Higher Education Outcomes, Graduate Employment
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Abstract: Official employment-related Performance Indicators in UK Higher Education are based on the population of students responding to the First Destination Supplement (FDS). This generates potentially biased performance indicators as this population of students is not necessarily representative of the full population of leavers from each institution. University leavers not obtaining qualifications and those not responding to the FDS are not included within the official analysis. We compare an employment-related performance indicator based on those students responding to the FDS with alternative approaches which address the potential non-random nature of this sub-group of university leavers.

Keywords:	Employment, higher education, performance indicators, non-random response
JEL Classification No.:	J24, I2

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1. Introduction

There is now a substantial statistical literature on the issue of performance measures for public sector institutions. This literature has grown in recent years in the context of an increasing emphasis of public policy on institutional auditing and surveillance. In the education sector in the UK, the publication of performance-based league tables of schools, colleges and universities has become an important aspect of public policy. This is also true of other sectors, especially health, and is an increasingly common feature of both regulated and quasi-markets in many countries. In the absence of price competition or measures of profitability in such markets, performance tables are typically intended to provide information relevant to consumer choice and to improve accountability. For secondary schools in England and Wales, annual rankings of schools based on public examination results first appeared in 1992. This was extended to primary schools in 1998. Following the recommendations of the National Committee of Inquiry into Higher Education (Dearing, 1997), the UK Government began to publish performance indicators for universities and other higher education institutions in December 1999.

Whereas league tables of schools focus primarily on examination performance, university performance is measured against a wide range of criteria. Assessment of the quality of both research and teaching in UK universities is well established. The Higher Education Funding Council for England (HEFCE) has now also published sets of Higher Education performance indicators (PIs) to cover (i) access and participation, (ii) retention and progression, (iii) research and (iv) employability. In the literature on the measurement of school performance it is generally accepted that school performance tables are potentially misleading if based on crude output measures with no adjustment for 'contextual' factors such as school intake. Goldstein and Spiegelhalter (1996) in particular express strong concern with the publication of unadjusted league tables of institutional performance in both the health and education sectors. Awareness of the need to take account of the prior academic achievements of pupils has led to an emphasis on 'value-added' measures of school examination performance. The Government now publishes a value-added indicator of school performance based on performance differences between Key Stages 2 and 3 (see DfEE, 1995, and DfES, 2003, for details).

Methodological issues regarding the construction of PIs for Higher Education Institutions (HEIs) have also received increasing attention. There has been a lively debate concerning the measurement of research output (see for example, Francis, Johnes and Taylor

(1993), Johnes and Taylor (1990), Goedegebuure *et al.*, (1990) and Cave, Hannay and Kogan (1997)). The publication of official university PIs on access, progression and employability has stimulated a renewed research interest in other aspects of university performance measurement: see, for example, Smith, McKnight, and Naylor (2000), Smith and Naylor (2001a), Smith and Naylor (2001b), Johnes and McNabb (2003) and McNabb, Pal and Sloane (2002).

The current paper is concerned with a unique aspect of university PIs based on post-university outcomes. Whereas derived PIs on progression are based entirely on information contained in administrative records – as is typically the case with institutional PIs - indicators for employability are based on survey data, as we describe more fully below. Information on the post-university employment status of university leavers is obtained from responses to a First Destination Supplement (FDS) survey sent by each institution to a target population of individuals in its leaving cohort. This target population comprises all home-domiciled students obtaining an undergraduate-level qualification and who studied full-time. Hence, the target population excludes students leaving with no qualifications.

The response rate to the FDS is approximately 84% on average, but does vary across institutions. We note that the probability of a response from a student is unlikely to be a random event: rather, it is likely to be correlated with the individual's performance at university and with their post-university labour market outcome. This means that an institutional performance measure based solely on the population of respondents, in other words, conditional on responding (as is the case with the official employment PI) will be a biased estimate of the *unconditional* performance: that is, of that not conditional on response. We are not aware of any previous work on this issue in the context of institutional performance measurement.

In the current paper, we conduct an analysis of the determinants of graduate first destination outcomes and from this derive employment-based university PIs. We relate our analysis to that implicit in the official employment PI, and pay particular attention to aspects relating both to sample selection and to non-response. Given that the average response rate across institutions is relatively high on average (for example, the Labour Force Survey has a response rate of 79% for the latest wave 1), it might be unsurprising if we find no substantial difference in measured performance according to whether one looks at conditional or unconditional measures. Thus, our data provide a reasonably strong test of the sensitivity of measured performance to conditioning on response.

The rest of the paper is set out as follows. In Section 2, we provide a brief overview of the data and methodology we employ in our analysis. Section 3 discusses the results from the various stages of the analysis of individual graduates' labour market outcomes. Section 4 then describes how the results of the individual-level analysis can be used in the construction of university-level PIs. Section 5 considers an alternative approach which corrects for selectivity bias. Section 6 addresses some issues relating to the sensitivity of the results and Section 7 closes the paper with conclusions and further remarks.

2. Data and methodology

By far the largest survey of university leavers is the First Destination Supplement (FDS), a survey of full-time undergraduate leavers from UK higher education institutions, conducted by the Careers Offices of each university and deposited with the Higher Education Statistics Agency (HESA). The response rate to the FDS survey varies markedly across institutions, but for the 1998 returns averaged around 84%. These responses can be matched to individual administrative records for each student. The survey is conducted approximately six months after students have successfully completed their course and identifies, *inter alia*, the main activity of the student leaver at that time. For UK students, the main activity can be grouped into four categories:

- (i) Entering employment or self-employment (E)
- (ii) Undertaking further study, training or research (FS)
- (iii) Unemployed and seeking work or further study (U)
- (iv) Inactive - unavailable for (or not seeking) employment or further study (I)

The HE official employment indicators are derived from the FDS (see PISG/HEFCE, 1999). The most recently published PI for employment is that of December 2002 and is based on the 2000-2001 survey (see HEFCE, 2002). In the current paper, we exploit individual HESA and FDS data for 1997-98, the most recent cohort for which we have appropriate data.

On the basis of the information contained in the FDS and the matched HESA data, we present a method for the construction of a set of employment-related university performance measures. First, we distinguish between 'positive' outcomes (E and FS above, denoted EFS) and 'negative' outcomes (U and I together, denoted UI). We note that this contrasts with the work conducted by HEFCE who choose to exclude students who report that they are 'not available for (or not seeking) employment, study or training'. It is not clear why this group should be excluded: if universities are to be assessed on their ability to prepare graduates for the labour market then arguably this group should be included. Omission generates a possible bias as this group, in part, captures 'hidden' unemployment which is unlikely to be randomly distributed across HEIs, while the inactive group who are travelling or ill should either be random or picked up in the modelling exercise. We note that there is considerable variation in the percentage of graduates 'not available for (or seeking) employment, study or training' across HEIs and hence we include this category along with the unemployed. However, the sensitivity of our results to the inclusion of this inactive group with those unemployed is addressed in Section 6 of the paper.

In our analysis, we match the FDS responses of the individual student to administrative records, which are rich in information on the student's higher education record (including institution and course details) and prior qualifications and personal characteristics (including social class background). Therefore, when estimating the university effects in these models (for the construction of performance measures), we are able to control for a large amount of information on the characteristics of the students within each university.

