university decisions are made.[14] The LAD unemployment rate is measured at time of enrollment,

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[11]We do this by using the user written command "boottest" in Stata (Roodman, MacKinnon, Nielsen, and Webb, 2018).

[12]Local Authority District is a generic term to describe the district level of local government in the United Kingdom. It includes non-metropolitan districts, metropolitan districts, unitary authorities and London boroughs in England; Welsh unitary authorities; Scottish council areas; and Northern Irish district council areas. The areas are made up of whole electoral wards/divisions. `http://data.gov.uk/dataset/local-authority-districts-uk-2012-names-and-codes`

[13]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.

[14]Clark (2011) looks at the labor market effects on enrollment in post-compulsory education in England by using variation in youth unemployment rates across regions and over time (1976-2005). His analysis is performed at the aggregate (regional) level. He finds that youth unemploy-

$t-4$, and is attributed to each student using the area where they were domiciled before going to university (U_d).[15,16] 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 most complete specification therefore is:

$$
\begin{aligned}
y_{idft} = &\ \alpha + \beta U_{f,t-1} + \gamma SES_i + \delta U_{f,t-1}*SES_i \\
&+ \lambda U_{d,t-4} + \sigma U_{d,t-4}*SES_i + \theta X_i + \mu_f *t + \xi_{idft},
\end{aligned}
\tag{5}
$$

where

$$
\xi_{idft} = \mu_f + \rho_h + \tau_d + \zeta_{idft}.
\tag{6}
$$

ment rates have an important and positive effect on enrollment as well as some measure of expectations of future labor market success at national level. In another recent study, Barr and Turner (2015), find a positive impact of the Great Recession on post-secondary enrollment outcomes in US by using variation in local labor market conditions as well as state-specific variation in Unemployment Insurance (UI) programs and their duration.Taylor (2013), investigates the effect of leaving education at age 16 when unemployment is high for both men and women in Britain. He finds the negative effect of an increase in unemployment rates for men. Other papers in the UK suggest that aspiration and attitudes towards education are influenced by the economic climate, and this varies across different groups in the population, with particularly important differences across SES (Meschi, Swaffield, and Vignoles (2011), Tumino and Taylor (2015), Rampino and Taylor (2012)).

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

[16]The local unemployment rates defined at the level of Local Authority Districts comes from the ONS Claimant Count statistics (`https://www.nomisweb.co.uk/`). There are 406 different local areas or LADs in our sample. On average this measure of unemployment ranges from a minimum of 2% to a maximum of 3%, although much more variation is found across different LADs, with values between 0.5% to almost 8%. 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.

IV Data and descriptive statistics

IV.A Data and sample selection

The Destination of Leavers from Higher Education (DLHE) is a survey that is carried out 6 months after graduation on graduates from all UK HEIs. The survey is conducted by the UK Higher Education Statistics Agency (HESA). It contains 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 (for instance their nationality and ethnicity), and some information about students' education before attending university (for example, whether attended a private school, overall grades obtained at KS5, etc.).

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 represent 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.[17] 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 (dropping 5,165 observations). 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, in maintenance grants regime, and duration of study). Our intermediate sample consists of 1,492,290 observations.[18]

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[17]Moreover, information on SES is missing for a large proportion of non-UK nationals.

[18]To comply with HESA requirements, observation numbers are always rounded to the nearest

Next, we operate the following restrictions. First, we look at information on the subject studied. 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. In some cases, however, the field is undefined (8,665) or there is no field which is studied for at least 50% of the time (6,440), so we drop those observations. 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, so we will check that response rates do not vary by SES and unemployment at graduation (see Section VII). Our final sample consists of 1,054,865 records, about 71% of our intermediate sample. Table A1 in the Appendix summarizes the restrictions that we implement in the sample selection and Table A2 reports descriptive statistics for the (i) intermediate and (ii) final sample. The latter shows that our selection did not affect students' composition.

IV.B   Measuring socio-economic status

We use three main pieces of information to derive an indicator of family SES. The first is the Low Participation Neighbourhood marker (LPN), which summarizes the HE participation in the neighbourhood of residence at the time of application to university, and is a proxy of the general level of education of those living in the area of family residence. This is expressed in quintiles.[19] The

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[19]More precisely, this variable is based on the HE participation rates of people who were aged 18 between 2005 and 2009 and entered a HE course in a UK HE institution or an English or Scot-

second variable indicates the type of secondary school attended, codified as state vs. Finally, we match the postcode of family residence to information on the Index of Multiple Deprivation (IMD), a widely used measure of socio-economic conditions in the UK.[20],[21] Figure 3 (a, b, and c), shows the distribution of these variables across the period considered.

Next, we apply principal component analysis to construct an overall SES index and split this into quintiles (see also Crawford, 2014b, for a similar approach).[22] Figure 3.d shows that there has been a narrowing of the HE SES-gap over time, with the the percentage of students in the highest three quintiles falling for the most recent cohorts and the share in the lowest quintile correspondingly increasing. The figure also suggests that these changes occurred smoothly, as a reflection of

tish further education college, aged 18 or 19, between academic years 2005-06 and 2010-11.

[20]The Index of Multiple Deprivation is derived by combining several domains of deprivation such as income, employment, crime and education of 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. When the same postcode is associated with different values of the IMD, because for example it is part of several LSOAs, we compute a weighted average of the corresponding IMD values depending on the extension of the postcode in the areas in which the IMD is calculated.

[21]The SES index is based on pre-determined characteristics. Note that although the IMD and LPN are measured partly or completely in the recession period, these are relative measures and are 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, Miller, and Schaller, 2012).

[22]Given the discrete nature of the variable used, we implement PCA by using the polychoric correlations. We use the command "polychoricpca" in Stata (Kolenikov, Angeles et al., 2004). We consider 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 A3 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 A3). 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.

long-term trends rather than as a response to specific policy changes. In the analysis that follows we will 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.

Table 2 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; Indians and Pakistani 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).[23] Rather, within these categories we notice that high SES students are more likely to graduate in Architecture & Engineering and in Humanities and Languages.

One of the most striking differences across SES groups is the type of university attended. While in the empirical analysis we consider each university singularly, here we group them by their "prestige" following standard classifications.[24] 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. These percentages are much lower for low SES graduates: 14% and 4% (20% and 7% for middle SES), respectively. Finally, we see 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

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[23]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.

[24]For a description of the various groups see Appendix B.

originally from, compared to 39% and 27% of middle and high SES students.

IV.C Outcomes

The DLHE allows us to investigate the activity status of students and the type of jobs they were employed in 6 months after graduation. 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. In our empirical analysis we do not however model this selection. All outcomes are dummy variables (=0/1) except for the log of gross annual salary.

The literature suggests that the trade-off between continuing to study and entering the labor market depends on the opportunities offered by the labor market, especially for certain socio-economic groups (Altonji, Kahn, and Speer, 2016; Cockx and Ghirelli, 2016; Whitfield and Wilson, 1991; Rice, 1999; McVicar and Rice, 2001; Clark, 2011; Meschi, Swaffield, and Vignoles, 2011; Taylor, 2013). Specifically, we would expect graduates who finished their undergraduate studies at a time of high unemployment to be more willing to continue in education. As postgraduate education is also costly, we would expect differences by SES in the probability to continue in education.

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.[25]

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, the latter being available for full-time employees only.[26] Table 3 reports the mean values of the outcomes of interest 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. We then show how the SES gap changes across the cohorts considered.

Figures 4 and 5 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 4.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 5.a.

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[25]We group "working and studying" with all these other categories for the sake of space. Results do not differ when considering them separately.

[26]This salary is deflated using the 2012 consumer price index.

While in 2003 this was about 5 percentage points, in 2012 the gap is twice as much. These figures clearly suggest that the Great Recession has had an impact on SES inequalities in the first destination of graduate students in the UK.

Our main outcomes are measured at 6 months after graduation. While this is interesting, it might not say very much about graduates' longer-term labor market outcomes and future careers. It has however been shown (as discussed in Section I) that graduating during recessions has long-lasting negative consequences for many years after graduation, so we expect to see a significant association between short- and longer-term outcomes. If this is the case and individuals from different SES respond differently to the economic conditions at graduation, important implications arise with respect to the transmission of socio-economic inequality and to social mobility in the longer term.

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).[27] Table 4 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 percent of high SES students are unemployed at 3.5 years after graduation, the perecentages are higher for middle and low SES graduates, 2.9% and 3.7%, respectively.

Table 5 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

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[27]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 V.B.

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.

IV.D   Capturing the variation in the business cycle

In order to capture variation in labor market conditions we use the regional unemployment rate and the unemployment rates by field of study. The UK is divided in twelve different regions. Nine regions are situated in England (East Midlands, East of England, London, North East, North West, South East, South West, West Midlands, and Yorkshire and the Humber) and the others are Wales, Scotland, and Northern Ireland. Figure A2 shows the yearly average unemployment rate by region. The southern regions are those experiencing the lowest unemployment rates, while the northern regions are those suffering the highest unemployment rates on average and the highest increase in unemployment following the recession.

