

Secondary School Grades and Graduate Returns to Education in the UK

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Abstract

We examine the relationship between secondary school attainment and early career graduate salaries in the UK. Based on literature on grade inflation we hypothesise that there is uncertainty regarding the quality of the signal communicated by degree classifications, and that secondary school grades can be used as a tool to determine the veracity of classifications. We find that differences in secondary school attainment, expressed in UCAS points, are consistently a significant predictor of salary differences among graduates attaining Upper Second class degrees, and some First class graduates. We estimate predicted probabilities, to predict the likelihood of a graduate appearing in a given salary band based on the combination of their secondary school attainment, degree classification and the university attended. The most common category of graduate in our sample (250 to 325 UCAS points, studied at a Post-1992 institution and attained an Upper Second class) has a 55% chance of attaining a salary less than £20,000 in the 12 months after graduation.

Earnings, Employer Learning, Grade Inflation, Human Capital, Education Economics, Higher Education

JEL Classifications: I23, I26, J24

Introduction

The growth in higher education within the UK has resulted in around 40% of young people aged 17 to 20 across England, Wales, Northern Ireland and Scotland now attending university (Office for Students, 2019). While this is short of the Labour government's 1997 target of a 50% participation rate of young people in higher education, it still represents what has been a significant expansion in the sector over the last 30 years since granting a number of former polytechnic colleges university status in 1992. The 1992 expansion combined with the existing number of institutions at the time has raised the number of degree granting institutes to 164. This expansion can be viewed in a positive light in several ways. An increase in the number of universities inherently increases the number of educational opportunities for prospective students, and the more even distribution of universities throughout the UK, ensures that the majority can find access to education without excessive travel or the need to move away from home² The increase in students has led to an increase in the number of graduates, enhancing the collective skill level throughout the country. This expansion in skills has not been isolated to the upper echelons of the social classes, as the UK has seen a progressive increase in participation from young people living in lower income households (Department for Education, 2019), which captures the majority of students for whom they are the first in their family to have attended university. The increase in participation, both generally and among those from a lower income background has persisted despite the decision by the UK government to raise tuition fees from £3,000 to around £9,000 in England and Wales in 2012 (Office for Students, 2019).

Despite the benefits of growth in the sector, it is not without its challenges. An issue of growing concern centres around the notion of grade inflation, defined as the awarding of a larger proportion of higher or 'good'³ degree classifications over time, but in absence of an increase in achievement or ability (Rosovsky and Hartley, 2002). The topic of grade inflation has been examined extensively in several countries, with research examining the issue in Canada (Dickson, 1984), Australia (Marginson, 1995), Ireland (O'Grady and Guilfoyle, 2007), Italy (Bagues et al, 2008) and Germany (Bauer and Grave, 2011). Much of this literature has reached consensus on the potential causes of grade inflation. Job security and funding concerns among staff, pressure from students and diverse grading standards are commonly cited as motives for grade inflation.

Recent evidence from HESA, indicates that the number of 'good' degree classifications awarded between 06/07 and 18/19 rose from 60.2% to 76.3%⁴ in the UK. The increase during this time consisted of a significant

² There are significant indirect costs associated with moving away from home for university, such as the cost of accommodation (Christie, 2007). Some previous studies have noted the benefits of student mobility, see for example, Holdsworth (2009).

³ A 'good' degree classification is considered to be a Upper Second (2.1) or above

⁴ HESA data summarised in Appendix A

rise in the proportion of 1st class degrees (12.5% to 27.8%), compared to a more moderate increase in Upper Second class degrees (47.6% to 48.4%). A higher proportion of students falling into such categories that were previously exclusively reserved for a minority of high performing or elite students on a more superficial level devalues the achievements of those who truly deserve to be in such categories relative to those who are there as a result of inflated grades. Of greater concern though may be the implications this has for the signalling power of classifications to provide reliable information about graduate quality to employers. The decision to hire a recent graduate, the majority of whom have little significant work experience, represents a point at which an employer is likely heavily reliant on a credible signal of quality provided by a student's education in order to at least in part, determine whether or not the prospective candidate would be suitable for the role (Spence, 1973). This is a central tenet of theory relating to recruitment and employer learning where uncertainty regarding ability/productivity exists due to the inability to properly evaluate prospective employees beforehand. The challenge for employers in the current environment is where a majority of graduates signal high ability by holding a high classification, how will employers differentiate between those of legitimate high ability, versus those benefitting from inflated qualifications?

The solution in part may lie in utilising a more objective measure of attainment, that is less prone to grade inflation, and the heterogeneity between universities, where differences in curriculum, teaching and standards make it difficult to directly compare graduates across institutions. Such a measure exists, in the form of the student's pre-higher education grades, attained in standardised nationally identical examinations completed in their final year(s) in secondary education. Examining students in this manner ensures that the grades attained are directly comparable across all students, regardless of their secondary institution. Furthermore, unlike university assessments, the examinations are marked externally rather than by those who taught students within an institution, thereby mitigating any obvious potential personal incentive on the part of the exam marker to artificially grade higher. The same cannot be said for universities where awarding higher classifications can align with individual and institutional incentives⁵ (Butcher et al, 2014).

The grades attained are converted from their letter form (A, B, C etc) to points, referred to as UCAS points, which are used to gain entry to university, with more challenging courses and prestigious institutions demanding higher points levels to attain entry. The idea of utilising secondary school grades as an alternative to

⁵ Universities do make efforts to at least partially mitigate the moral hazard associated with marking their own assessments through the external examiners who verify the quality of exam papers and grade distributions. It should be noted that external examiners can merely recommend changes to exams and grade distributions and that universities do not have a binding obligation to conform to any and all changes recommend by the external examiner, thereby limiting the potential effectiveness of this process.

degree classifications has been explored in the literature. Naylor et al (2015) highlight that UK secondary school grades provide greater detail about an individual's productivity relative to degree classifications, which are described as vague and poorly calibrated in comparison to secondary school grades. Miller (1998) finds that even among those with degrees, secondary school grades are a significant predictor of earnings. Wongsurawat (2008) examined the admissions behaviour of graduate schools finding in the presence of degree grade inflation, greater emphasis was placed by admissions on standardised test scores than degree classification/transcripts.

In this paper, we propose that given the degree of uncertainty regarding the veracity of the signal conferred by degree classifications, that UCAS points may play an important role as a tool for employers to confirm the consistency or lack thereof between a student's attainment between secondary school and university. In doing so, the employer indirectly determines a perception of whether or not the grade may have been subject to inflation, and in the process informs the employer's approach to recruitment. Where such a belief exists, we hypothesise that the salary returns for graduates will be greater for those with more UCAS points relative to those with fewer, as employers will discriminate between candidates, even those of the same institution and degree classification. While no literature we are aware of has examined the use of secondary school grades as a tool against a perceived weak signal communicated by degree classification, it is clear from the literature (Miller, 1998; Wongsurawat, 2008; Naylor et al, 2015) that there is evidence of the competing value of secondary school grades versus degree classification within the recruitment of employees. Given this evidence, combined with the growing concerns on the credibility of the signal conferred by degrees, it is plausible to hypothesise that employers could use secondary school grades, perceiving them as a superior or supplementary measure of ability, to evaluate prospective employees where concerns regarding grade inflation exist, as they very much do within the graduate labour market today.

The paper is structured as follows: firstly, we present a discussion of the related literature. This will focus on reviewing the literature on employer learning, which provides the theoretical and empirical basis of the importance of observable education characteristics in early career employment. We then review literature on the issue of grade inflation, identifying the evidence for its existence within higher education in the UK and explanations for its origin. The methodology is then presented, including a full discussion of the data used and the econometric methods applied in the analysis. Results from the analysis are then presented, followed by discussion, and concluding remarks.

Literature Review

Employer Learning

The iterative process of employers evaluating candidates, hiring employees and learning from the process for future rounds of hiring is known as employer learning (Farber and Gibbons, 1996). Employer learning is closely aligned with economic theory relating to signalling (Spence, 1973). Firms decide between prospective employees based on easily observable variables, which the employer assumes to be correlated with productivity. For a young person, such as a recent graduate, these variables largely focus on education, capturing factors such as degree subject, degree classification and the university attended, to name just a few (Arcidiacono et al, 2009; Bordon and Braga, 2017; Aryal et al, 2019). All such factors are believed to communicate a signal to the employer about the graduate's potential productivity. The firm will combine these variables with other elements of the recruitment process (interviews, references, firm testing) to come to a decision of who to hire, based on a cumulative evaluation of these traits. The characteristics signalled, while assumed to be correlated with productivity, are not direct measures of productivity as the firm is unable to directly observe this before hiring. The firm therefore faces the challenging task of hiring employees based on their internal perceptions of the veracity and quality of the signals from the prospective employee. Over time, it is assumed that the firm will become more adept at this process. The firm will be able to filter out 'noisy' signals it once assumed to be good indicators of productivity, but given past experiences, are now known to be weakly associated with an employee's capabilities (Altonji and Pierret, 2001).

Lange (2007) examines the speed at which employers learn. The faster employers learn about the true productive characteristics of an employee, the less they rely on schooling as a signal of productivity, leading to a decline in the returns the employee derives from schooling. Later research estimates the decline in returns to schooling of at 3% per annum (Bordon and Braga, 2017 op-cit). Lange finds that it takes three years for any expectation error on the part of the employer regarding the productivity of an employee to decline by around 50%. This highlights the extent to which errors at the hiring stage cause a longer term negative effective for the firm that cannot be easily or immediately overcome. Such errors may be more common in an environment where employers are uncertain about the veracity of a degree classification that may be subject to inflation, and further necessitate the use of additional information, such as secondary school attainment, within the recruitment process to confirm the credibility of the signal communicated by the degree classification.

Grade Inflation

The topic of grade inflation has been a subject of research in the academic literature for quite some time. Birnbaum (1977) provides a historical perspective on the possible source of grade inflation within universities dating back to the 1950s in the US. Birnbaum tests five hypotheses for reasons for grade inflation, outside of artificial inflation within universities. The analysis conducted found that students were being awarded higher grades despite having the same level of ability of students in the past, though found that the trend in inflation was declining.