As our aim is to assess both the impact of student characteristics and the effect of the institution on the first destination outcome, our concern focuses on the possible non-random nature of the sample based on those students responding to the FDS. A conditional analysis simply focussing only on the final stage of the process from qualification through to the post-university employment outcome may give misleading inferences if the final sample of students is not a random sample of the population of students from an institution.

In this paper, we examine two alternative approaches by which to construct university performance indicators for graduates' labour market outcomes. The first is based on a series of sequential probit models for the probabilities of (i) obtaining a qualification, (ii) responding to the FDS survey and (iii) being in employment or further study. Under the assumption of independence across the error processes in the three models, this approach takes into account differences in universities' qualification and FDS response rates in generating an adjusted performance indicator. This can then be compared with the HEFCE-like approach which considers only those responding to the FDS with no adjustment for differential response rates across institutions. The results from this approach are presented in Sections 3 and 4 of the paper.

The second approach we present for the construction of university performance indicators allows for non-independence in the error processes across the equations for responding to the FDS and the probability of being in employment or further study after university. Results from this approach are discussed in Section 5. Of course, this second approach is a generalisation of the first. We choose to examine the approaches separately, however, as we believe it plausible that the official employment-based performance indicator measures for universities might evolve so as to take account of differences in response rates under a methodology such as that based on independent probit models for response and employment outcome. We think it unlikely, however, that official indicators would be based on a methodology which corrects for endogenous selection problems. Nonetheless, we think it of interest to examine this issue.

We now sketch more formally the basic methodological approach we adopt for the development of adjusted indicators of HEI performance. We exploit the individual-level data for the cohort of 1997-98 leavers to model the probability that the student leaver obtains a qualification (OQ):

$$y_{1i} = \begin{cases} 1 & \text{obtains a qualification} \\ 0 & \text{otherwise} \end{cases},$$

where $y_{1i} = I(x'_{1i}\beta_1 + \sum_j H_{ij}\alpha_{1j} + u_{1i} > 0)$ and $E(y_{1i}) = \Pr(OQ = 1)$. I(.) is the indicator function, and assigns the value one to a true statement and the value zero to a false statement. i and j are subscripts for individuals and universities, respectively. x_{1i} is a vector of individual characteristics and H_{ij} a university dummy which takes the value one if individual i attended university j and zero otherwise, with one university dummy excluded as the 'default' university, with respect to which the university effects α_{1j} are estimated. We assume that $u_{1i} \sim N(0,1)$. This simple probit essentially models the probability of both non-completion as well as the probability of failing to obtain a qualification.

For those individuals who are in the target population, we model the probability of an individual responding (R) to the FDS by the simple probit:

$$y_{2i} = \begin{cases} 1 & y_{1i}\text{=1 and responded to FDS} \\ 0 & y_{1i}\text{=1 and did not respond to FDS} \end{cases},$$

where $y_{2i} = I(x'_{2i}\beta_2 + \sum_j H_{ij}\alpha_{2j} + u_{2i} > 0)$, $E(y_{2i} \mid y_{1i} = 1) = \Pr(R = 1 \mid OQ = 1)$, $u_{2i} \sim N(0,1)$.

Finally, for those who responded to the FDS, we model the probability that the student is either employed or in further study (EFS), rather than unemployed or inactive (UI), again as a simple probit:

$$y_{3i} = \begin{cases} 1 & y_{2i}=1 \text{ and in EFS} \\ 0 & y_{2i}=1 \text{ and not in EFS} \end{cases},$$

where $y_{3i} = I(x'_{3i}\beta_3 + \sum_j H_{ij}\alpha_{3j} + u_{3i} > 0)$, $E(y_{3i}\,|\,y_{2i} = 1, y_{1i} = 1) = \Pr(EFS = 1\,|\,R = 1, OQ = 1)$ and $u_{3i} \sim N(0,1)$.

Consequently, the *unconditional* probability of being, for example, in employment or further study is equal to the conditional probability of EFS multiplied by the conditional probability of replying, multiplied by the marginal probability of obtaining a qualification. That is:

$$\Pr(EFS = 1, R = 1, OQ = 1) = \Pr(OQ = 1).\Pr(R = 1 \mid OQ = 1).\Pr(EFS = 1 \mid R = 1, OQ = 1) \quad (1)$$

Initially, we assume that the error processes across the three equations for OQ, R and EFS are independent: that is, $corr(u_{1i}, u_{2i}) = corr(u_{1i}, u_{3i}) = corr(u_{2i}, u_{3i}) = 0$. In this case the three probit models can be estimated separately. We can then calculate an individual university marginal effect on the unconditional probability of EFS, relative to the default or reference case, by calculating the difference in (1) for the individual university and for the default university, using sample mean values for all other determinants. Similarly, we can calculate the university marginal effect for the conditional probability of EFS by evaluating $\Pr(EFS = 1 \mid R = 1, OQ = 1)$ for the individual university relative to the default university.

This model, which assumes independence across the error processes in the three equations, is similar to the so-called two-part model described in Cragg (1971) and Manning *et al.* (1987). The main advantage of estimating such a model, as opposed to using a Full Information Maximum Likelihood (FIML) or Heckit-type estimator (see Heckman, 1979), is that the two-part model does not rely on any exclusion restriction for model identification (e.g., on variables specific to the different stages of the model and which are excluded from the other stages). Puhani (2000) finds that, because of the quasi-linearity of the inverse Mill's ratio (IMR) and the consequent strong correlation between the variables included in the outcome regression and the IMR when no exclusion restriction is used, the Heckit and FIML estimators are not robust and the two-part model is a preferable alternative.

In Section 5 of the paper, we allow for the possibility that the probabilities associated with EFS and with response to the FDS are not independent. We use a probit model which corrects for endogenous sample selection and use this to examine the sensitivity of the derived university marginal effects to selection correction.

3. Modelling the probabilities of qualification, response and employment outcome: independent probits

As described in the previous section, we now estimate a sequence of three probit models, under the assumption of independence. In Section 3.1, we model the probability of obtaining a qualification (OQ). In Section 3.2, for those students who obtained a qualification, we model the probability of responding (R) to the FDS and, in Section 3.3, for those responding to the FDS, we model the probability of being in employment or further study (EFS).

3.1 Modelling graduates' probabilities of obtaining a qualification

Individuals responding to the FDS must have originally been in the target population, as defined by HEFCE. The target population is defined over: home-domiciled graduates who studied full-time, qualifying with an undergraduate qualification. Table 1 presents summary statistics for the main variables broken down by gender and according to the different stages of the analysis: that is, over (i) all students, (ii) those obtaining a qualification (OQ), (iii) those responding to the FDS (R) and (iv) those in employment or further study (EFS). Following HEFCE, the sample is restricted to home-domiciled students who studied full-time. We also exclude Medical students from the analysis as there is essentially no variation in their reported main activity on leaving university. Additionally we only consider the set of 'old' (pre-1992) universities and 'new' (former polytechnic) universities.