The field-specific unemployment rates is calculated considering the graduate population of workers aged 21-65.[28] These are derived from the Labour Force Survey (LFS), which is the only large UK dataset that contains information on activity, level of education, and field of study.[29]

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[28]Figure A3 shows the trends of the unemployment rate by field of study when the unemployment rate is constructed by using different age groups (21-30, 21-40, 21-50, and 21-65). The trends are very similar across all age groups. The youngest age group shows higher levels of unemployment and relatively higher volatility compared to the older age groups. The younger the group the higher the probability of measurement error given the lower number of observations on which the unemployment rate is calculated (N=156,851 for the 21-30 group, N=340,027 for the 21-40 group, N=490,332 for the 21-50 group, and N=622,278 for the 21-65 group). This is why we opted for considering the age group with the highest number of observations. 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.

[29]The yearly unemployment rate is calculated as an average of the quarterly unemployment rate within a year. This means that we consider the unemployment rate by field of study six months prior graduation and six months after graduation. The latter corresponds to the month in which the student in surveyed. For example, if a student graduated in June 2005, we consider the unemployment rate from January 2005 to December 2005, which corresponds to the period in which students search for jobs.

Table 6 shows the values of the unemployment rates (defined by geographical area and field of study) for the whole population and by SES category. Then it shows the variation across cohorts and the difference between those graduating in 2007 and those graduating in 2011, that is two years before and after the start of the recession. We see that there is hardly any difference between the regional unemployment rates based on the graduates domicile and that based on the HEI attended. This is not surprising because about 40% of graduates attends a university in the same region as the region of domicile. The unemployment rate at regional level is however always higher than that by field of study because it includes both graduates and non-graduates, and we saw that the latter experience on average higher unemployment rates (Section I). 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 2). If graduates are geographically mobile, the unemployment rate defined by field of study is arguably a more appropriate representation of the economic conditions they face at the time of graduation. Finally, Table 6 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 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.

Figure 6 shows the variation in graduate unemployment over the period we consider here. Interestingly, there is significant heterogeneity across all fields of study even within the STEM (Medicine & related subjects, Biological Sciences, Physical Sciences, Mathematics & Computing, and Architecture & Engineering) and non-STEM (Social Studies, Business & Financial studies, Communication, Languages, Arts, Humanities, and Education) 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 same can also be seen in the non-STEM group. The unemployment rate of graduates in "Education" - another sector not particularly affected by the business cycle because it is mostly influenced by demographic trends - has been stable at around 2% across all years considered, while graduates in "Business Studies" experienced an increase of two percentage points with the recession. The mentioned differences across fields of study are determined by the fact that the recession affected different sectors in different ways, and this is what we will exploit in our analysis.

V   Results

V.A   The consequences of graduating in a recession

We start by showing in Table 7 how the business cycle affects the probability of being unemployed 6 months after obtaining a first degree. In column (1) we simply include year of graduation dummies, while in column (2) we interact them with SES categories to look at whether the change in labor demand had different effects for different groups of the population. We then approximate the labor market faced by students at time of graduation with different unemployment rates: the unemployment rate by region of family domicile (columns 3-4)[30] and by field of study (5-6). All specifications control for the demographic characteristics of the students, such as gender, ethnicity, disability status, and log distance from family residence to HEI institution. We also take into account degree class dummies, field of study dummies, and HEI dummies. When using

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[30]Here we do not report the results using the unemployment rate by HEI to keep the table readable. Notice that when using the regional unemployment rate based on HEI attended instead of family domicile results are identical to those in specifications 3 and 4 and are available upon request.

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. Robust standard errors are reported in parentheses and obtained through the wild cluster bootstrap procedure (Cameron and Miller, 2015).

From the results shown in Table 7, we see very clearly that the probability of being employed in a full-time position is monotonically decreasing from 2004 to 2007 (2003 is the omitted category), then it increases for all cohorts graduating from 2008 onwards. The magnitude of this change is large: 2008 graduates are about 2 percentage points (ppt) more likely to be unemployed at 6 months after graduation than 2003 graduates, and this gap persists up to cohort 2011. The disadvantage of graduating in bad times is exacerbated for middle and low SES students and statistically significantly so for the latter - as shown by the coefficients of the interaction of year of graduation and the SES index in column (2).

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 0.012ppt increase in the probability of being unemployed (column 3). This is a large effect, compared to what found in the previous literature. For example, Oreopoulos, von Wachter, and Heisz (2012) finds that the probability of being unemployed goes up by 0.001ppt in response to a 1ppt increase in the provincial unemployment rate in the first year after college graduation in Canada.[31] Our results are much larger, although differences in institutional features of the labor market - which allow adjustments to run through earnings rather than employment in Canada - and differences in the cohorts considered could play a role. However, 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 different definition of labor market conditions at graduation, which takes into account regional mobility, might

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[31]The analysis in Oreopoulos, von Wachter, and Heisz (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.

matter more for the UK. Indeed, when using field-specific unemployment (column 5) we see that the overall effect of unemployment is now 0.006ppt, half the previous value. 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 job destinations.

We next look at the way in which labor market conditions interact with family SES. Columns (4) and (6) 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. Note that there is little difference between the coefficients on these interactions in the models using regional unemployment (column 4) and those using unemployment by field of study (column 6). This seems to suggest that patterns of geographical mobility by SES are not very important in explaining the widening of the SES gradient in graduate outcomes in a recession. In what follows we will therefore continue by using unemployment 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.

Table 8 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 7 in column (6), 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 unemployment at the time of HE enrollment as a control for labor market conditions at the time of entry into higher education.

The first two columns (top panel) of Table 8 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 0.004ppt 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 3). 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 6 and section IV.D), 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 0.005 and 0.009ppt, 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.

Table 9 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 0.9% and 2.0% 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 grad-

uates (notice that this info is available for full-time workers only) are almost 1% lower than those of high SES graduates.[32]

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, Kahn, and Speer (2016) find that graduating in bad times increases the length of time in HE. Altonji, Kahn, and Speer (2016) show that the Great Recession has negatively impacted graduates' labor supply in terms of hours worked. Kahn (2010), Liu, Salvanes, and Sørensen (2016), and Oreopoulos, von Wachter, and Heisz (2012) find that graduating when the unemployment rate is high negatively affects the probability of getting a job that matches the qualification obtained.

V.B   Heterogeneity

Next, we show whether graduating in bad times affects the SES gap of certain groups more than others. We focus on the characteristics of the degree and university attended. For example, if graduating with a *good degree* (first or upper second) is a positive signal of the quality of human capital, this could be a safety net for disadvantaged students when the competition for jobs is tougher. On the other hand, graduating from a university with an *high intake of disadvantaged students* might become a penalty for low SES students because it might decrease the effectiveness of their social networks.[33] Furthermore, some *fields of study* might be affected more than others in a recession. Indeed, it has been found that graduating in a field leading to a high paid job reduces the negative effects of graduating in a recession, although this has been less the case in the most recent downturn (Altonji, Kahn, and Speer, 2016). We then turn our attention to the de-

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[32]Notice that for a 1ppt increase in unemployment the loss in log earnings is equivalent to 2.8ppt. This estimate is close to the estimate of 2% in Oreopoulos, von Wachter, and Heisz (2012).

[33]Chetty, Friedman, Saez, Turner, and Yagan (2017) find that in the US universities with the highest intake of disadvantaged students are those in which students experience worse labor market outcomes once they graduate.

gree of *specialization of the field of study*. As a measure of specialization we use the Hirschman-Hirfindahl Index, previously introduced in Section III.

We perform our heterogeneity analysis by means of a triple interaction: the SES categories are interacted first with the unemployment rate by field of study and then with the characteristic of interest, for example whether the student graduated in a STEM subject. We find that most of the heterogeneity is revealed when we group fields of study according to whether they are in a STEM field and, especially, according to their degree of specialization.[34] Table 10 shows that disadvantaged graduates who enroll in fields with a high level of specialization have a higher probability to continue in education, find employment in a part-time position, and suffer from higher unemployment than their more advantaged counterparts. The magnitude of these effects is also relatively large. For example, the likelihood of being unemployed increases by 0.8ppt for low SES students compared to high SES students, their probability of enrolling in a professional postgraduate programme increases by 1.7ppt, while we see a decrease in the probability of being in a full-time job of 2.8ppt. Finally, as shown in Table 11, disadvantaged students are also less likely to find employment in professional occupations or graduate jobs, although no statistically significant effects can be detected in terms of salary. These 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.

VI   Possible 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.[35] We rule out explanations in terms of human capital since we consider a population of first-degree full-time graduates, we

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[34]We also looked at other characteristics such as gender, ethnicity, and whether the university attended belongs to the Russell group, but failed in finding any significant pattern.

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

look at their situation 6 months after graduation, and we condition on university attended and degree class. 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 V, 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, Bentolila, Fernandes, and Ichino, 2010; Card, 2001; Cobb-Clark, 2008; Kaplan et al., 2009). We would therefore 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 it is true that graduates from a lower SES background generally find a job closer to the initial domicile, as seen in Figure 7, there is no evidence that this is more likely to be the case during the recession years. Indeed, our results in Table 12 (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.[36]

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

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

friends, networking". In Table 12 (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 for reasons of space 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.[37] 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 Faggian, Jewell, and King (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.