Some recent contributions to the literature asserts that grade inflation concerns are overblown. Pattison et al (2013) find little evidence for grade inflation in the US. Using four nationally representative US schools across four time periods from 1972 to 2004 they find that high school grades have improved while university grades have declined, findings that run counter to the prevailing sentiment regarding grade inflation. On this basis they argue that the signalling power of grades has not been compromised.

Sabot and Wakeman-Linn (1991) examined the impact of grade inflation on course choice. Grade inflation is shown to be a greater issue within specific disciplines, with subjects in the arts and humanities categorised as traditionally high grading and more prone to inflation, compared with STEM subjects with more exacting grading standards, and therefore are less prone to inflation. Students were more responsive with regards to continue taking a course when receiving a B or C in a lower grading subject relative to receiving the same grades in a higher graded discipline. This reflects the relative value students placed on the same grades from different disciplines, a behaviour that may filter through to the hiring process where research has observed differences in the returns to education by degree subject (O'Leary and Sloane, 2005; Kelly et al, 2010; Walker and Zhu, 2011; Belfield et al, 2018). Bar et al (2009) identified a similar impact of grade inflation on course choice at Cornell, where evidence of grade inflation led to divergent behaviour in high and lower ability students, with high ability students avoiding leniently graded subjects, with lower ability students being more likely to take such modules.

Butcher et al (2014) evaluated the impact of policies employed at Wellesley College in the US to correct for grade inflation. The college instituted grade caps on traditionally high grading courses, with grades beyond the cap requiring additional approval. The policy decreased the likelihood of A grades while increasing the chance of B's. While effective, the policy had a negative effect on teaching evaluations. The negative effect of anti-grade inflation policies on evaluations serve as an argument against such interventions being adopted. Furthermore, there is pressure on universities to produce graduates who appear to be of high standard. This

increases the likelihood of a university's graduate being hired in a 'good' job raising the profile of the university in the competitive landscape for students (Popov and Bernhardt, 2010). Any policy that disrupts this process, and as such the ability of some universities to compete with others is unappealing for both students and universities and may in part explain why grade inflation has grown over time.

Focusing on grade inflation in the UK Gibbs and Lucas (1997) examined the increase in university student grade attainment at UK universities, despite the decline in resources experienced at universities. The decline in resources led to declining staff student ratios, and increasing class sizes, both of which have been shown to have a negative impact on student performance. Gibbs and Lucas identify the source of grade inflation at that time to the different assessment structures of modules. Modules with greater levels of coursework produced higher average grades, as did subject disciplines which utilised more coursework. Elton (1998) echoes the findings of Gibbs and Lucas, emphasising the need to implement new grading policies to diminish the presence of grade inflation. Yorke (2002), examined degree classification trends in the UK from 1994 to 1999. Yorke confirms the continuation of the trend from the 1970s onwards of the increasing rate of higher classifications being awarded in UK universities, though highlights that the percentage of higher classifications varies by subject. This aligns with earlier research in the US, which identified different grading standards by subject. Another strand of the literature employs a stochastic frontier methodology to analyse grade inflation in the UK. Johnes and McNabb (2002), Johnes and Soo (2013) and Bachan (2017), utilise variations of the stochastic frontier method to examine grade inflation from as far back as the 1970s, all finding evidence of the existence of grade inflation within UK institutions. Given the prevalence of grade inflation within the UK and the associated challenges this brings to employers in the hiring process, there is a need to establish whether prior attainment, in the form of secondary school grades, impacts the salary returns for graduates.

Methodology

Data

The data used come from the Destination of Leavers from Higher Education Survey (DLHE) and covers the period from 2010 to 2016 inclusive. Initially the data set consisted of approximately 1.2 million observations. Observations were dropped from the sample due to missing values for the key variables included within the model. The majority of observations were dropped due to failing to report a salary, or for failing to complete secondary school examinations (A-Levels or Scottish Highers) to which UCAS points are assigned, and as a result, failing to report their UCAS points. A full summary of dropped observations is presented in Appendix B.1. Further to this, Appendix B.2 summarises the characteristics of the regression sample relative to the initial full sample, and a sample including those dropped from the analysis for failing to report a salary and who did not complete A-Levels/Highers. The similarities in the characteristics (social class, gender and domicile country) across all three samples demonstrates the regression sample as being representative of the overall graduate population. Observations earning £40,000 or more were also excluded from the sample. Individuals earning £40,000 or more were outliers relative to the vast majority of graduates as they represented only 1% of observations who reported a salary. The final data set consists of 46,648 undergraduates who have graduated within the last 12 months of their surveyed year. The data are initially collected by participating Higher Education Providers, before being collated by the Higher Education Statistics Agency (HESA). The data consist of a series of variables covering basic demographic details, to more detailed information on a student's education and employment history/status and earnings. The earnings variable, which is discussed in more detail in the following section, is self-reported, with the option to opt-out of providing details on your salary. This is not an uncommon characteristic of UK data sets, where data such as the ONS Quarterly Labour Force Survey, the British Election Survey and the British Household Panel Survey/Understanding Society all rely on self-reported earnings data. It is the availability of data on a student's past and present qualifications that will allow for the estimation of the effects of how differences in performance in secondary school may affect returns to education where tertiary qualification details such as degree classification and institution type are held constant. Universities are segmented into three categories: Russell Group universities, universities established before 1992⁶ (Pre-92's) and universities established after 1992 (Post-92's). This approach to categorising universities is an accepted convention within the literature (Boliver, 2015; Raffe and Croxford, 2015). Additional explanatory variables include domicile country,

⁶ While all Russell Group universities were established before 1992, they are not included among the Pre-92's category

subject studied, residential status during university, degree classification, gender, and social class⁷. Inclusion of some additional explanatory variables, particularly degree classification, may adversely impact the magnitude and significance of the effects associated with UCAS points. This is due to a variable such as degree class existing on the same causal pathway from UCAS points to salary, and as such is an imperfect control within the estimates. Similarly, the earnings of those who attain high UCAS points will likely be greater than those with lower UCAS points, not only because of their secondary school attainment, but also due to the correlation between UCAS points and unobservable factors that independently increase salaries. Combined this means that the estimates will be subject to bias. The direction of the bias is indeterminate. While the imperfect nature of including variables such as degree classification can cause a downward bias on the effect of UCAS points, an upward bias may exist due to the inability to control for unobserved factors that impact salary.

A common concern when conducting any returns to education estimation is ability bias and how one might control for this within the model. Ability bias focuses on the general concern when estimating returns to education that the more able will be selected into education endogenously and hence the apparent return to education is likely to be upward biased as it is at least in part picking up some of the effects of ability. This point is frequently raised when one compares the returns of a graduate to a non-graduate. The difference in ability can be partially controlled for where there is either a direct comparable measure of ability across individuals, or via the utilisation of techniques such as instrumental variable analysis. While similar in that we estimate the returns to education, our data differ in two important characteristics. In the first instance, we do not estimate the returns between graduates and non-graduates, but rather between different groups of graduates. In doing so, the assumed ability gap between individuals should be less pronounced given that the entire sample have attained at least a minimum standard to attend university. Be that as it may, the entry standards, and as such the ability even among a group of graduates who are homogenous in their broad categorised level of education, differ greatly across the UK's higher education institutes. As such, the homogeneity of the sample in their graduate status will in itself not adequately control for ability. The inclusion of UCAS points is very useful in partially addressing the issue of ability bias. UCAS points are awarded based on the grades attained by a student while commonly, but not exclusively, studying at secondary school. Points attained at individual subject exams are then combined. The combined level of points attained serve as a primary entry requirement for a student seeking admission to university, with higher ranked institutions and selective degree disciplines requiring higher levels of UCAS points in order to be considered for entry. The availability of UCAS points within our data set, combined with the novel

⁷ Descriptive statistics are presented in Appendix C

way in which they are integrated within our estimates, allows for the clear delineation between students of different and similar attainment, while holding other factors constant. This allows us to estimate the effects of UCAS points on graduate outcomes, and as such the extent to which UCAS points may potentially be used as a tool to verify the veracity of degree and classification signals, as evidenced by higher salary premiums being associated with higher UCAS point totals. Existing research can be somewhat limited in the ability to delineate between the returns experienced by graduates of different levels of attainment due to the somewhat vague and institutionally dependent variable of degree classification. The absence of a more detailed attainment variable increases the extent to which differences in ability are not controlled for. Conversely, our paper seizes upon the increased detail and granularity provided by UCAS points to acutely estimate the effects of changes in secondary school attainment on graduates returns where institution and degree classification are held constant. The approach employed does not entirely mitigate the effects of ability bias, as the returns to education experienced will still be impacted by unobserved abilities which we cannot account for in our model.

While UCAS points, degree classification and institution are all directly or indirectly measures of attainment, they are weakly correlated with each other⁸. This may be somewhat counter intuitive particularly with respect to the weak correlation between of 0.28 between UCAS points and institution type. One might assume that the admissions process would be highly segmented with only those with exceptionally high UCAS points attaining entry to high-ranking Russell Group institutions, while those with far fewer points resigned to low-ranking Post-1992 universities. A review of the descriptive statistics (Appendix C), in particular the sample sizes of the 3-way interactions between degree class, institution and UCAS points indicate that it is not the case. While within the sample Russell Group institutions have a high number of students, specifically 5,529 (49%), with 400 or more UCAS points (the equivalent of A*A*A at A-Level), they have 5,664 with fewer than 400 UCAS points, approximately 34% of whom attained 250 to 325 UCAS points, which equates to grades ranging from BCC to ABB at A-Level. In reference to the sample of graduates from Post-1992 universities, while one may assume that such institutions would be predominantly attended by graduates with low UCAS points, a minority (44.6%) appear in the lowest UCAS points bracket of between 250 and 325 points.