As can be seen from Table 1, the total number of UK-based full-time students in the cohort of 1997-98 leavers from all universities was 104,148 (104,437) male (female) students. Of these students, some 82% (86%) of males (females) obtained a qualification. From the table, we note that compared to all students, those obtaining a qualification (OQ) had higher A-level points on average and tended to be younger and from higher Social Class and ethnic white backgrounds.

Table 2 presents the results from modelling the probability that the student obtains a qualification and therefore is in the target population for the FDS. This probability is modelled using probit regression. The analysis is conducted separately for men and women, as previous work has shown there are marked differences between males and females (see Smith, McKnight and Naylor (2000)) and a likelihood ratio test for the equality of coefficients for this dataset easily rejects the hypothesis of no differences by gender.

The probit model for the probability of obtaining a qualification (OQ) is equivalent in nature to (1 minus) that for dropping-out. As our data relate to a leaving cohort, we are modelling the probability of withdrawing or failing to obtain an undergraduate degree in the academic year 1997-98 versus obtaining a degree. This will include students withdrawing or failing in any year of their degree. Students will not all have started their courses in the same academic year. The analysis is therefore similar to that used by Johnes and McNabb (2003), who undertook an analysis of dropout behaviour on the USR leaving cohort for 1993. The approach is different from the analysis undertaken by Smith and Naylor (2001a), who analysed drop-out behaviour for the cohort of students starting a three- or four-year degree in September/October 1989.

Table 2 shows the derived marginal effects on the probability of obtaining a qualification (OQ), for males and females separately, together with the 95% confidence intervals. In looking at prior qualifications, the default is a student with 18 points (CCC grades) in his/her A or AS levels, and the marginal effects are calculated relative to this case. As can be seen from the results, students with HNC, HND, ONC or OND qualifications are more likely to obtain an undergraduate qualification: that is, they are less likely to drop out of their university course. In the case of females, students with Higher qualifications are less likely to obtain a university qualification.

For males (females) increasing A-levels by one grade - that is, by two points - increases the probability of obtaining a qualification by about one (one-half) percentage point. This finding is in line with the results of Smith and Naylor (2001a), who find that A-levels had a greater effect on reducing the probability of dropping out for males compared to females.

Compared to students aged less than 24 years old when they left university, older students are significantly more likely to obtain a qualification. There are some significant social class effects. Relative to students from a Social Class II (managerial and technical occupations) background, students from Social Class I (professional occupations) are more likely to obtain a qualification while students from Social Class IIIM (skilled manual occupations), Social Class IV (partly skilled occupations) and Social Class V (unskilled occupations) are typically less likely to obtain a qualification, regardless of sex. Students from a background where the parents are unemployed are markedly less likely than students from Social Class II backgrounds to obtain a qualification. These effects are stronger than those observed in Smith and Naylor (2001a) for the earlier 1992-93 leavers. We also find some strong ethnicity effects. Relative to white students, students who are black or, in the case of males, Indian or Pakistani are less likely to obtain a qualification. Disability effects are relatively weak, with the notable exception of mentally ill students, who are less likely to obtain a qualification.

There are strong effects associated with the degree subject studied. Relative to students who study Business, there are some very marked course effects. A ranking of marginal effects shows that males studying Mathematical Sciences, Other subjects, Engineering, Modern European Languages, Physical Sciences, Architecture and Building, Literature and Classics, Social Science, Biological Sciences and Humanities are significantly less likely to leave university with a qualification. For males (females) Economics (Education), on the other hand, is associated with a significantly higher probability of obtaining a qualification. If we compare the results reported in Table 2 with those reported in Smith and Naylor (2001a) for the earlier cohorts, we note very strong similarities. In contrast to Smith and Naylor (2001a), students living independently off campus (that is, in non-institutional accommodation) are more likely to obtain a qualification than those living in either university accommodation or at their parental home.

There are large and significant institutional effects for both males and females. Thus, even after controlling for all of these other factors, the probability of obtaining a qualification varies across Higher Education Institutions. Figure 1 plots the marginal effects (with 95% confidence intervals) for male students for each university. 34 out of 101 institutions have a significant and positive marginal effect, relative to the default case, in the sense that their confidence interval does not encompass the point estimate of the default (that is, the median) university. 28 have a significant negative effect. For females, the corresponding numbers are 35 and 26. A stricter condition for the significance of the ranking of institutions would be based on non-overlapping confidence intervals (see, for example, Goldstein and Spiegelhalter, 1996). Under this criterion, it emerges that:

(i) The confidence interval (CI) for the top-ranked university is overlapping with that for each of the highest 9 (10) ranked universities, for males (females), but is non-overlapping for the 10th (11th) and lower ranked universities. Next we consider the range of universities for which there are overlapping CIs with the CI for the 10th (11th) ranked universities, proceeding in this way through segments of the distribution.

(ii) The CI for the 10th (11th) ranked university for males (females) is overlapping with all those ranked as high as 2nd (2nd) and as low as 22nd (29th).

(iii) The CI for the 23rd (30th) ranked university for males (females) is overlapping with all those ranked as high as 10th (11th) and as low as 46th (58th).

(iv) The CI for the 47th (59th) ranked university for males (females) is overlapping with all those ranked as high as 23rd (31st) and as low as 83rd (91st).

(v) The CI for the 84th (92nd) ranked university for males (females) is overlapping with all those ranked as high as 47th (60th) and as low as the lowest ranked university, that is the 101st, for both males and females.

We conclude from this analysis that ignoring the selection of the target group, as does the official HEFCE PI methodology by restricting the analysis to students who successfully graduate with a first degree, risks masking important institutional differences.

3.2 Modelling the probability of responding to the FDS

For those individuals who have obtained a qualification (OQ), a FDS questionnaire is sent out to graduates around six months after they have successfully completed their degrees to seek information on their main activity at that time. The careers services within universities are given the responsibility of collecting the FDS information and ensuring as high a response rate as possible to this survey. Students who do not respond to the questionnaire might receive a further questionnaire, or alternatively may receive follow-up telephone calls in order for the survey to be as comprehensive as possible. However, the extent to which universities attempt to track their students may differ and this is clearly a strategic decision as those likely to have a lower employment rate are also less likely to respond. Given this, it might not be in an institution's interests to invest substantial resources actively pursuing non-respondents. In fact, there appears to be little punishment to submitting a low response rate. HESA view 80% as an expected response rate. In the published HEFCE employment PIs, only two institutions were excluded due to a low response rate. We note that there was a substantial range of response rates reported in the HEFCE employment indicators for 2001: with 98% for Cranfield University, 94% for Imperial College, 93% for Warwick University, 60% for Coventry University, 63% for Middlesex University, 66% for Staffordshire University, and 72% for Oxford Brookes, Anglia Polytechnic University, King's College London and Thames Valley University.

From Table 1, we note that, of those obtaining a qualification, 83% (86%) responded to the First Destination Supplement (FDS), giving a sample of 69,767 (77,263) male (female) students for the subsequent analysis of first destination outcomes. The table also shows that students graduating with a good degree are more likely to respond to the FDS survey than are other students. For example, 9% of males who responded had obtained a first class degree, compared to 8.3% of those obtaining a qualification – and hence being in the target population for the FDS survey.