Figure 8.a shows that the vast majority of students find their first job after graduation with a new employer, but that there is a significant proportion who return to their previous employer, especially in non-placement jobs. The lower panels of this figure also show that there are significant

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[37]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.

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 visual evidence that the SES gap in access to previous professional networks increases with the recession. Indeed, this is what we find in our regression analysis shown in Table 12, 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.

These results provide evidence 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, or they are less able to exploit these opportunities after they graduate. According to a recent study for the UK (Delavande, Del Bono, and Holford, 2019), 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, however. So, it seem likely that the access to placement jobs could be important in explaining the unequal effects of a recession.

VII Robustness checks

In this section we address three specific concerns. First, those graduates who responded to the survey might be different to the whole universe of graduates in their observable characteristics. More importantly, response rates to the survey might be a function of SES and unemployment rates, thus threatening the internal validity of our findings. Second, it is possible that we do not control well enough for academic achievement given that degree class is a very broad indicator (half of our students gain an upper second class degree). Third, we have a large number of missing values for our salary variable. Indeed, this is only available for students in full-time jobs. We discuss each of these issues in turn below.

One of the concerns related to the use of the DLHE is that there is a relatively high non-response rate (about 16.72% non-respondents and 2.27% explicit refusals). So that in this paper we know the labor market outcomes of the 80% of the universe of all graduates in 2003-2012. In Table A4 we show the mean of the main characteristics of all graduates and we compare them to those of the survey respondents. The third column shows the difference between the two means. It is clear that the mean differences are very small and insignificant since they are below one percentage point. If anything, the sample of respondents is positively selected, that is respondents are more likely to belong to the highest SES category and to the white ethnic group, to have obtained a high degree classification and a degree in the STEM field. Thus, our findings could be a lower estimate of the effects of the recession on the SES gap among graduates. A more concerning issue would arise if the non-response rate differs by SES according to levels of unemployment. This could introduce a source of bias. As we have information on the issued sample, we can explore whether rates of response vary by unemployment and SES. Table A5 shows the results of this exercise. Clearly, we find no evidence that the recession generated differential patterns of response by SES; the coefficients of the interaction term of SES and unemployment are not statistically significant. Early academic achievement is very important in determining later academic outcomes.[38] We

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[38]Several studies have highlighted how in the UK the socio-economic background of a student

therefore test the robustness of our results to the inclusion of tariff scores, that is equivalent to the GPA obtained at age 18 at the end of KS5. Unfortunately, tariff scores are available only from graduation year 2004/5, and there are some year-on-year differences in the way they are recorded. To overcome this measurement issue, we transform what would be a continuous score into quintiles and use these in our model. Table A6 shows that th einclusion of th etarriff score as acovariate has a minimal impact on the magnitude and the statistical significance of the coefficients of interest.

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).[39] Table A7 shows our estimates when using the imputed salary at 6 months after graduation. Once again the results are very similar to what we obtain when using self-reported salaries in Table 9.

VIII   Conclusion and discussion

In this paper we address an important question. We ask whether achieving a high level of education is enough to ensure that the negative effects of an economic downturn will be shared equally across different socio-economic groups. We provide evidence that this is not the case by looking at the experience of recent graduates in English universities. Our findings show that the recent recession has reduced social mobility even among the most educated groups of the population. It would appear that obtaining a degree is not enough to guarantee that individuals from different

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is relevant for application to HE, enrollment, drop-out and final attainment but there is strong evidence that most of the gap is due to poor academic achievement at secondary school (Chowdry, Crawford, Dearden, Goodman, and Vignoles, 2013; Johnes and McNabb, 2004; McNabb, Pal, and Sloane, 2002; Smith and Naylor, 2001; Vignoles and Powdthavee, 2009).

[39]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).

socio-economic backgrounds enjoy the same labor market opportunities later on in life.

We use data from the Destination of Leavers from Higher Education Survey, a repeated cross-sectional survey of graduates leaving UK universities after completing their qualification. We observe successive cohorts of graduates over the period 2002/3 to 2011/2 and match this dataset with information on graduate labor demand using field-specific unemployment rates derived from the Labour Force Survey. This allows us to use variation over time and across field of study to identify the effect of the Great Recession on entry-level graduate labor market outcomes.

Our results show that the sharp increase in unemployment experienced in the UK - as well as in many other countries - between 2008 and 2011 translated into wider SES gaps across a range of labor 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, field-specific time trends, and economic conditions at the time of enrollment. Analysing different subgroups reveals the SES gap in outcomes widens independently of the institution attended and achievement (degree class). However, we show that the recession has a particularly unequal effects among students who enroll in field of studies which are very specialised and open the door to a smaller range of occupations. This implies that the choice of a degree is an important aspect to consider when thinking about how to reduce inequalities in graduate outcomes.

We consider different mechanisms through which a recession could widen SES inequalities. We find only limited evidence that this might have to do with access to financial resources or social networks. We find instead that access to professional networks is important and this is shown by the fact that during a recession low SES graduates are more likely than high SES graduates to return to their previous employer, particularly where this offered a non-placement job. This would seem to suggest that universities might have 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 at the time of graduation.

The economic literature has recently focused on the importance of informing students about the labor market returns of different educational qualifications and choice of field of study (Arcidiacono, Aucejo, and Spenner, 2012; Attanasio and Kaufmann, 2014; Giustinelli, 2016; Wiswall and Zafar, 2017). This information could be particularly important for low SES students, for whom university and the opportunities that it offers might not be well understood. This paper however highlights that to be able to take full advantage of the opportunities offered by a university degree, we also need to understand much better 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 (Delavande, Del Bono, and Holford, 2019; Milner, Cousins, and McGowan, 2016).

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Figures and tables

Figure 1: Percentage of graduates in the UK population 2002-2017
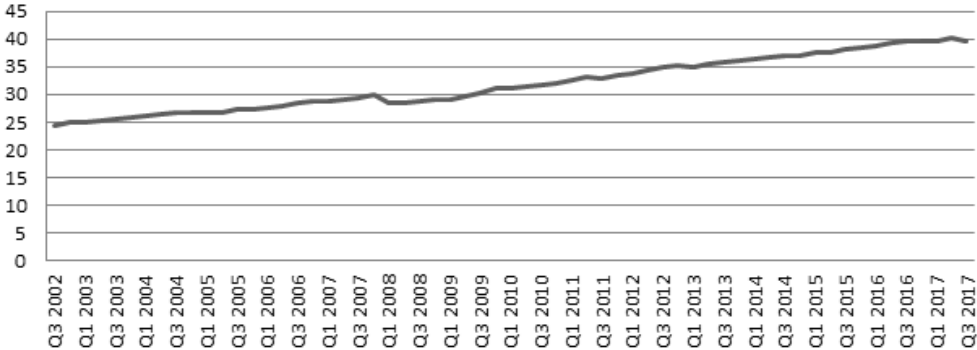
Source: Office for National Statistics.

Figure 2: Unemployment and inactivity rates by graduates and non-graduates

(a) Unemployment rates
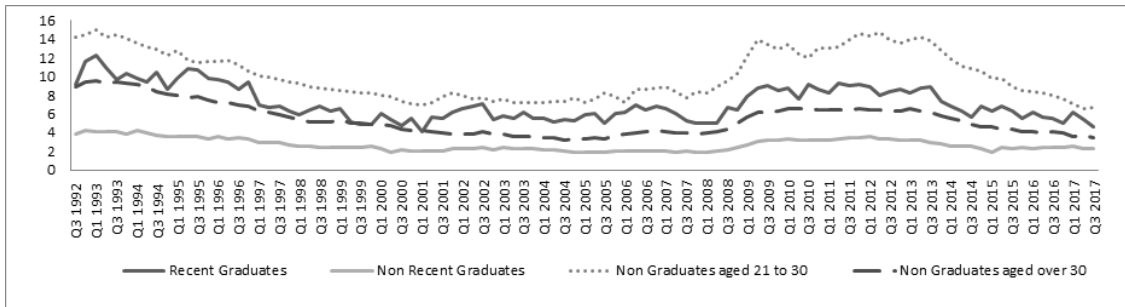
(b) Inactivity rates
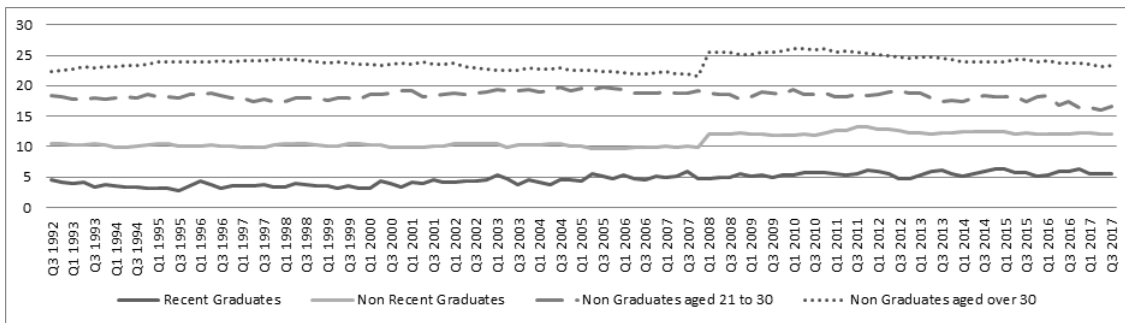
Source: Office for National Statistics.