We contend that there should be limited concern as to the consistency of the assumed value of UCAS points across the duration of the data set. The data do not cover an especially long period, with no substantial changes to the nature of examinations that we are aware of which could reasonably impact our ability to utilise

⁸ Summary of the correlation between the variables and the methodology of the calculations are presented in Appendix D

UCAS points as a consistent measure of ability over time. The point levels of individuals are based on identical nationwide exams for those within the same year and country. Where exams have been taken in different years, the short time period under examination, combined with the consistency of curricula within subjects means there should be relatively little variation in the difficulty of the exams to the extent that it would be highly unlikely to lead to wildly different grades/points attained between the years examined⁹. Furthermore, the rate of A to C grades during the time period relevant to our analysis has stayed reasonably consistent. As observations within our sample graduated from university between 2010 and 2016, it means that they are most likely to have completed their secondary school examinations between 2007 and 2014¹⁰. During that time the A to C pass rate increased by only 4.6 percentage points from 72.6% to 77.2%¹¹. The high pass rate may be perceived as an indication of grade inflation within secondary school examinations, thereby leading to a conclusion that both degree classification and UCAS points are equally inflated, and therefore equally flawed. Potential grade inflation in secondary school exams is a topic of annual discussion when exams grades are released each summer. While we make no claims that grade inflation among secondary school exams does not exist, we caution against the equivocation of grade inflation between universities and secondary schools for several reasons. As previously discussed, the inflation of degree classifications is being driven by a significant rise in 1st class degrees. Conversely the 5% increase in A to C grades at A-Level is observed more so in grades B and C, with only a 0.7% increase in A grades. In this sense, grade inflation at secondary schools is less pronounced at the top end of the grade distribution compared to universities. Secondary school exams are externally marked, so there is no obvious moral hazard associated with the grading of secondary exams that would generate grade inflation. Beyond their attempts to prepare their students, secondary schools have no ability to impact a students' final grades. This compares to universities, who as previously mentioned grade their own students under the influence of a strong incentive to award higher classifications, given the effect of classifications on university rankings. Any external input from external examiners is purely advisory, with no binding obligation for the university to accept the examiners input if they were to suggest changes to a questionable grade distribution.

Two further potential issues may exist with the data set and as result, our analysis. It can be argued that some graduates attain their graduate employment prior to graduation, and that this may explain any significance of UCAS points revealed by our estimates, as at the time of the offer, a student's classification is unknown. While

⁹ Changes were made to how points were calculated in 2017, but given our data ranges from 2010 to 2016 this does not impact our analysis

¹⁰ This projected period is based on an assumption that a undergraduate takes 3 to 4 years to complete their degree i.e. to graduate in 2010, one must have at least completed their secondary school examinations in 2007

¹¹ Summary of the distribution of A to C A-Level grades from 2007 to 2014 are presented in Appendix E

it may be true for some students to be extended an offer before graduating, the offer is commonly conditional on attaining a predicted degree classification, with failure to attain the classification nullifying the offer. A final broad concern with our analysis may be the premise that we draw any meaningful conclusion from the pecuniary returns of graduates in the 12 months after they have graduated. This point is raised on the basis that this 12-month period may not necessarily reflect a time in, which graduates are seeking graduate employment, and therefore to evaluate the returns to their education at this time may lead to inaccurate conclusions. If this were the case, then one would expect the majority of our sample to be in occupations that are unlikely to be considered graduate jobs. This would include jobs in sectors such as leisure and retail where graduates commonly work part time during their studies. We would expect that if graduates were not seeking graduate employment, then a minority would be working in managerial or professional occupations one would commonly associate with graduate occupations. A review of the Standard Occupational Classification (SOC) codes of observations within the sample, which are summarised in the descriptive statistics (Appendix C) indicates that neither assumption is true. Approximately 75% of the final sample are found to be working in occupations categorised as Managerial, Professional and Associate Professional. This leads us to be reasonably comfortable in our assertion that our sample includes a majority of individuals who are seeking graduate level work, and as such our findings accurately reflect the experience of such graduates 12 months after graduation.

Salary Model Estimation

We estimate the relationship between secondary school attainment, measured in UCAS tariff points and early career graduate pecuniary returns to education controlling for institution and degree classification. The dependent variable would normally be wages, but unlike the data used in many similar returns to education studies, the DLHE does not provide an individual's hourly wage rate. Instead, HESA provide a series of categorical annual salary bands summarised in Table 1.

Table 1: Dependent Variable Classification	
Value	Qualitative Category
1	Less than £15,000 per annum
2	£15,000 to £19,999 per annum
3	£20,000 to £24,999 per annum
4	£25,000 to £39,999 per annum

As such, a traditional Mincer (1974) model estimation is not suitable. As the dependent variable is ordered and categorical, an Ordered Logit is normally used to estimate the model. The Ordered Logit allows for the estimation

of an individual's likelihood of appearing in a higher salary category. While an Ordered Logit was initially estimated, the model violated the parallel regression assumption¹². The parallel regression assumption assumes that the coefficients that describe the relationship between each pair of outcome groups are the same. Where this assumption is violated and the coefficients differ across outcome groups, it is necessary to estimate different models to describe the relationship between each pair of outcome groups. This is done by estimating a Generalised Ordered Logit¹³ (Williams, 2006), which can be written as:

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + \{\exp(\alpha_j + X_i\beta_j)\}}, \quad j = 1, 2, \dots, M - 1$$

where M is the number of categories for the ordered dependent variable. Given the above, the probabilities that Y will take for each of the values 1, ..., M are equal to:

$$P(Y_i = 1) = 1 - g(X_i\beta_1)$$

$$P(Y_i = j) = g(X_i\beta_{j-1}) - g(X_i\beta_j) \quad j = 2, \dots, M - 1$$

$$P(Y_i = M) = g(X_i\beta_{M-1})$$

Where the value of $M > 2$, as is the case with our model where the outcome variable consists of four categories, the model becomes a series of binary logistic regressions in which categories of the dependent variable are combined. For our own model where $M = 4$, then for $J = 1$, the 1st category of the dependent variable is contrasted with categories 2, 3 and 4; for $J = 2$ the contrast is between categories 1 and 2, versus categories 3 and 4, and for $J = 3$, it is categories 1, 2 and 3 versus category 4. For interpretation, odds ratios greater than one indicate that higher values on the explanatory variable make it more likely that an observation will appear in a higher category of the dependent variable than the current one. Conversely, odds ratios less than one indicate higher values on the explanatory variable, increase the likelihood of appearing in the current or lower category of the dependent variable. Further estimation of predicted probabilities identifies the probability of an individual appearing within a specific salary band category given the series of explanatory variables. The predicted probabilities have been calculated for each outcome variable for each observation in the data set using the actual values of all other variables in the data, with the 3-way interaction group changed each time giving the average predicted probability of appearing in a given outcome group.

¹² The parallel regression assumption is tested using Stata's "omodel" command. Results of the tests are presented in appendix F

¹³ Estimated using the "gologit2" command in Stata

Point estimates are presented to examine the statistical significance in terms of the impact on salaries of movement from one band of UCAS points to another, holding institution and classification constant. Point estimates are calculated for each equation from the Generalised Ordered Logit using the odds ratios estimated by the model.

Results

Generalised Ordered Logit

Four different variations of the Generalised Ordered Logit were estimated as presented in Appendix G. Each variation of the model consists of three binary logistic regressions, in which categories of the dependent variable are combined and then contrasted in the manner detailed within the methodology. This table includes estimates for a base model (Columns 1 to 3), absent of any interactions between the key variables of interest, two further variations of the model where UCAS points are interacted initially with degree classification (Columns 4 to 6) and then with institution (Columns 7 to 9). The final variation (Columns 10 to 12) interacts UCAS points, classification and institution. An interaction of this kind enables the examination of the effect of changing UCAS point levels on salary returns, holding institution and classification constant and thereby illustrating the extent to which attaining more UCAS points is associated with higher salary returns upon graduating. Model coefficients are expressed as odds ratios. While we would wish to continue this process by integrating subject studied to create a 4-way interaction between UCAS points, classification, institution and subject, this approach is not viable due to issues pertaining to very small or non-existent sample sizes for a large number of the variables produced by a 4-way interaction term.

Each variation and individual equation of the model is consistent with the hypothesis that a greater number of UCAS points is associated with greater odds of appearing in a higher salary category. We can also observe that the size of the positive effect which an increase in UCAS points has on salary increases across the salary categories. The general finding of the increasing odds associated with higher UCAS points supports our hypothesis of the potential use of such information by employers to differentiate between applicants. Furthermore, that the effect associated with points increases as we estimate the effects associated with higher salary bands, might also be revealing the greater reliance on this information by employers offering higher salaries. The availability of higher salary may incentivise employers to evaluate potential candidates more intensively, using information such as UCAS points differences to differentiate between candidates. We also observe that attending traditionally higher ranked Russell Group or Pre-1992 institutions also increase the odds of higher returns, as does higher attainment at university, in the form of a higher standard of degree classification. The final set of estimates presented in Columns 10, 11 and 12 focus on the 3-way interaction of UCAS points, classification and institution. Each equation of the estimation of the 3-way interaction terms is made relative to an excluded category of those who attained between 250 and 325 UCAS points, who attended a Post-1992 institution and who graduated with a Lower Second Class honours or less.

The 3-way interactions, which are the central focus of the analysis are plotted in Figures 1a, 1b and 1c with two standard error bands indicated¹⁴. The results can be used to evaluate the position of all other interaction combinations relative to the excluded category. In this case, the general finding is that in all but a small number of instances, graduates have higher, and statistically significant odds of appearing in a higher salary band relative to the excluded category.

[Insert Figures 1a, 1b and 1c here]

Another means of utilising the results in Column 10, 11 and 12 is to examine the odds ratios where institution and classification are held constant and progressively observe the change in the odds ratio as the level of UCAS points increases. As this odds ratio rises it can be interpreted as an increase in the odds of appearing in a higher salary band relative to the excluded category. In simple terms, the more points one attains relative to graduates of a similar institution, with the same degree classification, the greater the odds of appearing in a higher salary category.

The significance of UCAS point differences within the 3-way interaction¹⁵ demonstrate some different findings across the three equations estimated within the model. For the odds ratios estimated for outcome 1, which estimate the odds of earning greater than or equal to £15,000, differences in points are for the most part insignificant. As differences in points are largely insignificant, then this can be interpreted as indicating that there is sufficient information communicated to the prospective employer by the graduate's degree classification, such that differences in points have no effect on whether a graduate attains employment with a salary of less than or greater than £15,000.