The results reported in Table 3 show that conditional on obtaining a qualification - and hence being in the target population - there are few clear effects on the response probability for both males and females from prior qualifications. Male students who enter university with either HNC/HND or ONC/OND qualifications have a higher propensity to respond to the FDS. For males (females), an extra 2 A-level points (1 extra grade) raises the probability of responding by 0.08 (0.14) percentage points. Mature students (those aged 24 or more on leaving) are less likely to respond to the FDS, regardless of sex.

The estimated gender-specific probit equations also included interactions between degree class and each of the following explanatory variables: (i) social class (ii) disability status (iii) ethnicity and (iv) course type (an aggregation of individual courses). Each of these sets of interactions was jointly significant. Results reported below are interpreted in the context of the inclusion of these interaction terms. The estimated marginal effects of each of the interactions are not reported in the table, due to consideration of space.

For the default case of a student with an upper second class degree, Table 3 shows that there are no well-determined effects associated with Social Class background, although females whose parents were unemployed are some 5.3 percentage points less likely to respond to the survey. Disability status is not found to be associated with differential response propensities. Individuals with non-white backgrounds are significantly less likely to respond than are white students, irrespective of sex.

There are strong degree subject effects for both sexes. On the whole, leavers obtaining upper second qualifications in science subjects are more likely to respond to the FDS than leavers who had studied social science or arts based subjects. Education and Law have high response rates and are more in line with those observed for the science-based subjects. Students who had lived either on campus or with parents were more likely to respond than students in private accommodation. Similarly, students who had taken sandwich (vocational placement) courses were more likely to respond. Of the interactions between degree class and degree subject area, the only individually significant interactions are for students with awards below lower second level, with such students less likely to respond regardless of subject area.

There is a strong and monotonic association between degree class and the probability of responding to the FDS. Graduates who perform better in their degrees have a significantly higher probability of responding to the FDS: for the default student (white, studying business, with no disability and a SCII background), a first class degree is associated with being approximately 10 percentage points more likely to respond to the FDS than a student with a third class degree, *ceteris paribus*. The effect associated with a first carries over for students regardless of ethnicity, subject, disability status and social class background. As we know that the probability of EFS is positively related to degree class (see Smith, McKnight and Naylor, 2000), this finding supports the argument that those not responding are likely to have poor labour market prospects.

University effects are also important. In Figure 2, we plot the institutional marginal effects (and 95% confidence intervals) on the conditional probability of responding to the FDS, for males. 38 out of 101 institutions have a significant and positive marginal effect, whereas 28 have a significant negative effect, relative to the default. For females, the corresponding numbers are 28 significantly positive and 30 significantly negative. We observe, however, that there is considerable overlap in the confidence intervals for the university marginal effects and hence that there is little precision in a 'league table' of universities based on these estimated effects. We note, for example, that:

(i) The CI for the top-ranked university, for example, is overlapping with that for each of the highest 13 (5) ranked universities, for males (females).

(ii) The CI for the 14^{th} (6^{th}) ranked university for males (females) is overlapping with all those ranked as high as 1^{st} (1^{st}) and as low as 48^{th} (35^{th}).

(iii) The CI for the 49^{th} (36^{th}) ranked university for males (females) is overlapping with all those ranked as high as 14^{th} (6^{th}) and as low as 89^{th} (74^{th}).

(iv) The CI for the 90^{th} (59^{th}) ranked university for males (females) is overlapping with all those ranked as high as 48^{th} (39^{th}) and as low as 101^{st} (98^{th}).

We also note that there is little correlation (-0.03 for males and –0.12 for females) between the university marginal effects on responding (R) to the FDS and the university marginal effects on obtaining a qualification (OQ). In contrast, the correlation in the university marginal effects on the response rates for males and females is very high at 0.95. Again, we would infer from these results that ignoring the issue of non-random response is likely to lead to potential bias in the construction of institutional performance indicators based on conditional employment outcomes.

3.3 Modelling the first destination outcomes (Employment or Further Study (EFS))

As is shown in Table 1, of the 69,767 male graduates who responded to the FDS, 60,787 (approximately 87%) were in either employment or further study (EFS). Of the 77,263 females who responded to the FDS, 68,601 (approximately 89%) were in either employment or further study. From the table, we can also see that, compared to the population of those responding (R) to the survey, those in employment or further study (EFS) tended on average (i) to have higher A-level scores, (ii) to have a higher class of degree and (iii) to have taken a sandwich course.

Table 4 shows the estimated marginal effects on the EFS probability, along with the 95% confidence intervals. With respect to the graduate's educational background, the table shows that the individual's total A-level points score has no significant impact on the post-university EFS probability, for either males or females. Male students with Highers are less likely to be in EFS. With respect to personal characteristics, Table 4 shows the effects of age at graduation on the EFS probability, with more mature students more likely to be unemployed or inactive than students aged less than 24 at graduation.

As with the analysis of the probability of responding, interactions between degree class and subject, ethnicity, disability and social class were included in the estimations. There are few significant Social Class effects. Graduates' disability status has some significant impact on the EFS probability of male graduates. There are strong ethnicity effects. For the default case, Black, Indian and Chinese graduates have lower EFS probabilities than otherwise equivalent white graduates.

Table 4 shows that there are significant marginal effects associated with the subject studied at university, compared to the default case of students studying for Business Studies degrees and graduating with an upper second class degree. For males, for example, students reading Law, Mathematics, Engineering, Architecture, Education or Medical related subjects have a higher probability of being employed or in further study. Conversely, for male students of Humanities, Social Science, and Arts the probability of EFS is lower than that for Business Studies graduates. For females, the subject effects are similar to those for male graduates. The ranking of degree course effects is similar to that reported in Smith, McKnight and Naylor (2000) for 1993 leavers.

Table 4 also shows the estimated effects of the student's degree class on the EFS probability. For the default case of a white student of business with no disability, from a Social Class II background, a male graduate with a first class degree is more likely to enter further study or employment than an otherwise equivalent student with a lower class degree.

Figure 3 plots the institutional marginal effects on the probability of being employed or in further study, conditional on responding to the FDS (for reasons of space, figures are included for male students only). There are only limited statistically significant effects: for males (females), 15 (3) institutions have positive and significant effects and 13 (12) institutions have negative and significant effects, relative to the default case. Furthermore, we observe that there is considerable overlap in the confidence intervals for the university marginal effects and hence that there is little precision in a 'league table' of universities based on these estimated effects. We note that:

(i) The CI for the top-ranked university is overlapping with that for each of the highest 11 (42) ranked universities, for males (females).

(ii) The CI for the 12th (43rd) ranked university for males (females) is overlapping with all those ranked as high as 3rd (2nd) and as low as 78th (101st).

(iii) The CI for the 79th ranked university for males is overlapping with all those ranked as high as 14th and as low as 101st.

Thus, for females in particular, there is a remarkable degree of overlap in the CIs, with the CI of the 43rd ranked university overlapping with both that of the 2nd highest ranked and that of the lowest ranked university. We note that the point estimates themselves are large in magnitude. For example, the top-ranked (lowest-ranked) university for males has a point estimate of almost 0.1 (-0.1), relative to the median university.