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 3: SES indicators
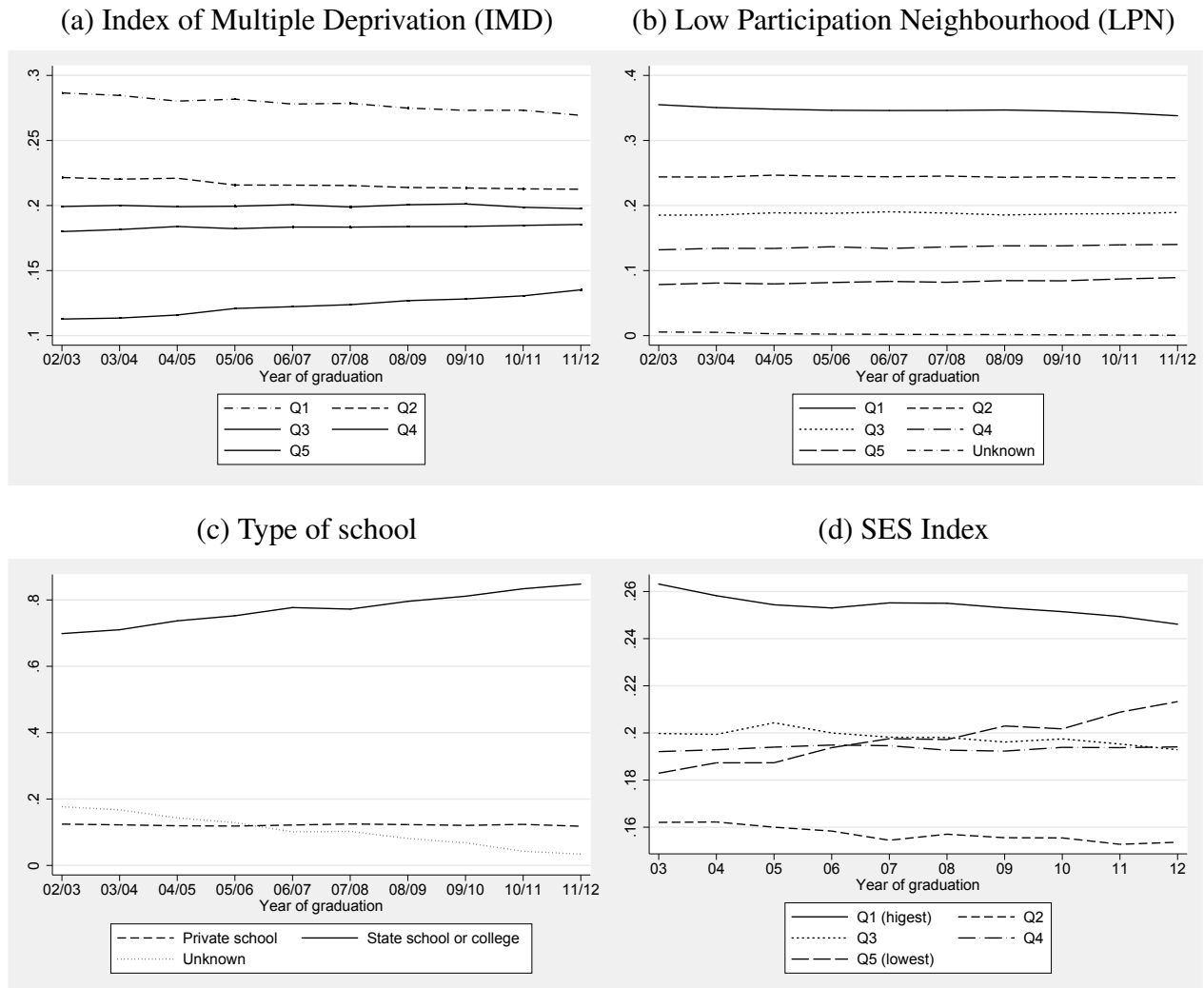
(a) Index of Multiple Deprivation (IMD)

(b) Low Participation Neighbourhood (LPN)

(c) Type of school

(d) SES Index

Source: DLHE data on the selected sample described in section IV.A 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 IV.B.

Figure 4: labor market outcomes - Activity status
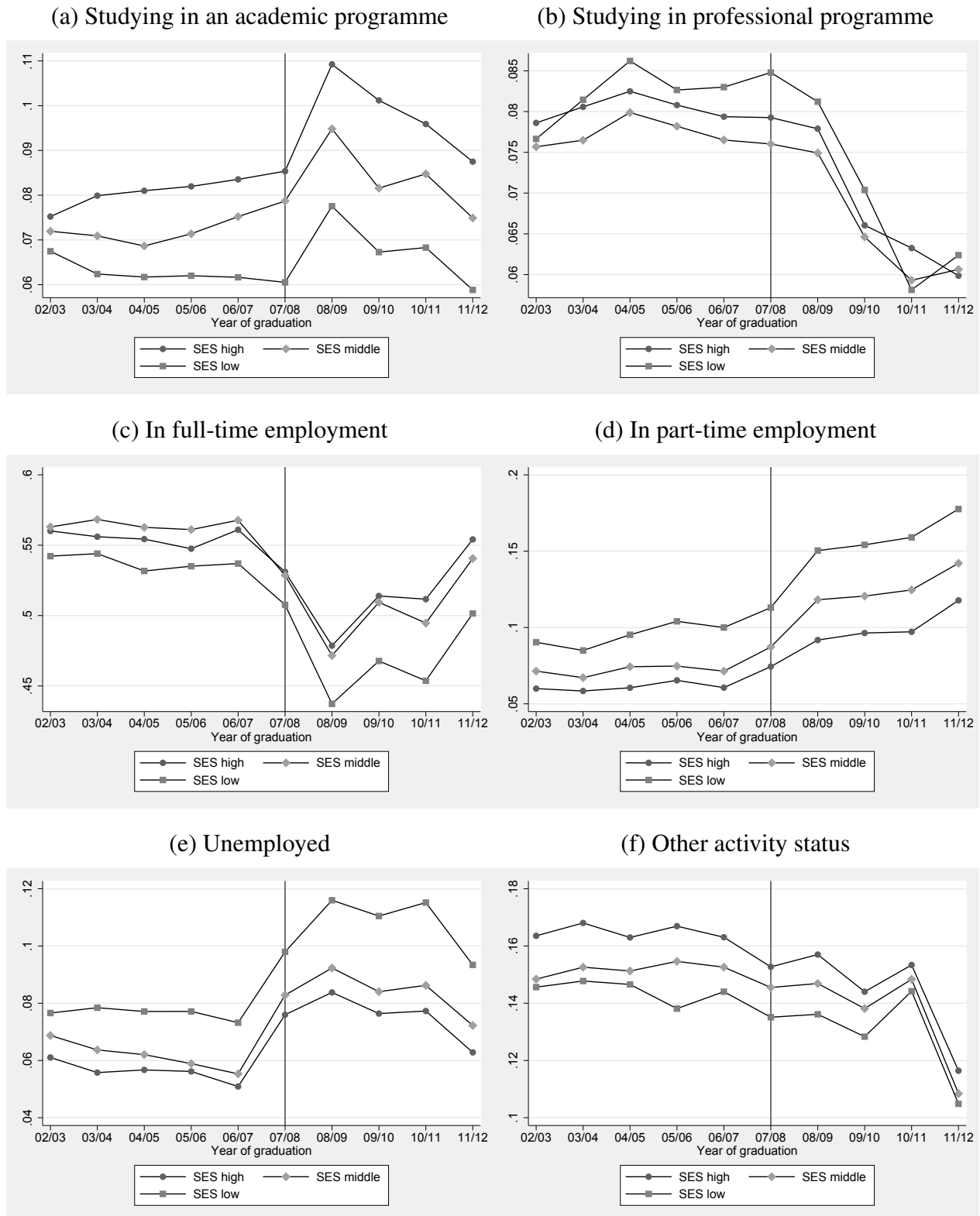
(a) Studying in an academic programme

(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 IV.A 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 IV.C.