For the odds ratios estimated for outcome 2, which estimated the odds of earning greater than or equal to £20,000 a more consistent pattern begins to emerge. In most instances, differences in UCAS between Upper Second class graduates from either Russell Group or Pre-1992 institutions are statistically significant. Where institution and classification are held constant, an increase from one UCAS points band to the next increases the odds of attaining a salary greater than £20,000. Within this salary band, UCAS points differences are, in all but one instance, insignificant among First class graduates, irrespective of their institution. There are several potential explanations for this outcome. Among First class graduates from Russell Group universities, such students have

¹⁴ The full results are shown in Columns 10, 11 and 12 of Appendix G

¹⁵ Significance among all points/institution/classification groups are confirmed using point estimates. Point estimates allow for the examination of differences in UCAS point levels when holding institution and degree classification constant. Point estimates are summarised in Appendix H.1, H.2 and H.3.

attained the highest possible qualification at what is generally regarded to be the most prestigious group of institutions in the UK. On this basis, prospective employers may have found it unnecessary to discriminate when hiring based on UCAS points, as the signal of institution quality and attainment was deemed as an accurate indicator of the applicants' quality, given the nature of occupations associated with a salary greater than outcome 2, without the need to verify this against their secondary school attainment and differentiate between such individuals. Among First class graduates of Pre-1992 and Post-1992 institutions, points are also largely insignificant, potentially based on the earlier conclusion with similar Russell Group graduates, i.e. that their university attainment alone alleviates the need to differentiate returns based on secondary school grades.

The emerging pattern of the statistical significance of points differences that began within those earning greater than or equal to £20,000, continues into outcome group 3. The equation for outcome group 3 estimates the likelihood of earning greater than or equal to £25,000. In all but one instance, differences in UCAS points among Upper Second class graduates are statistically significant, regardless of the institution the graduate studied at. Similarly, in several instances, points differences become significant among First class graduates, again regardless of institution. These outcomes may again be interpreted as being consistent with the hypothesis that firms are using UCAS points to differentiate between similar graduates. The expanding range with which points are significant relative to prior outcome groups is not surprising as we hypothesise that this reflects the greater attention to detail applied to graduates at this stage by employers, where the salary on offer is greater and as such where the skills required for the job are greater too. Therefore, there should be greater need to use such information to verify the signal associated with the degree classification if grade inflation concerns exist.

Focusing specifically on Post-1992 institution graduates within the estimates for outcome category 3, we observe a first consistent pattern of significant differences in this group, specifically among First class and Upper Second class graduates. This outcome represents strong support for the hypothesis of the signal confirmation value of UCAS points. If UCAS points are indeed used as a tool to verify degree signals, then it may be rational to assume that this approach would be prevalent with Post-1992 graduates. Employers may have concerns about the standards and degree classification quality at such institutions which consistently lie in the lower end of national university league tables. As such differences in UCAS points should be prevalent among graduates of these institutions, especially within higher income bracket jobs in order to confirm the consistency between prior attainment and degree class, and ultimately discriminate between graduates where discrepancies exist.

Predicted Probabilities

As the 3-way interaction of the Generalised Ordered Logit is the focus of the analysis, the estimation of predicted probabilities is limited to the equations in the model where the 3-way interaction is included¹⁶. Furthermore, the results are only presented for the 3-way interaction terms rather than all of the explanatory variables as it is the interaction of UCAS points, classification and institution which is of primary interest and the main factors upon which we aim to base our analysis and draw conclusions. The estimation of predicted probabilities reveals the probability of appearing in a specific salary category, given a specific 3-way interaction of points, classification and institution.

The predicted probabilities reveal some interesting and potentially concerning findings for early career graduates. For instance, in referring back to our descriptive statistics appendix we can see that of the 3-way interaction categories identified, that the most common category is that of candidates who attained between 250 and 325 UCAS points, who attended a Post-1992 institution, and who attained an Upper Second class degree in the process. For this most common category of graduate, the outcome is not especially promising. More than half (55%) are predicted to attain a salary of less than £20,000, with almost 85% earning less than £25,000 in the year after their graduation. The average probability for all students in the entire sample of attaining a salary of less than £20,000 is 49.8%. Falling into this category regardless of institution and classification is more likely for students who attained between 250 and 400 UCAS points with an average probability of 25.8%, compared to those who scored between 401 and 550 points with an average probability of 24%, though the difference between the respective groups is admittedly small.

Across all interaction categories, the probability of attaining a salary greater than £25,000 is consistently relatively low, with an average probability of 19.1%. An examination of individual 3-way interaction groups illustrates that those with UCAS points greater than 401 are more likely (average probability of 20.4%) to appear in this category than those with fewer than 400 points (average probability of 17.8%). Appearance in higher categories is enhanced by higher degree classification and/or attendance at a higher category of institution.

The findings revealed through the predicted probabilities serve as a contribution to the relatively scarce literature into graduate salary expectations. Of the limited literature on this topic, the majority of which applies to graduates in the EU, there is some debate about the ability of graduates to accurately anticipate their salary with some research (Wolter, 2000; Wolter and Zbinden, 2002; Webbink and Hartog, 2004) indicating students

¹⁶ Predicted Probabilities are presented in Appendix I

accurately predict their graduate salary, while Brunello et al (2004) finding that graduates overestimate their graduate wage premium. In the UK, Jerrim (2011), found that undergraduates overestimate their starting salary, though Jerrim also notes significant variation in the extent of overestimation across different sub-groups of graduates. Jerrim's findings of the likelihood of UK graduates to overestimate their starting salary, combined with the relative high probability of modest starting salaries of undergraduates within our own estimates should be a concerning result for graduates expecting immediate high returns from their education, with wider implications for government in terms of the pace of loan repayment, and for universities regarding the value of a degree. While relevant, a more detailed discussion of these issues falls outside the scope of this paper.

Discussion and Conclusions

Existing returns to education literature confirms that the average return to a degree varies based on factors such as subject studied and degree classification. In the case of degree classification this is problematic as there also appears to be evidence of grade inflation of degree classifications over time. Over time the rate of the Upper Second classification has increased significantly as has the growth in the rate of First class degrees being awarded. This is compared to the closer parity that previously existed between Upper and Lower Second classifications, and the relative scarcity of First-class degrees awarded. Given that a majority of graduates now attain either a First or Upper Second (broadly referred to as ‘good’ degrees), there exists a concern in the ability of classifications to accurately provide employers with a means of distinguishing between different students within these categories. One option for employers is to supplement their information on the potential ability of job candidates by placing more weight on other aspects of candidates’ applications, specifically alternative cognitive measures of ability proxied by UCAS points.

We use DLHE data to estimate the statistical association between UCAS points and the salary of graduates in the 12 months after they have graduated from university. We use a Generalised Ordered Logit model in which the dependent variable is expressed in categorical salary bands to estimate this relationship. Among other explanatory variables included in the model is information regarding an individual’s education, including degree classification, category of university attended and their UCAS points. We examine the interactions between these key variables, to observe the extent to which differences in UCAS points yield statistically significant salary differences where classifications and university categories are held constant.

We find that as the salaries associated with a job increase, differences in UCAS points appear to become statistically significant among some First class graduates and a majority of Upper Second class graduates, regardless of the institution they completed their studies at. We believe these findings not only serve as evidence of our general hypothesis that employers may use UCAS points to differentiate between similar students to verify the signal associated with their degree classification, but also that the significance among both Upper Second and First class graduates is consistent with the increased frequency of such classifications within the graduate population, and possible concerns that this frequency may in part be caused by grade inflation. Subsequently employers may use UCAS points to address grade inflation concerns among some prospective candidates. The observation that UCAS point differences become statistically significant as salaries increase is not surprising. We would anticipate that as salaries increase there is a greater incentive for employers to evaluate prospective candidates using evermore acute attainment differences, given the higher salary associated with the job, and the

assumed higher skill level that is therefore required by the employer. These findings may serve as a contribution to the employer learning literature as they may reflect a pattern of evaluation by prospective employers who have established over time that while it is necessary to intensely evaluate candidates for higher earning positions, the same cannot be said for low salary jobs such as those that fall into outcome category 1 in our estimates. Estimates relating to outcome 1, where we estimate the odds of a graduate earning greater than or equal to £15,000 in all but a few instances demonstrated no statistically significant difference between similar candidates based on UCAS points.

Further to our Generalised Ordered Logit estimates, predicted probabilities were utilised to identify the probability of an individual appearing in a specific salary band category. As summarised in the predicted probabilities discussion, the findings may present a rather bleak picture for graduates anticipating high salaries upon completion of their degree, with the modal category attaining a starting salary that may fall far below graduates' expectations.

Our findings raise a series of issues that would be of interest to various higher education stakeholders. As previously mentioned, our findings should cause alarm for the government. With the majority of new graduates earning far below the threshold to start student loan repayment, the government cannot expect loan repayments to occur for quite some time. Seemingly aware of this, the UK government recently proposed lowering the threshold at which students must begin to repay their loans from £27,000 to £23,000. This change, if adopted, still places the majority of new graduates in our sample below this threshold, and the government still struggling to begin to claw back loan repayments, let alone how long it may take to receive the full amount back.

The slow rate of repayment not only raises a revenue issue for the government, but also reflects the modest returns to education for recent graduates. The low salaries that students can expect to receive upon graduation, combined with the length of time assumed to pay back their loans, restricts their own economic development by compromising their ability to utilise their financial independence through establishing their own households. The findings may ultimately call in to question the decision to participate in higher education, particularly for students demonstrating lower levels of achievement in secondary school, as the immediate returns to their degree may be low and may take quite some time to accumulate to the level they may have initially expected.

The findings may also alert universities to the potential problems associated with the degree classification system. Our findings revealed that as salaries increase, differences in secondary school attainment are significant

among some First class graduates, and a majority of Upper Second class graduates. We hypothesise that this is possibly a consequence of employers using secondary school grades to verify the quality of the signal communicated by an Upper Second class degree, and some First Class graduates, and that the need to refer back to secondary school grades may reflect the distrust employers perceive with this classification. This may be in part due to most students achieving either classification, and the concern this may be a consequence of grade inflation given the increasing prevalence of these classifications in recent years. That the First class classification is subject to such significant differences is somewhat surprising as the First class may have been perceived as being a standard that has maintained value/credibility despite the possible presence of grade inflation within other classification bands. We would caution that while the somewhat unexpected significance of points differentials among high achieving First class students may be a consequence of signal verification in the presence of grade inflation, alternative explanations may exist. Particularly with high paying jobs, the significance of points differences between high achieving First class graduates may be a necessary tool for employers when trying to select only a few employees from a large sample of highly qualified graduates. Setting a threshold for required UCAS points, may be used as a blunt instrument with which employers can reject many applicants thereby partly simplifying the recruitment process for the employer.