The correlation between the university marginal effect on the probability of being in the EFS category, conditional on response, and that on the probability of responding, conditional on qualification, is 0.29 for males and 0.27 for females. The correlation across males and females in the university marginal effect on the probability of being in the EFS category is 0.67. The correlation between the university marginal effect on the probability of being in the EFS category, conditional on response, and that on the probability of qualification is 0.06 for males and 0.01 for females.

4. University marginal effects: independent probits

In the preceding section, we considered how individual-level characteristics influence various outcome variables, under the maintained hypothesis of independence between the processes determining the outcomes. The first two outcomes – the probability of obtaining a qualification (OQ) and the probability of responding (R) to the FDS – determine the prerequisites for inclusion in the official university or 'higher education institution' (HEI) employment PIs. We have found that a range of important individual-level personal characteristics (age at graduation, social class background, entry-level qualifications) and course characteristics (subject of degree) along with degree performance, were associated with differences in each of these two probabilities. In addition, even after controlling for all of these factors, we find statistically significant 'unexplained' differences across higher education institutions. This suggests that differences across universities either in qualification completion rates or in survey response rates could contaminate the final measures of HEI employment performance.

In terms of published university PIs, we note that there are performance indicators for student progression rates by institution. Thus, factoring qualification rates into a PI for employment outcomes could be regarded as double-counting qualification. In view of this, in this section we restrict ourselves to an assessment of the sensitivity of HEI rankings to whether or not one conditions on the probability of responding to the first destination supplement. Specifically, we compare HEI rank positions obtained from modelling (i) the probability of EFS conditional on having responded to the FDS – similar to the official HEFCE approach - and (ii) the probability of EFS conditional only on having obtained a qualification – that is, factoring in the probability of responding, which varies by institution.

Figure 4 shows a plot of the ranked university marginal effects on these two probabilities, for male students. For each of the two probabilities, the institution with the highest level of performance is denoted as having the top-ranked (1) marginal effect.

If the probability of responding to the FDS were a random event, then on average HEIs would be expected to have the same response rates and hence to line up along a 45 degree line from the origin. Instead, HEIs occupy different rank positions across the two alternative measures of performance, i.e., according to whether or not one factors in the differences in the probability of responding to the FDS across universities. Universities with low response rates do better under the measure which is constructed conditional on response – in Figure 4, they appear above the 45 degree line. When we adjust for differential response, universities with low response rates are penalised as non-response is effectively treated as a bad outcome, equivalent to being unemployed or inactive. This is likely to over-penalise low response as, although non-respondents are more likely than respondents to be unemployed or inactive, some non-zero proportion is likely to be employed or in further study.

We calculate the rank correlation between the two sets of university ranks shown in Figure 4 at 0.64 for males and 0.62 for females. Thus, there is substantial sensitivity in the measure of university performance ranking according to whether differential response is factored in or not. The sensitivity is moderated to some extent by the magnitude of the average FDS response rate.

5. Models with selection

So far, we have assumed independence across the error terms in the equations for qualifying, responding and for obtaining particular labour market outcomes. In this section of the paper, we relax this assumption and allow for unobservable individual factors affecting first destination outcomes to be correlated with those driving non-response to the FDS. Given that separate PIs are published for progression, as we noted in the previous section, we condition on having obtained a qualification. We then estimate equations for the probabilities of responding and of being EFS (employed or in further study), allowing for correlation in the error processes for the two probabilities: that is, allowing for $corr(u_{2i}, u_{3i}) = \rho \neq 0$.

Following the approach of Van de Ven and Van Praag (1981), we model, for those individuals who are in the target population (that is, having obtained a qualification: $y_{1i} = 1$), the probability that the student is either employed or in further study (EFS), rather than unemployed or inactive (UI), based upon the selection equation for the probability of an individual responding (R) to the FDS.

The log-likelihood is:

$$
\begin{aligned}
\ln(L) = &\sum_{\substack{y_{2i}=1 \\ y_{3i}=1}} \ln\left[\Phi_2(x'_{2i}\beta_2 + \sum_j H_{ij}\alpha_{2j}, x'_{3i}\beta_2 + \sum_j H_{ij}\alpha_{3j}, \rho \right] \\
&+ \sum_{\substack{y_{2i}=1 \\ y_{3i}=0}} \ln\left[\Phi_2(x'_{2i}\beta_2 + \sum_j H_{ij}\alpha_{2j}, -(x'_{3i}\beta_3 + \sum_j H_{ij}\alpha_{3j}), -\rho \right] \\
&+ \sum_{y_{2i}=0} \ln\left[1 - \Phi(x'_{2i}\beta_2 + \sum_j H_{ij}\alpha_{2j}) \right]
\end{aligned}
$$

where $\Phi_2(.)$ is the cumulative bivariate normal distribution function (with mean $[0,0]'$), and $\Phi(.)$ is the cumulative standard normal.

Table 5 reports the results of the probit model with correction for selectivity. The set of accommodation variables are used to identify the EFS equation as the type of university accommodation is unlikely to have a direct influence on the post-university labour market outcome (as shown in Table 4), but is a factor in determining the probability of response to the FDS (see Table 3). A comparison of Tables 4 and 5 shows that the results for the model with selection are very similar to those for the model without selection, especially for male students. This is not surprising as the selection term, rho, is not significant in the male equation. For females, rho is significantly different from zero, and thus ignoring this would introduce bias into the estimated employment probabilities. The same set of interactions included in the model without selection was also included in the model with selection. In the EFS equations, for both males and females, the interactions between degree class and the ethnicity variables are jointly significant, while for males the interactions with the subject area of study are significant and for females the disability status interactions are significant.

The university marginal effects on the probability of EFS, conditional on response, derived from the probit model with selection are plotted in Figure 5 (along with 95% confidence intervals) for each university, for male students. For males (females), 11 (4) out of 101 institutions have a significant and positive marginal effect relative to the default case, whereas 11 (8) have a significant negative effect. Again, we see that there is considerable overlap in the confidence intervals for the university marginal effects. We note that:

(i) The CI for the top-ranked university is overlapping with that for each of the highest 10 (35) ranked universities, for males (females).

(ii) The CI for the 11^{th} (36^{th}) ranked university for males (females) is overlapping with all those ranked as high as 2^{nd} (1^{st}) and as low as 78^{th} (100^{th}).

(iii) The CI for the 79^{th} (36^{th}) ranked university for males (females) is overlapping with all those ranked as high as 11^{th} (2^{nd}) and as low as 101^{st} (100^{th}).

Thus, just as in the case of the model without selection, presented in section 3.3, there is very little precision in the ranking of universities by their marginal effects on the EFS outcomes of students responding to the FDS.

The correlation across male and female rankings of universities is 0.66 for the probit model with selection. For male students, the correlation between the rankings of the university marginal effects according to (i) the model with selection (reported in Table 5) and (ii) the model without selection (reported in Table 4) is 0.998, reflecting the fact that rho is not significant for males in the probit model with selection. For female students the equivalent correlation is 0.978. Thus, although for females rho is significant – as shown in Table 5 – correcting for selection does not lead to substantial changes in the university ranking.