Figure 5: labor market outcomes - Employed graduates only
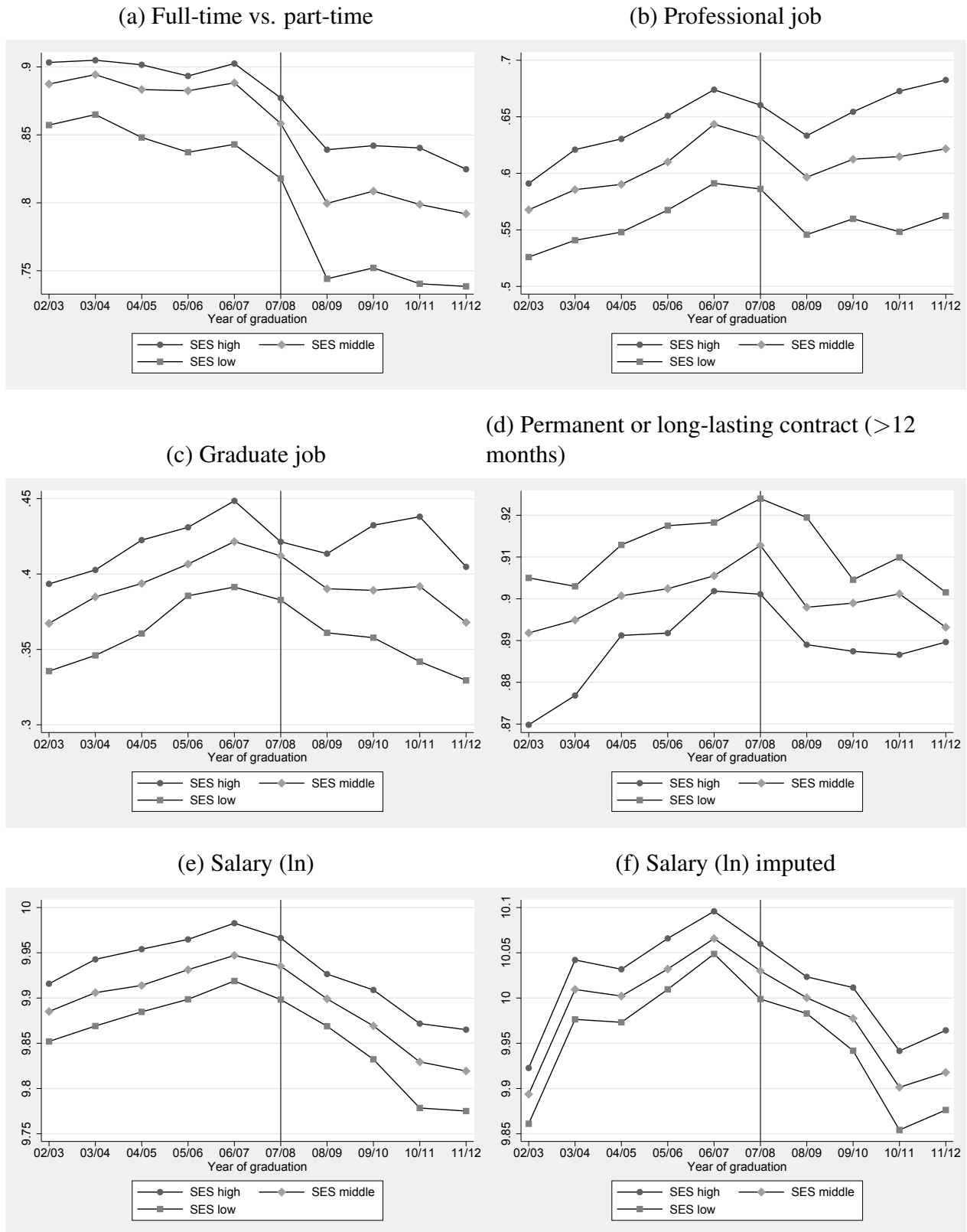
(a) Full-time vs. part-time

(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 IV.A 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 IV.C.

Figure 6: Graduate unemployment rates by field of study 2003-2012

Graphs by field_lfs
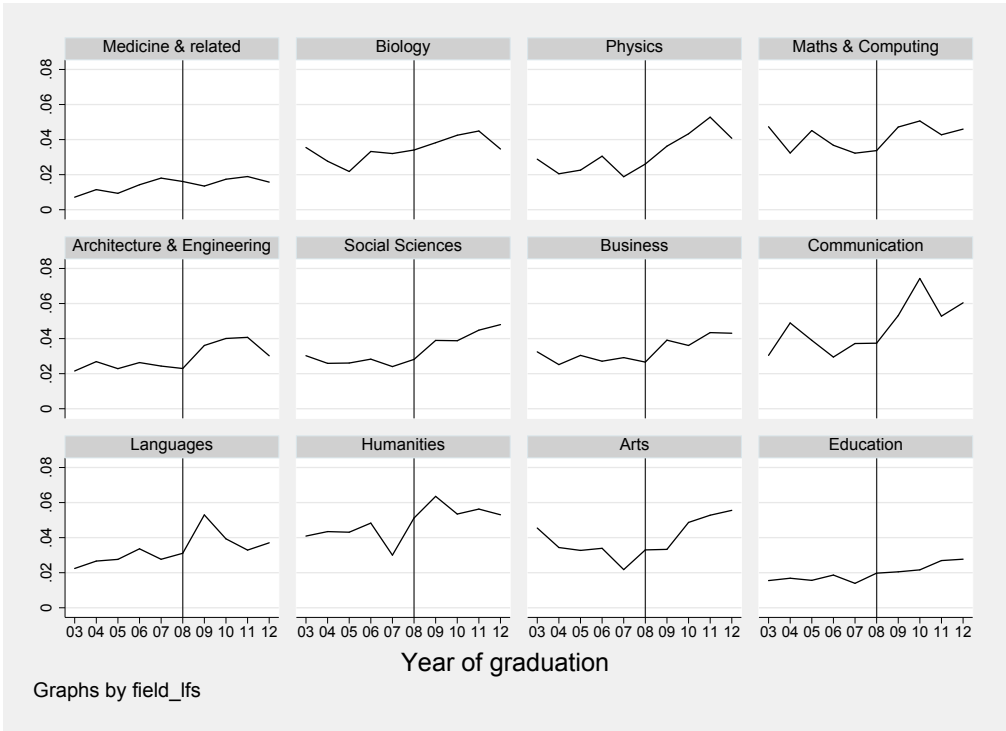
Source: Labour Force Survey.

Figure 7: Geographical distances

(a) Distance HEI-workplace and
domicile-workplace
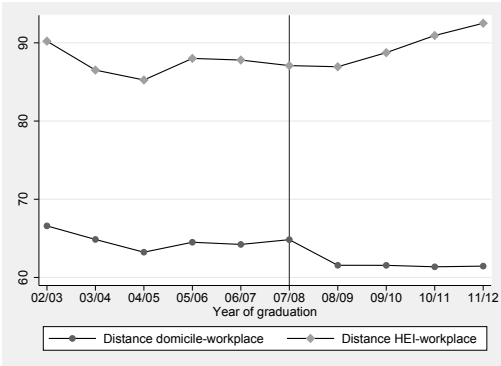
(c) Distance domicile-workplace (by
(b) Distance HEI-workplace (by SES) SES)
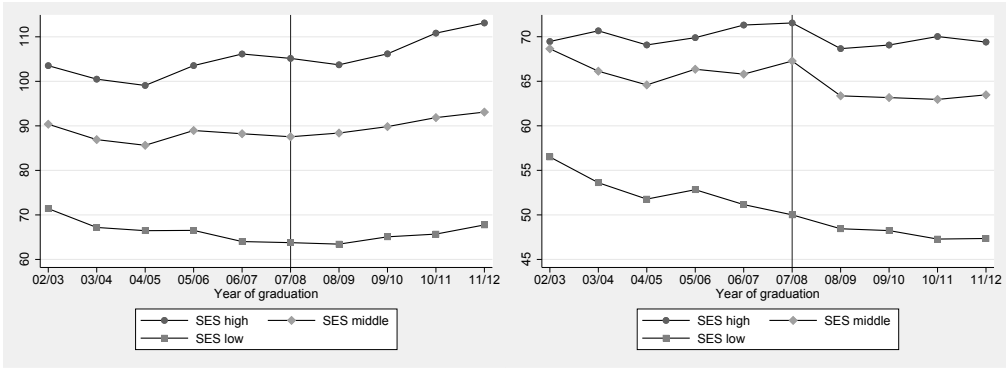
Source: DLHE data on the selected sample described in section IV.A linked with the relevant
statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: Distance in Km between workplace and original domicile (that is where student lived be-
fore enrolling into HE) and between workplace and university where student graduated from.

Figure 8: Whether working at previous employer
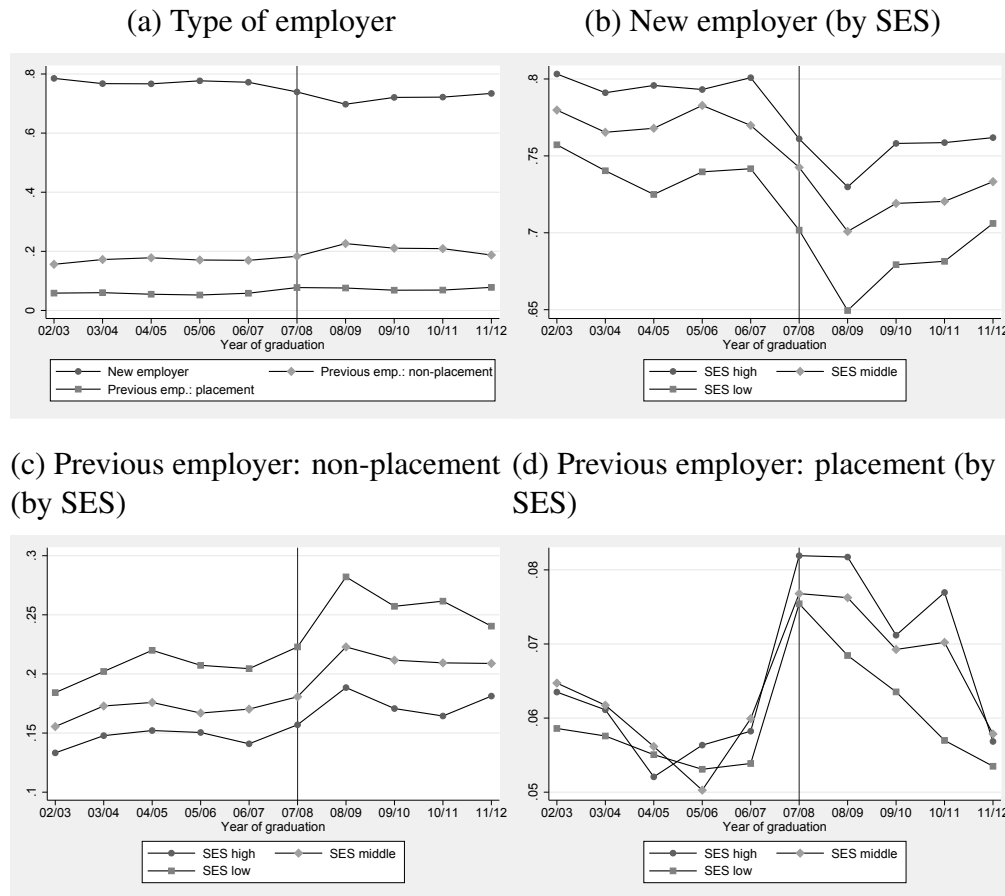
(a) Type of employer