Focusing on the findings relating to the Upper Second classification aligns with existing concerns. The possible credibility issue with the Upper Second class classification band was raised several years ago by then Minister of State for Universities, Science, Research, Jo Johnson (2015), when highlighting the issue of grade inflation in a speech to Universities UK, critiqued the degree classification system, particularly the Upper Second classification, which was described as a classification students could attain with limited effort, which disguised considerable variation in attainment. Our findings add empirical evidence to support this critique and only adds credence to alarm bells that have already been raised within Parliament. Addressing this point will be particularly challenging. As long as universities maintain the ultimate ability to independently assess and evaluate their own students then the incentives to ensure a high number of students attain at least an Upper Second class degree will remain, along with the employers concerns regarding credibility and the need to look beyond the classification to ensure they are hiring suitable candidates.

Further research involving the continuation of our analysis beyond the period examined would potentially strengthen this conclusion regarding the significance that an objective measure of attainment, such as UCAS points have, as the issue of grade inflation becomes more prominent. It would also be prudent to observe if over time, points differences do become significant among 1st class degrees as the rate of growth among 1st class

classifications has started to outpace the growth in 2.1 classifications. Future research in this area would also aim to compensate for the aforementioned underlying weakness of our analysis relating to our inability to control non-cognitive skills. The absence of the ability to integrate such a control into our own analysis excludes a potentially important determinant that could partly explain the differences observed in our salary estimates, which we currently put down to differences in secondary school attainment. The ability to address these issues is dependent on the availability of adequate data to do so. Lastly, we concede that the manner in which we suggest firms may use UCAS points is difficult to formally confirm and that there is no literature we are aware of that has sought to address the hypothesis proposed within our paper. Recruitment policies are relatively well guarded by firms, and at best are only informally presented to prospective candidates on firms' recruitment websites. By informally searching the graduate applicant portals of major employers we can ascertain that UCAS points are frequently required by employers as part of the application process, and we can only assume that the information is gathered for a purpose and therefore ultimately informs part of the evaluation process. We can only empirically identify the extent to which UCAS points may be relevant through what is inferred by our own results, with an earlier acknowledgment in mind that we cannot entirely separate the effects of points relative to other criteria used by employers to evaluate candidates.

Statement on open data and conflict of interest

Data for this project are unavailable due to data protection and privacy concerns. The data were obtained from the Higher Education Statistics Agency. The Higher Education Statistics Agency Limited do not accept responsibility for any inferences or conclusions derived from the Data.

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Appendix

Appendix A				
HESA Degree Classification Summary				
Year	Third class honours/Pass	Lower second class honours	Upper second class honours	First class honours
2006/07	23,070	92,690	138,685	36,630
2007/08	23,975	95,085	148,190	41,145
2008/09	23,810	93,060	148,390	43,135
2009/10	24,510	97,160	156,720	46,830
2010/11	24,855	99,305	166,195	53,240
2011/12	23,930	100,285	178,380	61,585
2012/13	23,495	98,245	187,555	69,670
2013/14	21,900	95,955	198,310	79,410
2014/15	20,340	85,250	183,680	81,640
2015/16	19,280	81,595	186,565	88,890
2016/17	19,025	79,515	192,395	100,945
2017/18	17,830	76,210	192,425	110,475

Source: HESA (various years)

Appendix B.1 Summary of Observations Lost Due to Invalid Values		
Variable	Reason for Exclusion	N
Employment Status	Unemployed	68838
Employment SOC	Unspecified	6856
Domicile County	Unspecified	49158
Salary	Salary n/a	644775
	Salary unknown	35041
	Salary outliers	4290
Secondary School Education	Did not complete A Levels or Scottish Highers	322319
UCAS Points	UCAS Points Unknown	1327
	UCAS Points <250	18702
	UCAS Points >550	6283
University	Invalid Institution - degree granting further education college	5925
Degree Subject	Subject unknown	8586
Gender	Gender outlier	1
Term Time Accommodation	Accommodation n/a	3600
Social Class	Social Class unknown	539
Degree Class	Degree Class Unclassified	652
	Degree Class Unknown	12101
Year	Observation outside our period of analysis	665

Appendix B.2 Sample Characteristics Summary			
	Regression Sample	Original Sample	No A-Levels & No Reported Salary Sample
Social Class - High	79%	77%	77%
Social Class - Medium	14%	15%	15%
Social Class - Low	7%	8%	8%
Male	45%	44%	45%
England	74%	64%	61%
Scotland	21%	28%	32%
Wales	3%	5%	5%
Ireland	2%	3%	2%

Appendix C	
Descriptive Statistics	
Variable	Frequency
Less than £15,000 per annum	8,443
£15,000 to £19,999 per annum	15,487
£20,000 to £24,999 per annum	14,041
£25,000 to £39,999 per annum	8,677
Post-1992 University	25,239
Pre-1992 University	10,216
Russell Group University	11,193
First Class	11,857
Upper Second Class	27,889
Less Than Upper Second Class	6,902
Male	21,054
Studied at English/Welsh Institution	45,256
Northern Ireland	553
England	34,552
Scotland	9,919
Wales	1,654
Social Class - High	36,658
Social Class - Medium	6,745
Social Class - Low	3,245
Medicine & Dentistry	574
Bio Science	6,098
Veterinary Science	70
Agriculture	462
Physical Science	2,726
Maths	1,259
Computer Science	1,803
Engineering	2,638
Architecture	1,054
Social Science	5,567
Law	2,066
Business	5,865
Communication	1,974
Languages	3,741
History	2,944
Arts	4,967
Education	2,840

Managers	1,827
Professionals	15,194
Associate Professionals	17,911
Administrative	4,510
Skilled Trade	391
Leisure	2,419
Sales	2,862
Process Operations	129
Elementary	1,405
2010-2011	13,017
2011-2012	20,471
2012-2013	13,039
2013-2014	65
2014-2015	41
2015-2016	15
250 to 325-less than 2.1 -Post 92	2,387
326 to 400-less than 2.1 -Post 92	1,151
401 to 475-less than 2.1 -Post 92	337
476 to 550-less than 2.1 -Post 92	133
250 to 325- 2.1 -Post 92	6,560
326 to 400- 2.1 -Post 92	4,934
401 to 475- 2.1 -Post 92	2,190
476 to 550- 2.1 -Post 92	1,047
250 to 325- 1st -Post 92	2,321
326 to 400- 1st -Post 92	2,211
401 to 475- 1st -Post 92	1,230
476 to 550- 1st -Post 92	738
250 to 325- less than 2.1 -Pre 92	592
326 to 400- less than 2.1 -Pre 92	542
401 to 475- less than 2.1 -Pre 92	223
476 to 550- less than 2.1 -Pre 92	93
250 to 325- 2.1 -Pre 92	1,709
326 to 400- 2.1 -Pre 92	2,398
401 to 475- 2.1 -Pre 92	1,389
476 to 550- 2.1 -Pre 92	648
250 to 325- 1st -Pre 92	511
326 to 400- 1st -Pre 92	943
401 to 475- 1st -Pre 92	705
476 to 550- 1st -Pre 92	463

250 to 325- Less than 2.1 - Russell Group	406
326 to 400- Less than 2.1 - Russell Group	550
401 to 475- Less than 2.1 - Russell Group	296
476 to 550- Less than 2.1 - Russell Group	192
250 to 325- 2.1 - Russell Group	1,163
326 to 400- 2.1 - Russell Group	2,442
401 to 475- 2.1 - Russell Group	2,049
476 to 550- 2.1 - Russell Group	1,360
250 to 325- 1st - Russell Group	339
326 to 400- 1st - Russell Group	764
401 to 475 1st - Russell Group	862
476 to 550 1st - Russell Group	770

Source: HESA (2010-2016)

Appendix D Education Variables Correlation Table <i>P Values in parenthesis * $p < .05$, ** $p < .01$, *** $p < .001$</i>			
	UCAS points	Degree classification	Institution
UCAS points	1		
Degree classification	0.1651*** (0.000)	1	
Institution	0.2806*** (0.000)	0.0120** (0.0095)	1
<i>Note: The Generalised Ordered Logit is estimated using factor variables rather than binary variables. For this reason, categorical variables such as Degree Classification and Institution take the form of single variables comprised of ordered values, where the greater values represent the higher/better category within the variable. With degree classification the variable takes a value of 1, 2 or 3, where 1 is the lowest category of “Lower Second Class or Less”, 2 is the middle category of “Upper Second Class” and 3 is for the highest category of “First Class”. The same approach is applied to Institution where institutions are coded 1 (Post-92), 2 (Pre-92) or 3 (Russell Group) in an order that aligns with the perceived quality of institutions based on national league tables. Given this approach to coding these variables using factor variables, the correlations above represent the correlation between</i> <i>UCAS points and Degree Classification, where a higher Degree Classification value indicates a higher classification.</i> <i>UCAS points and Institution value, where a higher Institution value indicates a generally higher-ranking institution.</i> <i>Degree Classification and Institution, where both variables are ordered as described above</i>			

Source: HESA (2010 – 2016)

Appendix E										
Percentage Distribution of A to C A-Level Grades										
	A*	Change in A*'s	A	Change in A's	B	Change in B's	C	Change in C's	A to C	Change in A to C's
2007	0		25.3		24.2		23.1		72.6	
2008	0		25.9	0.6	24.7	0.5	23.3	0.2	73.9	1.3
2009	0		26.8	0.9	25.1	0.4	23.2	-0.1	75.1	1.2
2010	8	8	18.9	-7.9	25.2	0.1	23.5	0.3	75.6	0.5
2011	8.4	0.4	18.8	-0.1	25.6	0.4	23.8	0.3	76.6	1
2012	8.2	-0.2	18.8	0	25.9	0.3	24	0.2	76.9	0.3
2013	7.9	-0.3	18.9	0.1	26.5	0.6	24.3	0.3	77.6	0.7
2014	8.6	0.7	18.1	-0.8	26.3	-0.2	24.2	-0.1	77.2	-0.4

Source: Joint Council for Qualifications (2020)