Predicted probabilities for EFS for non-respondents

We do not observe the first destination outcomes of non-respondents, of course. However, we do observe non-respondents' characteristics from the HESA administrative database and hence we are able to derive predicted values for the status of non-respondents' first destination outcomes. We do this on the basis of the probit model with selection. We then derive university marginal effects on the EFS probability, defined over both respondents and non-respondents. Figure 6a plots these university marginal effects (with 95% confidence intervals), obtained by bootstrapping the probit model with selection 500 times, for each university for male students. For males (females), 15 (10) out of 101 institutions have a significant and positive marginal effect relative to the default case, whereas 7 (10) have a significant negative effect. Once more we observe considerable overlap in the confidence intervals for the university marginal effects. We note that:

(i) The CI for the top-ranked university is overlapping with that for each of the highest 15 (6) ranked universities, for males (females).

(ii) The CI for the 16^{th} (7^{th}) ranked university for males (females) is overlapping with all those ranked as high as 1^{st} (1^{st}) and as low as 99^{th} (89^{th}).

(iii) The CI for the 100^{th} (90^{th}) ranked university for males (females) is overlapping with all those ranked as high as 65^{th} (11^{h}) and as low as 101^{st} (101^{st}).

Figure 6a shows the confidence intervals around the point estimates for each university's marginal effect on EFS, derived on the basis of both respondents and non-respondents from the probit model with selection. Following Marshall and Spiegelhalter (1998), and based on the 500 bootstrap replications, we calculate the median and the 95% confidence interval for the rank position of each university. These are represented in Figure 6b, which shows the considerable uncertainty in the universities' rank positions. Although the top 2 and the bottom 2 ranked universities have small confidence intervals, most other universities have very wide overlapping confidence intervals indicating considerable uncertainty in the derived rankings.

The correlation of institutions across male and female rankings is 0.67. Figure 7 plots the university ranking based on the university marginal effects (i.e., those presented in Figure 6a for both respondents and non-respondents) against the ranking based on the marginal effects on the probability of EFS conditional on response *for respondents only* (as presented in Figure 5). The correlation is 0.892 in the case of males and 0.832 for females.

Thus, there is further evidence of both (i) uncertainty in the rankings of universities by their marginal effects and (ii) sensitivity of the rankings according to how non-response is treated. As one would expect, the correlation in Figure 7 is higher than that in Figure 4. This is because in Figure 7, non-respondents are attributed a predicted value for EFS, based on the probit model with selection. In Figure 4, instead, non-response is treated as a negative outcome in the same way as is unemployment or inactivity. This is a rather extreme assumption and generates a substantial difference in university rankings according to whether or not the rankings are calculated as conditional on response. We note that ignoring the potential problem of selection on unobservable characteristics does not introduce variations in the derived university marginal effects which are as substantial as the variations associated with differences in the treatment of non-respondents. The fact that there is only limited selection on the unobservables is not inconsistent with substantial selection on observables: indeed, the results suggest that non-respondents have observed characteristics which predict a much lower EFS probability in the probit model with selection compared to respondents.

6 Sensitivity Issues

In this section, we look at the sensitivity of our results to (i) type of university, (ii) missing information on social class background of students and (iii) the treatment of economic activity.

(i) University type

In the analysis presented in this paper, for each of our (gender-specific) specifications we have included dummy variables for each university. Our models do not allow for interactions between universities and other co-determinants, with the exception of gender. The most likely source of differential performance across universities stems from the distinction between the 'traditional' or 'old' universities (those which pre-date the abolition of the binary divide between universities and polytechnics) and the 'new' universities (that is, the former polytechnics), typically with mission statements different from those of the old universities. Consequently, we have estimated the Heckit-type model of EFS on the population of students at old and new universities separately. The estimated marginal effects (not reported) are very similar to those reported in Table 5. Additionally, we find that the rankings of universities is very robust across the two approaches. The ranking of old universities based only on the sample of old universities has a correlation of 0.99 (0.97) with the equivalent ranking of old universities reported in Figure 5. For new universities, the equivalent correlations are 0.98 for both males and females.

(ii) Missing Social Class information

The administrative HESA data exploited in our analysis provides us with a rich database with little missing information for most variables. The summary statistics in Table 1 show the proportion of cases for which information on key variables is missing. One variable with a high proportion of missing observations relates to parental social class background: with unknown values for over 40% of cases. In the analysis presented so far, we have included all individuals in the analysis, and used dummy variables for unknown values. We have also re-estimated our Heckit-type model for EFS, excluding all those individuals for whom there is missing information on social class background. The estimated effects associated with the various determinants of EFS are robust to this re-estimation. With respect to the estimated university marginal effects, there is a high correlation across the two methods. However, at a number of new universities information on social class is particularly poor such that the institutional effect either cannot be estimated or is associated with very large standard errors.

(iii) Treatment of Economic Inactivity

The official HEFCE method for deriving university performance indicators based on employment excludes graduates who report themselves as unavailable for work. In our analysis, we have included this group with the unemployed. It is interesting to examine the sensitivity of the derived ranking of universities according to the treatment of those unavailable for work, whom we have labelled inactive (I) in our analysis. We have re-estimated the Heckit-type model for EFS, excluding those inactive and hence distinguishing between those in employment or further study (EFS) and those unemployed (U). The correlation in the derived rankings for universities across the two methods is 0.81 for males and 0.69 for females. It is not surprising that the ranking for females is the more sensitive to the treatment of inactivity: of unemployed or inactive female students, 48.4% are inactive while for males 36.4% are inactive.

7. Concluding remarks

This paper is concerned chiefly with examining the robustness of rankings of university marginal effects on graduate employment status to variations in the method for deriving those marginal effects. We note that the official HEFCE methodology is based only on students responding to the FDS survey. Our main concern is with the fact that students not responding to the FDS survey are unlikely to be randomly assigned across either universities or employment outcomes and hence ignoring them risks introducing bias into the estimation of university effects.

Using HESA data for all UK university leavers for 1997-98 we model both (i) the probability of a student obtaining a qualification (and hence of being in the target population which receives the FDS survey) and (ii) the probability of responding to the survey, conditional on obtaining a qualification. Among other results, we show that (i) the probability of qualification varies systematically with factors such as the students' pre-university qualifications and with university attended and (ii) the probability of responding to the FDS survey is sensitive to degree class awarded and to university attended. We also model the probability of a graduate being in employment or further study (EFS) rather than unemployed or inactive (UI) after university, conditional on responding to the FDS survey. We derive university marginal effects on this probability and rank universities on the basis of the point estimates for the marginal effects. We find that there are considerable overlaps in the confidence intervals around the point estimates. For example, the CI for the 79th ranked university for males is overlapping with all those ranked as high as 14th and as low as 101st. One would therefore have little confidence in such a ranking.

We also compare this HEFCE-type ranking of university marginal effects on the probability of EFS, conditional on response, with a ranking which exploits the model of the probability of responding in order to adjust for differences in response. We find that the correlation between these two ranks is 0.64 for males and 0.62 for females, suggesting that the treatment of non-response is an important influence on how universities are ranked relative.

Given the possibility of a non-zero correlation across the error terms in the models for the probability of responding to the FDS survey and the probability of being in EFS, we estimate a Heckit-type model which corrects for selection. We find that the selection correction term is significant for females but not for males. However, the derived estimates for the university marginal effects on EFS are not sensitive to correcting for selection on unobservables, for both males and females.