(b) New employer (by SES)

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

(d) Previous employer: placement (by SES)

Source: DLHE data on the selected sample described in section IV.A linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: Whether working at a new employer or previous employer and whether job held at previous employer was a placement.

Table 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

Source: DLHE data on the selected sample described in section IV.A 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 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	

Source: DLHE data on the selected sample described in section IV.A
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 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	267184	267184	267184	267184	267184	267184
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 IV.A 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 4: 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 5: Activity status at 6 months and 3.5 years after graduation

6 months		3.5 years						
		Full-time emp.	Part-time emp.	Studying	Working and Studying	Unemployed	Other	Unknown
		75.19%	4.43%	9.42%	5.55%	2.99%	2.14%	0.27%
Full-time emp.	50.41%	82.74%	2.8%	5.3%	5.23%	1.89%	1.79%	0.27%
Part-time emp.	8.01%	69.23%	11.42%	7.55%	4.83%	4.04%	2.62%	0.31%
Studying	17.63%	62.48%	3.63%	23.72%	5.36%	2.82%	1.8%	0.19%
Working and Studying	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.

Table 6: Unemployment rates over time and by SES group

		U_{home}^{grad}	U_{HEI}^{grad}	U_{field}^{grad}
All sample	mean	0.067	0.068	0.031
	sd	0.019	0.019	0.010
High SES	mean	0.065	0.067	0.031
	sd	0.019	0.020	0.010
Middle SES	mean	0.066	0.067	0.031
	sd	0.019	0.019	0.010
Low SES	mean	0.071	0.071	0.031
	sd	0.019	0.019	0.010
2002/03	mean	0.048	0.049	0.028
	sd	0.013	0.012	0.010
2003/04	mean	0.047	0.047	0.025
	sd	0.013	0.013	0.007
2004/05	mean	0.052	0.053	0.026
	sd	0.011	0.011	0.009
2005/06	mean	0.057	0.058	0.027
	sd	0.013	0.013	0.007
2006/07	mean	0.053	0.053	0.024
	sd	0.009	0.009	0.006
2007/08	mean	0.065	0.066	0.026
	sd	0.012	0.012	0.007
2008/09	mean	0.079	0.080	0.034
	sd	0.013	0.013	0.011
2009/10	mean	0.080	0.081	0.036
	sd	0.014	0.014	0.011
2010/11	mean	0.085	0.086	0.038
	sd	0.016	0.017	0.009
2011/12	mean	0.080	0.081	0.036
	sd	0.012	0.012	0.010
Difference 2011-2007		0.032	0.033	0.014

Source: DLHE data on the selected sample described in section IV.A 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.

Table 7: Different specifications: Unemployed

	(1)	(2)	(3)	(4)	(5)	(6)
Middle SES	0.002**	0.002	0.002**	-0.005+	0.002**	-0.001
	(0.001)	(0.002)	(0.001)	(0.003)	(0.000)	(0.019)
Low SES	0.011**	-0.001	0.011**	-0.014**	0.011**	-0.007
	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.006)
2004	-0.005**	-0.007**				
	(0.001)	(0.002)				
2005	-0.005**	-0.005*				
	(0.001)	(0.002)				
2006	-0.005**	-0.004+				
	(0.001)	(0.002)				
2007	-0.009**	-0.009**				
	(0.001)	(0.002)				
2008	0.018**	0.017**				
	(0.001)	(0.002)				
2009	0.029**	0.025**				
	(0.001)	(0.002)				
2010	0.022**	0.018**				
	(0.001)	(0.002)				
2011	0.025**	0.019**				
	(0.001)	(0.002)				
2012	0.011**	0.006**				
	(0.001)	(0.002)				
MiddleSES*2004		0.001				
		(0.003)				
MiddleSES*2005		-0.002				
		(0.003)				
MiddleSES*2006		-0.004				
		(0.003)				
MiddleSES*2007		-0.002				
		(0.003)				
MiddleSES*2008		0.000				
		(0.003)				
MiddleSES*2009		0.002				
		(0.003)				
MiddleSES*2010		0.002				
		(0.003)				
MiddleSES*2011		0.003				
		(0.003)				
MiddleSES*2012		0.003				
		(0.003)				
LowSES*2004		0.007+				
		(0.004)				
LowSES*2005		0.005				
		(0.004)				
LowSES*2006		0.006				
		(0.004)				
LowSES*2007		0.007*				

Continued on next page

Table 7 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)
		(0.003)				
LowSES*2008		0.007*				
		(0.004)				
LowSES*2009		0.017**				
		(0.004)				
LowSES*2010		0.020**				
		(0.004)				
LowSES*2011		0.023**				
		(0.004)				
LowSES*2012		0.016**				
		(0.003)				
U_{home}^{grad}			0.012**	0.011**		
			(0.001)	(0.001)		
MiddleSES*U_{home}^{grad}				0.001**		
				(0.000)		
LowSES*U_{home}^{grad}				0.004**		
				(0.000)		
U_{field}^{grad}					0.006**	0.005**
					(0.001)	(0.002)
MiddleSES*U_{field}^{grad}						0.001
						(0.001)
LowSES*U_{field}^{grad}						0.006**
						(0.001)
N	1054865	1054865	1054865	1054865	1054865	1054865

Source: DLHE data on the selected sample described in section IV.A linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data. Notes: Specification 1 captures the business cycle using year of graduation dummies (equation 1). Specification 2 introduces an interaction between SES and year of graduation (equation 2). Specification 3 uses unemployment rate by region of domicile, and Specification 4 implements the interaction of the unemployment rate with the SES index (equation 3). Specification 5 uses unemployment rate at time of graduation by field of study to capture the macroeconomic condition and Specification 6 introduces the interaction of the unemployment rate by field of study with the SES index (equation 4). 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 HEI fixed effects. Specifications 3 and 4 additionally condition on regional fixed effects and regional-specific time trends at domicile level. Specifications 5 and 6 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 8: The effect of graduating in bad times by SES - Activity status

	Academic programme		Professional programme		Full-time employment	
	(1)	(2)	(1)	(2)	(1)	(2)
MiddleSES*U^{grad}_{field}	-0.002+	-0.002	0.002	0.002	-0.005+	-0.005+
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
LowSES*U^{grad}_{field}	-0.005*	-0.004*	0.004	0.004	-0.012	-0.011+
	(0.002)	(0.002)	(0.005)	(0.005)	(0.007)	(0.006)
U^{grad}_{field}	0.005*	0.005**	-0.004	-0.004	-0.012*	-0.013+
	(0.002)	(0.002)	(0.004)	(0.004)	(0.006)	(0.007)
N	1054863	1054863	1054863	1054863	1054863	1054863

	Part-time employment		Unemployed		Other activity	
	(1)	(2)	(1)	(2)	(1)	(2)
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**	0.005**	-0.003	-0.003
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)
U^{grad}_{field}	0.005**	0.004**	0.005**	0.005*	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)
N	1054863	1054863	1054863	1054863	1054863	1054863

Source: DLHE data on the selected sample described in section IV.A 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), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), HEI fixed effects, and field-specific time trends (equation 4). Specification 2 also includes unemployment rate (at LAD level) at time of enrollment, its interaction with SES, and LAD dummies (equation 5). Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). $+ p < 0.10$ $* p < 0.05$ $** p < 0.001$.

Table 9: 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}	-0.010**	-0.010**	-0.014**	-0.014**	-0.014**	-0.013**
	(0.002)	(0.002)	(0.003)	(0.003)	(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	-0.009*	-0.008**
	(0.001)	(0.003)	(0.004)	(0.003)
U^{grad}_{field}	0.006**	0.006**	-0.030**	-0.028**
	(0.002)	(0.002)	(0.008)	(0.006)
N	579815	579815	291990	291990

Source: DLHE data on the selected sample described in section IV.A 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), human capital characteristics (degree classification, field of study, log distance between HEI and domicile), HEI fixed effects, and field-specific time trends (equation 4). Specification 2 also includes unemployment rate (at LAD level) at time of enrollment, its interaction with SES, and LAD dummies (equation 5). Robust standard errors are clustered by field of study in brackets (wild cluster bootstrap 999 reps). +$p < 0.10$ *$p < 0.05$ **$p < 0.001$.