Appendix F Approximate Likelihood-Ratio Test of Proportionality of Odds Across Response Categories				
	Base	Interaction 1	Interaction 2	3-way Interaction
chi²	1109.29	1149.93	1150.18	1229.49
Prob > chi²	0.0000	0.0000	0.0000	0.0000
<i>Note: A significant test statistic provides evidence that the parallel regression assumption has been violated.</i>				

Appendix G Generalised Ordered Logit Salary Category Estimates <i>Coefficients are expressed as Odds Ratios</i> <i>Standard errors in parentheses * $p < .05$, ** $p < .01$, *** $p < .001$</i>												
	(1) Base Model Outcome 1	(2) Base Model Outcome 2	(3) Base Model Outcome 3	(4) Interaction 1 Outcome 1	(5) Interaction 1 Outcome 2	(6) Interaction 1 Outcome 3	(7) Interaction 2 Outcome 1	(8) Interaction 2 Outcome 2	(9) Interaction 2 Outcome 3	(10) 3-way Outcome 1	(11) 3-way Outcome 2	(12) 3-way Outcome 3
UCAS Points – 250 to 325	0 (.)	0 (.)	0 (.)									
UCAS Points – 326 to 400	1.123*** (0.033)	1.184*** (0.028)	1.296*** (0.041)									
UCAS Points – 401 to 475	1.134*** (0.041)	1.288*** (0.036)	1.666*** (0.059)									
UCAS Points – 476 to 550	1.243*** (0.056)	1.469*** (0.049)	2.064*** (0.083)									
Russell Group	1.283*** (0.044)	1.383*** (0.037)	1.473*** (0.048)	1.278*** (0.043)	1.382*** (0.037)	1.474*** (0.048)						
Pre-1992	1.233*** (0.04)	1.186*** (0.037)	1.312*** (0.043)	1.231*** (0.04)	1.187*** (0.031)	1.313*** (0.043)						
Post-1992	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)						
Northern Ireland	0.909 (0.072)	0.909 (0.072)	0.909 (0.072)	0.911 (0.072)	0.911 (0.072)	0.911 (0.072)	0.908 (0.072)	0.908 (0.072)	0.908 (0.072)	0.909 (0.072)	0.909 (0.072)	0.909 (0.072)
Scotland	1.266*** (0.04)	1.406*** (0.033)	1.464*** (0.041)	1.268*** (0.04)	1.400*** (0.033)	1.464*** (0.041)	1.269*** (0.04)	1.406*** (0.033)	1.465*** (0.041)	1.271*** (0.04)	1.407*** (0.033)	1.466*** (0.042)
Wales	0.645*** (0.03)	0.645*** (0.03)	0.645*** (0.03)	0.645*** (0.03)	0.645*** (0.03)	0.645*** (0.03)	0.647*** (0.03)	0.647*** (0.03)	0.647*** (0.03)	0.645*** (0.03)	0.645*** (0.03)	0.645*** (0.03)
England	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Medicine & Dentistry	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)

Bio Science	0.903 (0.073)	0.903 (0.073)	0.903 (0.073)	0.900 (0.073)	0.900 (0.073)	0.900 (0.073)	0.903 (0.073)	0.903 (0.073)	0.903 (0.073)	0.899 (0.073)	0.899 (0.073)	0.899 (0.073)
Veterinary Science	1.327 (0.296)	1.327 (0.296)	1.327 (0.296)	1.318 (0.294)	1.318 (0.294)	1.318 (0.294)	1.329 (0.297)	1.329 (0.297)	1.329 (0.297)	1.319 (0.295)	1.319 (0.295)	1.319 (0.295)
Agriculture	1.260* (0.144)	1.260* (0.144)	1.260* (0.144)	1.259* (0.144)	1.259* (0.144)	1.259* (0.144)	1.262* (0.145)	1.262* (0.145)	1.262* (0.145)	1.259* (0.144)	1.259* (0.144)	1.259* (0.144)
Physical Science	1.298** (0.11)	1.298** (0.11)	1.298** (0.11)	1.293** (0.109)	1.293** (0.109)	1.293** (0.109)	1.299** (0.11)	1.299** (0.11)	1.299** (0.11)	1.290** (0.109)	1.290** (0.109)	1.290** (0.109)
Maths	1.627*** (0.151)	1.627*** (0.151)	1.627*** (0.151)	1.616*** (0.15)	1.616*** (0.15)	1.616*** (0.15)	1.628*** (0.151)	1.628*** (0.151)	1.628*** (0.151)	1.617*** (0.15)	1.617*** (0.15)	1.617*** (0.15)
Computer Science	1.783*** (0.159)	1.783*** (0.159)	1.783*** (0.159)	1.771*** (0.158)	1.771*** (0.158)	1.771*** (0.158)	1.785*** (0.16)	1.785*** (0.16)	1.785*** (0.16)	1.774*** (0.159)	1.774*** (0.159)	1.774*** (0.159)
Engineering	1.584*** (0.155)	1.843*** (0.162)	2.133*** (0.19)	1.572*** (0.154)	1.833*** (0.161)	2.131*** (0.19)	1.583*** (0.155)	1.845*** (0.162)	2.138*** (0.191)	1.567*** (0.154)	1.833*** (0.162)	2.142*** (0.192)
Architecture	1.718*** (0.207)	1.316** (0.132)	1.108 (0.126)	1.710*** (0.206)	1.310** (0.132)	1.101 (0.125)	1.723*** (0.208)	1.318** (0.133)	1.110 (0.126)	1.716*** (0.207)	1.312** (0.132)	1.096 (0.125)
Social Science	1.378*** (0.112)	1.378*** (0.112)	1.378*** (0.112)	1.373*** (0.111)	1.373*** (0.111)	1.373*** (0.111)	1.378*** (0.112)	1.387*** (0.112)	1.378*** (0.112)	1.371*** (0.111)	1.371*** (0.111)	1.371*** (0.111)
Law	1.241* (0.121)	1.072 (0.096)	1.058 (0.105)	1.239* (0.121)	1.068 (0.096)	1.053 (0.104)	1.239* (0.121)	1.072 (0.096)	1.060 (0.105)	1.236* (0.121)	1.069 (0.096)	1.058 (0.105)
Business	1.608*** (0.14)	1.465*** (0.121)	1.411*** (0.121)	1.600*** (0.14)	1.457*** (0.12)	1.404*** (0.12)	1.609*** (0.141)	1.463*** (0.121)	1.412*** (0.121)	1.603*** (0.14)	1.452*** (0.12)	1.403*** (0.12)
Communication	0.983 (0.087)	0.983 (0.087)	0.983 (0.087)	0.978 (0.086)	0.978 (0.086)	0.978 (0.086)	0.985 (0.087)	0.985 (0.087)	0.985 (0.087)	0.978 (0.087)	0.978 (0.087)	0.978 (0.087)
Languages	0.937 (0.082)	0.865 (0.073)	0.721*** (0.067)	0.935 (0.082)	0.864 (0.073)	0.717*** (0.066)	0.936 (0.082)	0.865 (0.073)	0.721 (0.067)	0.932 (0.082)	0.865 (0.073)	0.716*** (0.066)
History	0.915 (0.077)	0.915 (0.077)	0.915 (0.077)	0.912 (0.076)	0.912 (0.076)	0.912 (0.076)	0.915 (0.077)	0.915 (0.077)	0.915 (0.077)	0.911 (0.077)	0.911 (0.077)	0.911 (0.077)
Arts	0.928 (0.076)	0.928 (0.076)	0.928 (0.076)	0.924 (0.076)	0.924 (0.076)	0.924 (0.076)	0.929 (0.077)	0.929 (0.077)	0.929 (0.077)	0.925 (0.076)	0.925 (0.076)	0.925 (0.076)

Education	2.028*** (0.197)	3.581*** (0.32)	1.190 (0.117)	2.025*** (0.197)	3.578*** (0.32)	1.188 (0.117)	2.033*** (0.198)	3.591*** (0.322)	1.196 (0.118)	2.043*** (0.199)	3.578*** (0.321)	1.187 (0.117)
First Class	2.173*** (0.08)	2.369*** (0.071)	2.389*** (0.08)				2.176*** (0.08)	2.368*** (0.071)	2.390*** (0.08)			
Upper Second Class	1.434*** (0.036)	1.434*** (0.036)	1.434*** (0.036)				1.435*** (0.036)	1.435*** (0.036)	1.435*** (0.036)			
Less than Upper Second Class	0 (.)	0 (.)	0 (.)				0 (.)	0 (.)	0 (.)			
Social Class - High	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Social Class - Medium	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)	0.917*** (0.022)
Social Class - Low	0.887*** (0.03)	0.887*** (0.03)	0.887*** (0.03)	0.886*** (0.03)	0.886*** (0.03)	0.886*** (0.03)	0.887*** (0.03)	0.887*** (0.03)	0.887*** (0.03)	0.886*** (0.03)	0.886*** (0.03)	0.886*** (0.03)
Lived at Home during University	0.951* (0.021)	0.951* (0.021)	0.951* (0.021)	0.951* (0.021)	0.951* (0.021)	0.951* (0.021)	0.950* (0.021)	0.950* (0.021)	0.950* (0.021)	0.949 (0.021)	0.949* (0.021)	0.949* (0.021)
Male	1.103*** (0.028)	1.211*** (0.025)	1.351*** (0.035)	1.103*** (0.029)	1.210*** (0.025)	1.351*** (0.035)	1.102*** (0.028)	1.211*** (0.025)	1.352*** (0.035)	1.102*** (0.029)	1.211*** (0.025)	1.352*** (0.035)
2010-2011	2.669* (1.219)	3.537** (1.615)	3.820** (1.746)	2.729* (1.244)	3.613** (1.647)	3.895** (1.778)	2.167* (1.192)	3.470** (1.581)	3.742** (1.707)	2.702* (1.23)	3.573** (1.626)	3.851*** (1.755)
2011-2012	3.388** (1.546)	4.089** (1.866)	3.964** (1.812)	3.462* (1.578)	4.179** (1.904)	4.038** (1.843)	3.316** (1.511)	4.055** (1.847)	3.929** (1.792)	3.412** (1.553)	4.182** (1.903)	4.032** (1.837)
2012-2013	3.093* (1.411)	3.093* (1.411)	3.093* (1.411)	3.157* (1.439)	3.157* (1.439)	3.157* (1.439)	3.029* (1.379)	3.029* (1.379)	3.029* (1.379)	3.120* (1.419)	3.120* (1.419)	3.120* (1.419)
2013-2014	2.948* (1.5)	2.948* (1.5)	2.948* (1.5)	2.999* (1.524)	2.999* (1.524)	2.999* (1.524)	2.905* (1.475)	2.905* (1.475)	2.905* (1.475)	2.958* (1.501)	2.958* (1.501)	2.958* (1.501)
2014-2015	1.700 (0.904)	1.700 (0.904)	1.700 (0.904)	1.740 (0.925)	1.740 (0.925)	1.740 (0.925)	1.685 (0.896)	1.685 (0.896)	1.685 (0.896)	1.737 (0.923)	1.737 (0.923)	1.737 (0.923)
2015-2016	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)