We exploit the probit model with selection to derive predicted probabilities of EFS for non-respondents and derive university marginal effects for both respondents and non-respondents. Ranking the universities by these marginal effects we find that the 16th – highest ranked university for males has a confidence interval which overlaps with the confidence intervals of all those universities ranked as high as 1st and as low as 99th, out of the 101 universities. Thus, we find substantial uncertainty in the derived university ranking. We also plot the university ranking based on these marginal effects (i.e., those for both respondents and non-respondents) on EFS against the equivalent ranking based on *respondents only*: the correlation is 0.892 in the case of males and 0.832 for females, again indicating sensitivity to the treatment of non-respondents in the construction of performance measures.

Finally, we note that the official HEFCE methodology excludes graduates reporting themselves as unavailable for employment. Our analysis groups these graduates together with those unemployed and distinguishes between 'good' outcomes (employment and further study) and 'bad' outcomes (unemployment and inactivity). Using the probit model correcting for selection, we find that there is considerable sensitivity to the treatment of inactivity, especially for females.

We conclude that both (i) there is considerable uncertainty in the rankings of universities based on employment and further study (EFS) in each of the models we have examined and (ii) there is substantial sensitivity in the rankings according to which model is used and, in particular, according to the treatment of non-respondents.

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Table 1: Summary Statistics by stages in the EFS outcome

Variables	MALES ALL	MALES OQ	MALES R	MALES EFS	FEMALES ALL	FEMALES OQ	FEMALES R	FEMALES EFS
Prior qualifications								
HNC,HND	0.075	0.078	0.075	0.074	0.051	0.050	0.047	0.046
A-levels (default)	0.573	0.576	0.577	0.579	0.573	0.576	0.577	0.579
Highers	0.032	0.030	0.030	0.029	0.034	0.033	0.033	0.033
ONC, OND	0.054	0.052	0.050	0.049	0.036	0.035	0.033	0.033
Not known	0.096	0.095	0.093	0.093	0.090	0.089	0.086	0.086
Other	0.169	0.148	0.142	0.139	0.187	0.172	0.164	0.161
Point scores								
A-levels	18.6	19.2	19.3	19.5	20.0	20.2	20.3	20.5
Age groupings								
<24 (default)	0.739	0.741	0.761	0.766	0.755	0.760	0.776	0.784
24-26	0.106	0.109	0.100	0.099	0.078	0.078	0.072	0.071
27-30	0.062	0.060	0.054	0.054	0.051	0.049	0.043	0.042
31+	0.093	0.090	0.085	0.081	0.117	0.113	0.108	0.103
Social class								
SC I	0.095	0.101	0.105	0.107	0.092	0.097	0.101	0.102
SC II (default)	0.232	0.241	0.247	0.248	0.248	0.254	0.259	0.261
SC IIINM	0.067	0.068	0.070	0.071	0.075	0.076	0.077	0.077
SC IIIM	0.097	0.096	0.098	0.098	0.097	0.096	0.098	0.098
SC IV	0.044	0.043	0.043	0.042	0.043	0.042	0.042	0.043
SC V	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009
AF	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005
Not known	0.442	0.431	0.418	0.415	0.424	0.415	0.404	0.400
Retired	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Unemployed	0.005	0.004	0.003	0.003	0.005	0.005	0.004	0.004
Disability								
No disability (default)	0.879	0.875	0.874	0.874	0.879	0.876	0.874	0.875
Dyslexia	0.013	0.012	0.012	0.012	0.008	0.008	0.008	0.007
Blind	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Deaf	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Wheelchair	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mental	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Diabetes	0.021	0.021	0.022	0.022	0.026	0.025	0.026	0.026
Multiple	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003
Not known	0.075	0.081	0.082	0.082	0.077	0.082	0.083	0.083
Ethnicity								
White (default)	0.762	0.774	0.791	0.795	0.777	0.783	0.796	0.803
Black	0.028	0.022	0.017	0.015	0.033	0.029	0.023	0.021
Indian	0.059	0.053	0.047	0.046	0.050	0.049	0.045	0.043
Chinese	0.019	0.019	0.017	0.016	0.017	0.017	0.016	0.015
Other	0.014	0.012	0.011	0.011	0.014	0.013	0.012	0.012
Not known	0.118	0.120	0.117	0.116	0.109	0.109	0.107	0.105

Notes:
ALL – All undergraduate students aiming at an undergraduate degree,
OQ – Obtained a qualification,
R – Responded to the FDS,
EFS - Student in employment or further study six months after graduation.

Table 1 (cont'd): Summary Statistics by stages in the EFS outcome

	MALES				FEMALES			
Variables	ALL	OQ	R	EFS	ALL	OQ	R	EFS
Course type								
Medical related	0.026	0.027	0.028	0.030	0.080	0.081	0.083	0.088
Biological Science	0.063	0.064	0.066	0.065	0.097	0.099	0.102	0.099
Agriculture + related	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.012
Physical Science	0.084	0.086	0.089	0.088	0.048	0.049	0.051	0.051
Mathematical Science	0.108	0.100	0.100	0.103	0.034	0.033	0.033	0.033
Engineering	0.139	0.135	0.137	0.140	0.018	0.017	0.017	0.017
Technology	0.010	0.011	0.011	0.010	0.006	0.006	0.006	0.006
Architecture + building	0.044	0.043	0.044	0.045	0.011	0.011	0.010	0.011
Social Science	0.038	0.038	0.037	0.035	0.082	0.080	0.078	0.076
Economics	0.025	0.027	0.027	0.026	0.009	0.010	0.010	0.010
Politics	0.019	0.020	0.020	0.019	0.015	0.016	0.016	0.015
Law	0.034	0.036	0.037	0.039	0.045	0.046	0.046	0.048
Business (default)	0.112	0.112	0.109	0.109	0.112	0.111	0.109	0.108
Communication	0.012	0.012	0.011	0.011	0.016	0.016	0.015	0.015
Literature + Classic	0.031	0.033	0.033	0.033	0.071	0.074	0.075	0.076
Modern European Language	0.014	0.014	0.014	0.014	0.032	0.033	0.034	0.034
Humanities	0.044	0.048	0.048	0.047	0.048	0.051	0.051	0.051
Creative Arts	0.055	0.056	0.054	0.050	0.071	0.071	0.068	0.066
Education	0.022	0.022	0.023	0.024	0.057	0.057	0.060	0.063
Other subject	0.110	0.104	0.102	0.100	0.136	0.129	0.125	0.123
Study method								
Non-sandwich (default)	0.851	0.857	0.855	0.848	0.905	0.907	0.905	0.902
Sandwich	0.149	0.143	0.145	0.152	0.095	0.093	0.095	0.098
Accommodation type								
Own accommodation (default)	0.374	0.397	0.399	0.398	0.389	0.406	0.410	0.408
Institution	0.195	0.185	0.187	0.191	0.184	0.175	0.178	0.182
Parent	0.127	0.117	0.120	0.120	0.115	0.110	0.112	0.111
Other	0.160	0.170	0.169	0.170	0.164	0.172	0.171	0.173
Not known	0.144	0.130	0.124	0.121	0.148	0.137	0.129	0.126
Degree class								
First	-	0.083	0.090	0.097	-	0.072	0.077	0.080
Upper second (default)	-	0.400	0.418	0.425	-	0.502	0.516	0.518
Lower second	-	0.354	0.350	0.341	-	0.331	0.323	0.320
Third	-	0.065	0.061	0.057	-	0.033	0.030	0.028
Other	-	0.098	0.081	0.080	-	0.063	0.054	0.054
N	104148	84542	69767	60787	104437	89948	77263	68601

Notes:
ALL – All undergraduate students aiming at an undergraduate degree,
OQ – Obtained a qualification,
R – Responded to the FDS,
EFS - Student in employment or further study six months after graduation.