Table 10: Heterogeneity: activity status

	Ac. prog.	Prof. prog.	FT emp.	PT emp.	Unemp.	Other
		Whether got a first/upper second				
MiddleSES*U_{field}^{grad}*D	-0.001	0.002	0.002	-0.003	-0.002	0.002
	(0.001)	(0.003)	(0.004)	(0.002)	(0.001)	(0.001)
LowSES*U_{field}^{grad}*D	-0.003	0.005	-0.003	0.000	-0.001	0.002
	(0.002)	(0.005)	(0.006)	(0.003)	(0.002)	(0.002)
		Whether HEI has a high intake of low-SES students				
MiddleSES*U_{field}^{grad}*D	-0.000	-0.004	0.000	0.004*	0.001	0.000
	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.018)
LowSES*U_{field}^{grad}*D	0.001	-0.008+	0.001	0.000	0.002	0.004
	(0.002)	(0.004)	(0.004)	(0.002)	(0.001)	(0.003)
		Whether graduated in a STEM degree				
MiddleSES*U_{field}^{grad}*D	-0.001	0.008*	-0.002	0.001	0.001	-0.008**
	(0.002)	(0.003)	(0.006)	(0.002)	(0.001)	(0.002)
LowSES*U_{field}^{grad}*D	0.001	0.017*	-0.013	0.003	0.004**	-0.011**
	(0.004)	(0.007)	(0.010)	(0.004)	(0.002)	(0.004)
		Whether graduated in a degree at high specialization				
MiddleSES*U_{field}^{grad}*D	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}^{grad}*D	0.010**	0.017**	-0.028**	0.006*	0.008**	-0.013**
	(0.004)	(0.006)	(0.009)	(0.003)	(0.002)	(0.004)
N	1054865	1054865	1054865	1054865	1054865	1054865

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

Notes: D indicates the dummy variable of interest (for example, D=1 if got a first or upper second degree classification, and D=0 otherwise). 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 by field of study and its interaction with SES, unemployment rate (at LAD level) at time of enrollment and its interaction with SES, 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). $+\rho < 0.10$ *$\rho < 0.05$ **$\rho < 0.001$.

Table 11: Heterogeneity: job attributes

|	FT vs. PT	Professional occ.	Grad. job	Permanent cont.	Log Salary
	Whether got a first/upper second				
MiddleSES*U_{field}^{grad}*D	0.005+	0.003	-0.003	0.000	-0.004*
	(0.003)	(0.002)	(0.003)	(0.001)	(0.002)
LowSES*U_{field}^{grad}*D	0.005+	0.001	-0.008+	-0.004	-0.005+
	(0.003)	(0.004)	(0.004)	(0.002)	(0.003)
	Whether HEI has a high intake of low-SES students				
MiddleSES*U_{field}^{grad}*D	-0.004	0.004	0.001	0.000	0.001
	(0.003)	(0.003)	(0.007)	(0.002)	(0.003)
LowSES*U_{field}^{grad}*D	-0.001	0.003	0.001	-0.002	0.001
	(0.004)	(0.005)	(0.011)	(0.003)	(0.014)
	Whether graduated in a STEM degree				
MiddleSES*U_{field}^{grad}*D	-0.003	-0.003	0.001	0.003+	0.001
	(0.003)	(0.005)	(0.003)	(0.002)	(0.002)
LowSES*U_{field}^{grad}*D	-0.010+	-0.014*	-0.010*	0.007*	0.000
	(0.006)	(0.006)	(0.004)	(0.003)	(0.001)
	Whether graduated in a degree at high specilization				
MiddleSES*U_{field}^{grad}*D	-0.005+	-0.013**	-0.010**	0.003+	-0.006
	(0.003)	(0.004)	(0.003)	(0.002)	(0.005)
LowSES*U_{field}^{grad}*D	-0.014**	-0.032**	-0.022**	0.007*	-0.010
	(0.005)	(0.008)	(0.006)	(0.003)	(0.008)
N	662080	661210	555265	579815	291990

Source: DLHE data on the selected sample described in section IV.A linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
Notes: D indicates the dummy variable of interest (for example D=1 if got a first or upper second degree classification, and D=0 otherwise). 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 by field of study and its interaction with SES, unemployment rate (at LAD level) at time of enrollment and its interaction with SES, 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). $+\rho < 0.10$ *$\rho < 0.05$ **$\rho < 0.001$.

Table 12: 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*	-0.013**	0.004	0.004
	(0.008)	(0.002)	(0.003)	(0.004)
U$^{grad}_{field}$	-0.046**	0.006*	0.004	-0.018**
	(0.008)	(0.002)	(0.004)	(0.004)
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*	-0.004	0.013**	-0.008**
	(0.022)	(0.003)	(0.004)	(0.003)
U$^{grad}_{field}$	0.035*	-0.006	0.002	0.004+
	(0.014)	(0.004)	(0.004)	(0.002)
N	621750	527890	527890	527890

Source: DLHE data on the selected sample described in section IV.A 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, 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). $+p < 0.10$ $*p < 0.05$ $**p < 0.001$.

A   Figures and tables in Appendix

Figure A1: HE dropout rates in the UK

(a) Dropout rates by year of enrolment
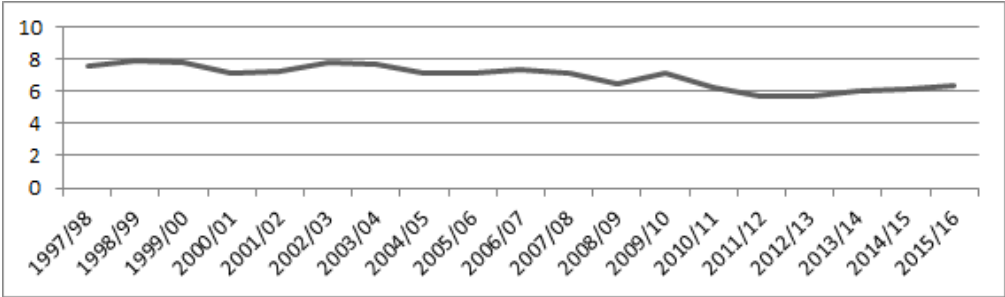
(b) Projected learning outcomes by year of enrolment
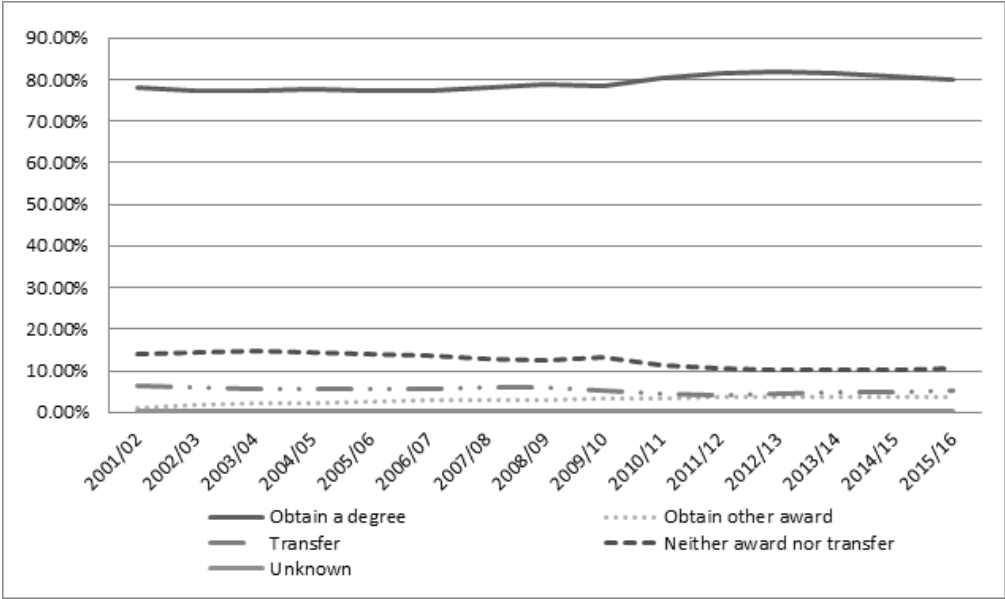
Source: Higher Education Statistics Agency
Notes: The sample is composed of UK domiciled full-time first degree students. Dropout rates are calculated as the percentage of entrants not continuing in HE after their first year by year of enrolment. The projected outcomes identify cohorts of students who started at the HEI on a full-time first degree course of study in a particular year. Their future progression outcomes (whether they qualify, transfer to another HEI, or do not continue) are projected based on current progression patterns at their HEI.