250 to 325 - less than 2.1				0 (.)	0 (.)	0 (.)						
326 to 400 - less than 2.1				1.309*** (0.08)	1.307*** (0.072)	1.213* (0.091)						
401 to 475 - less than 2.1				1.351** (0.123)	1.571*** (0.122)	1.629*** (0.163)						
476 to 550 - less than 2.1				1.482** (0.193)	1.693*** (0.178)	1.658*** (0.221)						
250 to 325 - 2.1				1.554*** (0.066)	1.499*** (0.059)	1.346*** (0.067)						
326 to 400 - 2.1				1.780*** (0.066)	1.780*** (0.066)	1.780*** (0.066)						
401 to 475 - 2.1				1.767*** (0.087)	1.929*** (0.084)	2.378*** (0.121)						
476 to 550 - 2.1				1.957*** (0.118)	2.284*** (0.115)	2.952*** (0.17)						
250 to 325 - 1st				2.713*** (0.171)	2.743*** (0.136)	2.426*** (0.144)						
326 to 400 - 1st				2.456*** (0.12)	2.872*** (0.135)	3.013*** (0.162)						
401 to 475 - 1st				2.622*** (0.174)	3.141*** (0.163)	3.624*** (0.208)						
476 to 550 - 1st				2.819*** (0.22)	3.409*** (0.199)	4.641*** (0.288)						
250 to 325 - Post 92							0 (.)	0 (.)	0 (.)			
326 to 400 - Post 92							1.075* (0.04)	1.141*** (0.034)	1.199*** (0.051)			
401 to 475 - Post 92							1.097 (0.055)	1.235*** (0.049)	1.632*** (0.084)			

476 to 550 - Post 92							1.325*** (0.092)	1.416*** (0.073)	1.951*** (0.122)			
250 to 325 - Pre 92							1.118* (0.06)	1.137** (0.05)	1.185** (0.072)			
326 to 400 - Pre 92							1.458*** (0.074)	1.407*** (0.055)	1.746*** (0.088)			
401 to 475 - Pre 92							1.356*** (0.084)	1.462*** (0.07)	2.106*** (0.122)			
476 to 550 - Pre 92							1.585*** (0.139)	1.761*** (0.112)	2.553*** (0.182)			
250 to 325 - Russell Group							1.306*** (0.088)	1.245*** (0.065)	1.338*** (0.094)			
326 to 400 - Russell Group							1.403*** (0.074)	1.621*** (0.065)	1.879*** (0.096)			
401 to 475 - Russell Group							1.490*** (0.084)	1.820*** (0.078)	2.358*** (0.123)			
476 to 550 - Russell Group							1.433*** (0.091)	1.979*** (0.097)	3.030*** (0.17)			
250 to 325 - Post 92 - less than 2.1										0 (.)	0 (.)	0 (.)
326 to 400 - Post 92 - less than 2.1										1.254** (0.099)	1.313*** (0.096)	1.152 (0.12)
401 to 475 - Post 92 - less than 2.1										1.457** (0.2)	1.546*** (0.184)	1.683** (0.268)
476 to 550 - Post 92 - less than 2.1										2.078** (0.495)	1.688** (0.307)	1.952** (0.446)
250 to 325 - Post 92 - 2.1										1.650*** (0.083)	1.523*** (0.072)	1.223** (0.073)
326 to 400 - Post 92 - 2.1										1.793*** (0.097)	1.736*** (0.086)	1.481*** (0.091)

401 to 475 - Post 92 - 2.1										1.740*** (0.118)	1.878*** (0.111)	2.165*** (0.155)
476 to 550 - Post 92 - 2.1										2.179*** (0.205)	2.118*** (0.159)	2.396*** (0.214)
250 to 325 - Post 92 - 1st										2.770*** (0.202)	2.705*** (0.157)	2.094*** (0.147)
326 to 400 - Post 92 - 1st										2.457*** (0.177)	2.733*** (0.161)	2.418*** (0.169)
401 to 475 - Post 92 - 1st										2.754*** (0.256)	2.986*** (0.213)	2.997*** (0.244)
476 to 550 - Post 92 - 1st										2.982*** (0.352)	3.527*** (0.308)	4.014*** (0.376)
250 to 325 - Pre 92 - less than 2.1										1.289* (0.134)	1.192 (0.114)	0.832 (0.124)
326 to 400 - Pre 92 - less than 2.1										1.750*** (0.201)	1.391** (0.136)	1.158 (0.161)
401 to 475 - Pre 92 - less than 2.1										1.586** (0.268)	1.915*** (0.272)	1.766** (0.324)
476 to 550 - Pre 92 - less than 2.1										1.653 (0.433)	1.404 (0.305)	0.726 (0.272)
250 to 325 - Pre 92 - 2.1										1.718*** (0.125)	1.653*** (0.105)	1.438*** (0.119)
326 to 400 - Pre 92 - 2.1										2.187*** (0.117)	2.187*** (0.117)	2.187*** (0.117)
401 to 475 - Pre 92 - 2.1										2.403*** (0.201)	2.129*** (0.144)	2.441*** (0.196)
476 to 550 - Pre 92 - 2.1										2.474*** (0.286)	2.646*** (0.237)	3.333*** (0.336)
250 to 325 - Pre 92 - 1st										3.543*** (0.523)	3.315*** (0.332)	2.946*** (0.329)

326 to 400 - Pre 92 - 1st										3.761*** (0.271)	3.761*** (0.271)	3.761*** (0.271)
401 to 475 - Pre 92 - 1st										2.686*** (0.309)	3.629*** (0.32)	4.781*** (0.439)
476 to 550 - Pre 92 - 1st										5.150*** (0.493)	5.150*** (0.493)	5.150*** (0.493)
250 to 325 - Russell Group - less than 2.1										1.454** (0.184)	1.233 (0.138)	1.368* (0.208)
326 to 400 - Russell Group - less than 2.1										1.975*** (0.234)	1.882*** (0.18)	1.595*** (0.205)
401 to 475 - Russell Group - less than 2.1										1.781*** (0.273)	2.073*** (0.258)	1.872*** (0.299)
476 to 550 - Russell Group - less than 2.1										1.672** (0.312)	2.657*** (0.406)	2.454*** (0.441)
250 to 325 - Russell Group - 2.1										2.096*** (0.187)	1.874*** (0.136)	1.554*** (0.147)
326 to 400 - Russell Group - 2.1										2.368*** (0.128)	2.368*** (0.128)	2.368*** (0.128)
401 to 475 - Russell Group - 2.1										2.347*** (0.17)	2.751*** (0.167)	3.135*** (0.218)
476 to 550 - Russell Group - 2.1										2.423*** (0.204)	3.258*** (0.225)	3.979*** (0.304)
250 to 325 - Russell Group - 1st										3.649*** (0.664)	3.495*** (0.421)	2.936*** (0.398)
326 to 400 - Russell Group - 1st										3.783*** (0.294)	3.783*** (0.294)	3.783*** (0.294)
401 to 475 - Russell Group - 1st										4.422*** (0.328)	4.422*** (0.328)	4.422*** (0.328)

476 to 550 - Russell Group - 1st										3.251*** (0.38)	3.963*** (0.341)	5.718*** (0.505)
Constant	0.655 (0.303)	0.092*** (0.043)	0.017*** (0.008)	0.591 (0.273)	0.0865*** (0.04)	0.017*** (0.008)	0.678 (0.312)	0.095*** (0.044)	0.017*** (0.008)	0.582 (0.269)	0.088*** (0.041)	0.020*** (0.009)
Pseudo R²	3.91%			3.94%			3.93%			4%		
Log-likelihood	-60497.881			-60477.502			-60483.432			-60437.4		
N	46,648			46,648			46,648			46,648		

Notes:
Base Model – initial model without interactions between UCAS Points, Institution or Degree Classification
Interaction 1 – model estimated with interactions between UCAS Points and Degree Classification
Interaction 2 – model estimated with interactions between UCAS Points and Institution
3-way – model estimated with three-way interactions between UCAS Points, Institution and Degree Classification
Outcome 1 – salary less than £15,000 p/a, Outcome 2 - £15,000 to £19,999 p/a, Outcome 3 - £20,000 to £24,999 p/a

Appendix H.1 3-Way Interactions - Point Estimates (by University Category) Dependent Variable Contrast - Category 1 with Categories 2, 3 and 4 * p<.05, ** p<.01, *** p<.001				
Russell Group				
UCAS Points, University and Classification Interaction	Odds Ratio	S.E.	z	P> z
326 to 400 with 1st Class – 250 to 325 with 1st Class	.133	.698	0.19	0.848
401 to 475 with 1st Class – 326 to 400 with 1st Class	.639	.372	1.72	0.086
476 to 551 with 1st Class – 401 to 475 with 1st Class	-1.170	.461	-2.54	0.011*
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.272	.192	1.41	0.158
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	-0.211	.171	-0.12	0.902
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.075	.225	0.33	0.738
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.521	.280	1.86	0.063
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	-.193	.342	-0.57	0.571
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	-.108	.401	-0.27	0.786
Pre 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	.217	.558	0.39	0.697
401 to 475 with 1st Class – 326 to 400 with 1st Class	-1.075	.377	-2.85	0.004**
476 to 551 with 1st Class – 401 to 475 with 1st Class	2.464	.549	4.48	0.000***
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.469	.137	3.40	0.001***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.216	.199	1.09	0.278
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.0711	.319	0.22	0.824
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.460	.225	2.04	0.041*
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	-.164	.321	-0.51	0.609
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	0.678	.500	0.14	0.892
Post 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	-.312	.224	-1.39	0.164
401 to 475 with 1st Class – 326 to 400 with 1st Class	.296	.274	1.08	0.280
476 to 551 with 1st Class – 401 to 475 with 1st Class	.228	.402	0.57	0.570
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.143	.082	1.74	0.082
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	--.0532	.114	-0.46	0.643
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.439	.207	2.12	0.034*
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.202	.209	0.97	0.334
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	.621	.524	1.19	0.236