Figure A2: Graduate unemployment rate by region 2000-2012

Graphs by region
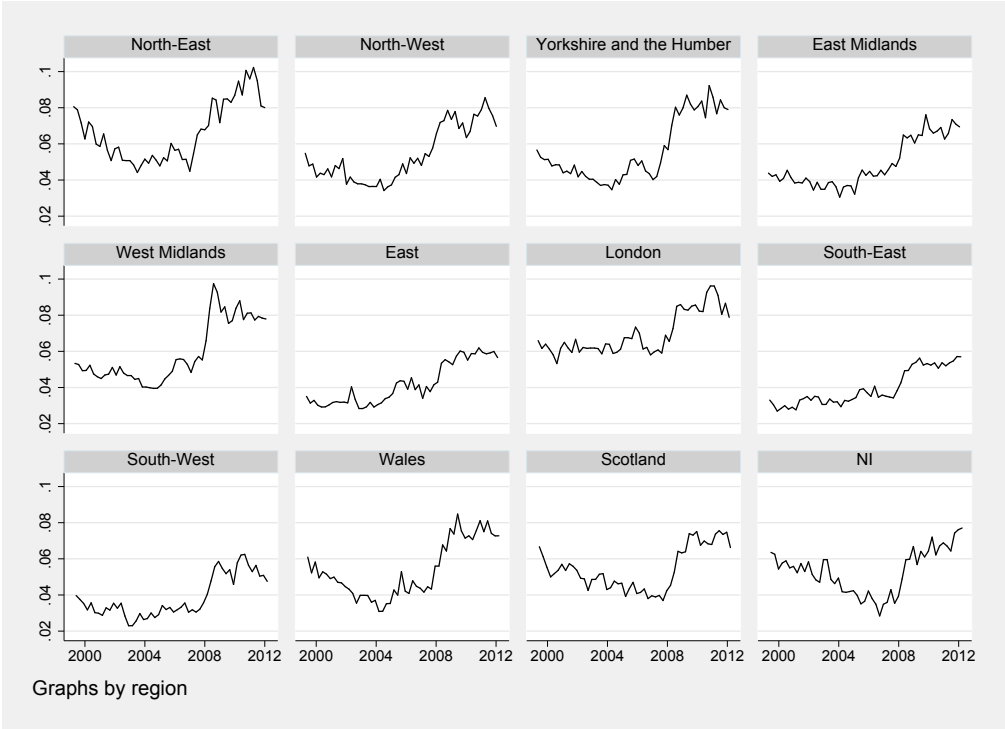
Source: Labour Force Survey.

Figure A3: Unemployment rate by field of study and age group 2000-2012

Graphs by field_lfs
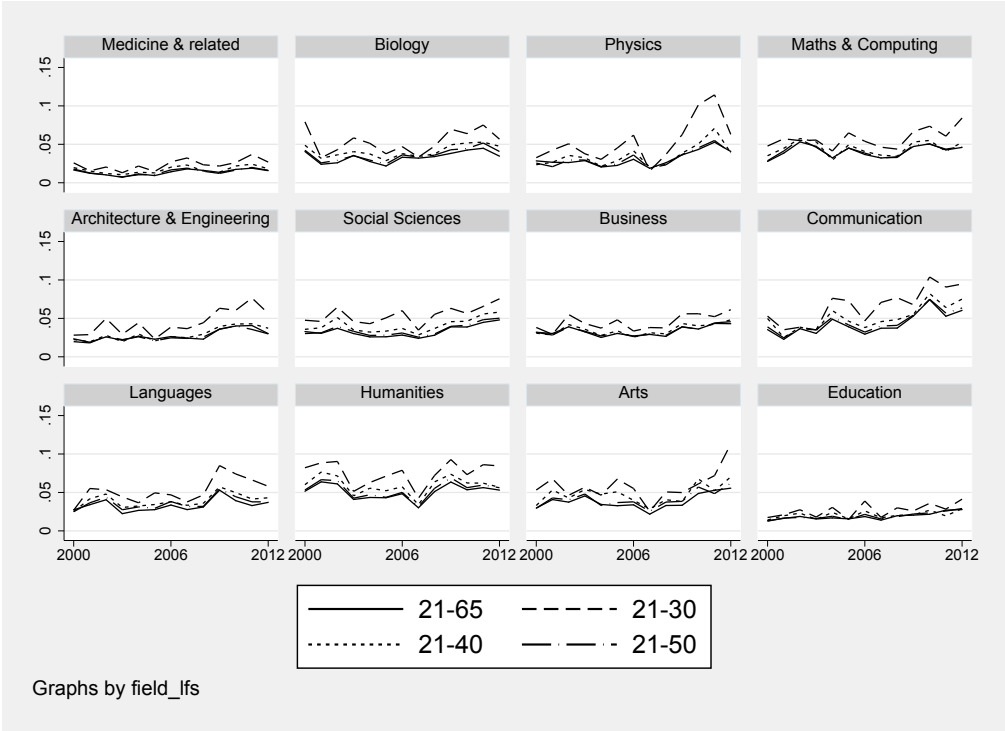
Source: Labour Force Survey.

Table A1: 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 A2: 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 A3: 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: DLHE data on the selected sample described in section IV.A linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data. 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.

Table A4: Descriptive statistics for the entire sample of graduates
and for respondents only

	All graduates	Respondent	Difference
High SES	0.249	0.253	0.004
Middle SES	0.586	0.588	0.002
Low SES	0.165	0.159	-0.006
Female	0.551	0.553	0.002
White	0.817	0.826	0.008
Caribbean	0.010	0.009	-0.001
African	0.013	0.012	-0.002
Other Black	0.002	0.002	0.000
Indian	0.055	0.055	0.000
Pakistani	0.025	0.023	-0.001
Bangladeshi	0.009	0.009	0.000
Chinese	0.011	0.011	-0.001
Other Asian	0.010	0.009	0.000
Other	0.033	0.031	-0.002
Unknown	0.015	0.014	-0.001
Any disability	0.085	0.085	0.000
First class honours	0.130	0.138	0.008
Upper second class honours	0.515	0.522	0.007
Lower second class honours	0.281	0.269	-0.012
Third class honours/Pass	0.046	0.041	-0.005
Unclassified	0.029	0.030	0.002
Medicine & related	0.075	0.079	0.005
Biology	0.110	0.112	0.001
Physics	0.053	0.056	0.002
Maths & Computing	0.071	0.072	0.001
Architecture & Engineering	0.070	0.072	0.001
Social Sciences	0.150	0.147	-0.003
Business	0.120	0.118	-0.002
Communication	0.038	0.037	-0.002
Languages	0.084	0.084	-0.001
Humanities	0.062	0.061	-0.001
Arts	0.128	0.123	-0.005
Education	0.038	0.040	0.001
Non grouped	0.283	0.286	0.004
Russell	0.206	0.210	0.004
Golden	0.068	0.067	-0.001
Ex-pol	0.081	0.079	-0.003
Alliance	0.244	0.241	-0.003
Million	0.070	0.068	-0.001
Guild	0.049	0.048	-0.001
Log distance home-HEI	4.151	4.164	0.013
N	1301960	1054865	

Notes: Mean values of relevant variables in the universe of grad-
uates and in the sub-sample of respondents to the DLHE.

Table A5: Robustness check: non-response

	Respondent
MiddleSES*U_{field}^{grad}	0.001
	(0.001)
LowSES*U_{field}^{grad}	0.001
	(0.003)
U_{field}^{grad}	0.013**
	(0.002)
N	1301960

Source: DLHE data on the selected sample described in section IV.A 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, 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). $+\rho < 0.10$ $*\rho < 0.05$ $**\rho < 0.001$.

Table A6: Robustness check: tariff score

	Academic prog.	Professional prog.	Full-time job	Part-time job	Unemployed	Other
MiddleSES*U^{grad}_{field}	-0.002+	0.002	-0.005	0.005**	0.001	-0.001
	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)
LowSES*U^{grad}_{field}	-0.004+	0.006	-0.012	0.007**	0.005**	-0.003
	(0.002)	(0.005)	(0.007)	(0.002)	(0.001)	(0.002)
U^{grad}_{field}	0.006**	-0.001	-0.022**	0.005*	0.005**	0.007**
	(0.002)	(0.003)	(0.007)	(0.002)	(0.002)	(0.003)
N	687635	687635	687635	687635	687635	687635

	Full-time job	Prof. occ.	Grad. job	Permanent cont.	Log Salary
MiddleSES*U^{grad}_{field}	-0.007**	-0.010**	-0.006*	-0.002	-0.002+
	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
LowSES*U^{grad}_{field}	-0.014**	-0.015**	-0.008+	-0.003	-0.007**
	(0.004)	(0.005)	(0.005)	(0.002)	(0.002)
U^{grad}_{field}	-0.013**	-0.019**	-0.015*	0.008**	-0.027**
	(0.003)	(0.005)	(0.007)	(0.002)	(0.007)
N	420480	419970	358060	373410	189620

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

Notes: Controls: tariff score quintiles, 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, 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). +$p < 0.10$ *$p < 0.05$ **$p < 0.001$.

Table A7: Robustness check: imputed salary

MiddleSES*U^{grad}_{field}	-0.003*
	(0.002)
LowSES*U^{grad}_{field}	-0.007**
	(0.003)
U^{grad}_{field}	-0.041**
	(0.009)
N	467070

Notes: DLHE data on the selected sample described in section IV.A linked with the relevant statistics derived from the Labour Force Survey and the Office for National Statistics data.
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, 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). $+\rho < 0.10$ *$\rho < 0.05$ **$\rho < 0.001$.

B   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.