Appendix H.2 3-Way Interactions - Point Estimates (by University Category) Dependent Variable Contrast - Categories 1 and 2 with Category 3 and 4 * p<.05, ** p<.01, *** p<.001				
Russell Group				
UCAS Points, University and Classification Interaction	Odds Ratio	S.E.	z	P> z
326 to 400 with 1st Class – 250 to 325 with 1st Class	.287	.469	0.61	0.541
401 to 475 with 1st Class – 326 to 400 with 1st Class	.639	.372	1.72	0.086
476 to 551 with 1st Class – 401 to 475 with 1st Class	-.458	.409	-1.12	0.263
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.494	.144	3.42	0.001***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.383	.154	.248	0.013*
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.506	.219	2.31	0.021*
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.648	.209	3.09	0.002**
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.191	.293	0.65	0.516
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	.584	.460	1.27	0.205
Pre 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	.445	.381	1.17	0.242
401 to 475 with 1st Class – 326 to 400 with 1st Class	-.132	.365	-0.36	0.717
476 to 551 with 1st Class – 401 to 475 with 1st Class	1.521	.535	2.84	0.005**
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.534	.117	4.54	0.000***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	-.0575	.142	-0.40	0.686
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.516	.241	.214	0.033*
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.198	.161	1.23	0.219
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.524	.289	1.81	0.07
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	-.511	.3977	-1.29	0.199
Post 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	.027	.165	0.17	0.867
401 to 475 with 1st Class – 326 to 400 with 1st Class	.253	.212	1.19	0.234
476 to 551 with 1st Class – 401 to 475 with 1st Class	.540	.325	1.66	0.096
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.213	.064	3.30	0.001***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.142	.096	1.47	0.142
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.239	.156	1.53	0.126
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.233	.191	1.22	0.224
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	.141	.345	0.41	0.682

Appendix H.3 3-Way Interactions - Point Estimates (by University Category) Dependent Variable Contrast - Categories 1, 2 and 3 with Category 4 * p<.05, ** p<.01, *** p<.001				
Russell Group				
UCAS Points, University and Classification Interaction	Odds Ratio	S.E.	z	P> z
326 to 400 with 1st Class – 250 to 325 with 1st Class	.846	.452	1.87	0.061
401 to 475 with 1st Class – 326 to 400 with 1st Class	.639	.372	1.72	0.086
476 to 551 with 1st Class – 401 to 475 with 1st Class	1.296	.512	2.48	0.013*
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.814	.160	5.07	0.000***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.767	.197	3.88	0.000***
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.843	.295	2.86	0.004**
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.226	.275	0.82	0.411
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.276	.344	0.80	0.421
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	.582	.513	1.13	0.257
Pre 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	.815	.379	2.15	0.031*
401 to 475 with 1st Class – 326 to 400 with 1st Class	1.020	.452	2.26	0.024*
476 to 551 with 1st Class – 401 to 475 with 1st Class	.369	.589	0.63	0.531
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.749	.133	5.60	0.000***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.254	.187	1.36	0.174
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.891	.343	2.59	0.01**
326 to 400 with 2.2 Class – 250 to 325 with 2.2 Class	.326	.193	1.69	0.092
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.607	.350	1.74	0.083
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	-1.040	.416	-2.50	0.013*
Post 92				
326 to 400 with 1st Class – 250 to 325 with 1st Class	.324	.172	1.88	0.061
401 to 475 with 1st Class – 326 to 400 with 1st Class	.579	.241	2.40	0.016*
476 to 551 with 1st Class – 401 to 475 with 1st Class	1.016	.387	2.62	0.009**
326 to 400 with 2.1 Class – 250 to 325 with 2.1 Class	.258	.080	3.23	0.001***
401 to 475 with 2.1 Class – 326 to 400 with 2.1 Class	.684	.138	4.93	0.000***
476 to 551 with 2.1 Class – 401 to 475 with 2.1 Class	.231	.219	1.05	0.291
401 to 475 with 2.2 Class – 326 to 400 with 2.2 Class	.530	.280	1.89	0.058
476 to 551 with 2.2 Class – 401 to 475 with 2.2 Class	.269	.506	0.53	0.595

Appendix I Wage Model – Three-way Interactions Predicted Probabilities Standard Errors in Parentheses * p<.05, ** p<.01, *** p<.001				
	Less than £15,000 p/a	£15,000 to £19,999 p/a	£20,000 to £24,999 p/a	£25,000 to £39,999 p/a
250 to 325 - less than 2.1 - Post 92	0.23 (0.005)***	0.371 (0.003)***	0.272 (0.004)***	0.127 (0.004)***
250 to 325 - less than 2.1 - Pre 92	0.219 (0.01)***	0.365 (0.006)***	0.28 (0.007)***	0.135 (0.009)***
250 to 325 - less than 2.1 - Russell Group	0.2 (0.012)***	0.354 (0.008)***	0.294 (0.008)***	0.153 (0.011)***
250 to 325 - 2.1 - Post 92	0.199 (0.003)***	0.353 (0.003)***	0.294 (0.003)***	0.154 (0.003)***
250 to 325 - 2.1 - Pre 92	0.195 (0.006)***	0.351 (0.004)***	0.297 (0.004)***	0.158 (0.006)***
250 to 325 - 2.1 - Russell Group	0.179 (0.006)***	0.34 (0.005)***	0.307 (0.004)***	0.174 (0.007)***
250 to 325 - 1st - Post 92	0.167 (0.004)***	0.33 (0.004)***	0.314 (0.003)***	0.189 (0.005)***
250 to 325 - 1st - Pre 92	0.145 (0.008)***	0.309 (0.008)***	0.325 (0.004)***	0.221 (0.013)***
250 to 325 - 1st - Russell Group	0.141 (0.01)***	0.305 (0.01)***	0.327 (0.004)***	0.227 (0.016)***
326 to 400 - less than 2.1 - Post 92	0.217 (0.007)***	0.364 (0.005)***	0.282 (0.005)***	0.137 (0.006)***
326 to 400 - less than 2.1 - Pre 92	0.201 (0.01)***	0.355 (0.007)***	0.293 (0.007)***	0.152 (0.01)***
326 to 400 - less than 2.1 - Russell Group	0.186 (0.009)***	0.345 (0.007)***	0.302 (0.006)***	0.166 (0.01)***
326 to 400 - 2.1 - Post 92	0.191 (0.003)***	0.348 (0.003)***	0.299 (0.003)***	0.161 (0.004)***
326 to 400 - 2.1 - Pre 92	0.169 (0.004)***	0.332 (0.004)***	0.313 (0.003)***	0.186 (0.005)***
326 to 400 - 2.1 - Russell Group	0.161 (0.004)***	0.324 (0.004)***	0.317 (0.003)***	0.197 (0.006)***
326 to 400 - 1st - Post 92	0.167 (0.004)***	0.33 (0.004)***	0.314 (0.003)***	0.189 (0.006)***
326 to 400 - 1st - Pre 92	0.126 (0.006)***	0.289 (0.006)***	0.332 (0.003)***	0.253 (0.01)***
326 to 400 - 1st - Russell Group	0.133 (0.006)***	0.297 (0.007)***	0.33 (0.003)***	0.241 (0.011)***
401 to 475 - less than 2.1 - Post 92	0.2 (0.013)***	0.354 (0.008)***	0.293 (0.009)***	0.152 (0.012)***
401 to 475 - less than 2.1 - Pre 92	0.178 (0.014)***	0.339 (0.011)***	0.307 (0.009)***	0.175 (0.017)***

401 to 475 - less than 2.1 - Russell Group	0.181 (0.013)***	0.341 (0.01)***	0.306 (0.008)***	0.172 (0.014)***
401 to 475 - 2.1 - Post 92	0.179 (0.005)***	0.339 (0.004)***	0.307 (0.003)***	0.175 (0.006)***
401 to 475 - 2.1 - Pre 92	0.175 (0.006)***	0.336 (0.005)***	0.31 (0.004)***	0.18 (0.007)***
401 to 475 - 2.1 - Russell Group	0.148 (0.004)***	0.313 (0.005)***	0.324 (0.003)***	0.215 (0.007)***
401 to 475 - 1st - Post 92	0.156 (0.006)***	0.32 (0.005)***	0.32 (0.004)***	0.204 (0.008)***
401 to 475 - 1st - Pre 92	0.13 (0.007)***	0.294 (0.008)***	0.331 (0.003)***	0.246 (0.012)***
401 to 475 - 1st - Russell Group	0.121 (0.006)***	0.283 (0.007)***	0.333 (0.003)***	0.263 (0.011)***
476 to 550 - less than 2.1 - Post 92	0.184 (0.019)***	0.343 (0.014)***	0.304 (0.012)***	0.169 (0.021)***
476 to 550 - less than 2.1 - Pre 92	0.243 (0.028)***	0.377 (0.011)***	0.263 (0.02)***	0.117 (0.019)***
476 to 550 - less than 2.1 - Russell Group	0.159 (0.015)***	0.323 (0.013)***	0.318 (0.008)***	0.199 (0.02)***
476 to 550 - 2.1 - Post 92	0.179 (0.007)***	0.339 (0.006)***	0.307 (0.005)***	0.175 (0.008)***
476 to 550 - 2.1 - Pre 92	0.152 (0.008)***	0.317 (0.007)***	0.322 (0.004)***	0.209 (0.011)***
476 to 550 - 2.1 - Russell Group	0.135 (0.005)***	0.299 (0.006)***	0.329 (0.003)***	0.237 (0.009)***
476 to 550 - 1st - Post 92	0.138 (0.007)***	0.303 (0.007)***	0.328 (0.003)***	0.231 (0.011)***
476 to 550 - 1st - Pre 92	0.105 (0.007)***	0.263 (0.009)***	0.335 (0.002)***	0.298 (0.016)***
476 to 550 - 1st - Russell Group	0.117 (0.006)***	0.279 (0.007)***	0.334 (0.002)***	0.271 (0.012)***