Table 2: ME (%) on the probability of obtaining a qualification (OQ) - Males and Females[1]

Variables[2]	MALES			FEMALES		
		95% CI			95% CI	
	ME	Lower	Upper	ME	Lower	Upper
Prior qualifications (A-levels)						
HNC,HND	8.51	7.66	9.36	2.59	1.53	3.65
Highers	0.64	-1.17	2.45	-2.55	-4.36	-0.74
ONC, OND	6.31	5.33	7.29	1.61	0.44	2.79
Not known	3.78	2.65	4.90	-1.67	-2.94	-0.40
Other	-1.60	-2.78	-0.43	-3.80	-4.93	-2.67
Point scores						
A-levels	0.52	0.46	0.58	0.26	0.21	0.31
Age groupings (<24)						
24-26	5.92	5.28	6.55	2.91	2.26	3.57
27-30	5.63	4.18	7.08	1.32	-0.07	2.72
31+	5.79	4.35	7.24	1.42	0.11	2.74
Social class (SC II)						
SC I	1.25	0.32	2.17	1.58	0.79	2.36
SC IIINM	-0.81	-1.86	0.25	-0.03	-0.89	0.82
SC IIIM	-1.40	-2.35	-0.44	-0.99	-1.80	-0.17
SC IV	-0.92	-2.17	0.32	-1.21	-2.29	-0.12
SC V	-4.39	-6.85	-1.92	-2.92	-5.12	-0.72
AF	-0.65	-3.88	2.58	-0.56	-3.64	2.52
Not known	-1.52	-2.28	-0.77	-1.08	-1.75	-0.42
Retired	-2.79	-8.89	3.31	-3.56	-9.91	2.78
Unemployed	-16.83	-21.09	-12.56	-7.14	-10.33	-3.96
Disability (No disability)						
Dyslexia	-1.26	-3.29	0.76	-1.48	-3.73	0.76
Blind	-1.16	-6.44	4.13	2.34	-2.63	7.31
Deaf	3.10	-0.89	7.08	-0.73	-4.71	3.25
Wheelchair	-2.30	-8.96	4.37	-5.98	-12.29	0.32
Mental	-22.72	-33.45	-11.98	-16.00	-25.85	-6.15
Diabetes	-0.10	-1.68	1.48	-1.67	-2.97	-0.37
Multiple	-8.60	-15.60	-1.61	-6.80	-13.46	-0.14
Other	-4.33	-8.09	-0.57	-4.18	-7.68	-0.67
Not known	9.39	8.54	10.24	8.50	7.86	9.14
Ethnicity (White)						
Black	-11.25	-13.01	-9.49	-4.03	-5.27	-2.79
Indian	-4.79	-5.90	-3.69	0.24	-0.67	1.14
Chinese	-1.15	-2.86	0.56	1.36	-0.05	2.77
Other	-6.85	-9.12	-4.58	-4.37	-6.24	-2.50
Not known	-0.79	-1.72	0.14	0.36	-0.44	1.17

Table 2 (cont'd): ME (%) on the probability of obtaining a qualification (OQ) - Males and Females

	MALES			FEMALES		
		95% CI			95 CI	
Variables	ME	Lower	Upper	ME	Lower	Upper
Course type (Business)						
Medical related	0.52	-1.07	2.12	0.45	-0.49	1.38
Biological Science	-2.55	-3.82	-1.28	-1.30	-2.27	-0.33
Agriculture + related	0.61	-1.95	3.17	0.02	-2.05	2.09
Physical Science	-4.81	-6.07	-3.55	-1.21	-2.44	0.02
Mathematical Science	-7.45	-8.60	-6.30	-4.81	-6.25	-3.37
Engineering	-5.87	-6.94	-4.80	-5.87	-7.88	-3.86
Technology	-2.05	-4.66	0.55	1.76	-0.84	4.37
Architecture + building	-3.87	-5.29	-2.44	-3.99	-6.25	-1.73
Social Science	-3.15	-4.70	-1.59	-3.88	-4.98	-2.79
Economics	1.83	0.17	3.49	-2.36	-4.89	0.18
Politics	-0.19	-2.12	1.75	0.51	-1.23	2.25
Law	1.79	0.34	3.24	-0.06	-1.25	1.12
Communication	-1.27	-3.52	0.99	-1.88	-3.65	-0.11
Literature + Classic	-3.55	-5.36	-1.74	-1.26	-2.38	-0.13
Modern European Language	-5.16	-7.83	-2.50	-1.53	-3.04	-0.03
Humanities	-1.85	-3.42	-0.28	-0.79	-2.07	0.49
Creative Arts	0.75	-0.44	1.94	0.02	-0.98	1.01
Education	-0.33	-2.06	1.40	1.28	0.29	2.27
Other subject	-6.27	-7.45	-5.10	-4.78	-5.78	-3.79
Study method (Non-sandwich)						
Sandwich	-0.76	-1.50	-0.01	-0.87	-1.65	-0.09
Accommodation type (Own accommodation)						
Institution	-15.97	-16.93	-15.02	-15.25	-16.20	-14.29
Parent	-6.95	-7.87	-6.03	-6.39	-7.27	-5.52
Other	2.47	1.64	3.31	2.12	1.40	2.84
Not known	-9.51	-10.60	-8.43	-9.11	-10.12	-8.10
Degree class (Upper second)						
First	-	-	-	-	-	-
Lower second	-	-	-	-	-	-
Third	-	-	-	-	-	-
Other	-	-	-	-	-	-

1. Model also includes controls for region of residence and university attended.
2. The default category for each group of categorical variables is noted in brackets.

Table 3: ME (%) on the probability of responding to the FDS (R) - Males and Females[1]

	MALES			FEMALES		
		95% CI			95% CI	
Variables[2]	ME	Lower	Upper	ME	Lower	Upper
Prior qualifications (A-levels)						
HNC,HND	1.88	0.57	3.19	0.31	-1.01	1.63
Highers	-0.26	-2.49	1.98	1.22	-0.53	2.96
ONC, OND	1.59	0.18	3.00	0.14	-1.28	1.55
Not known	0.59	-0.84	2.02	-0.47	-1.81	0.87
Other	0.41	-0.88	1.70	-0.29	-1.41	0.83
Point scores						
A-levels	0.04	-0.02	0.10	0.07	0.02	0.12
Age groupings (<24)						
24-26	-6.95	-7.93	-5.97	-5.25	-6.23	-4.26
27-30	-8.36	-10.88	-5.85	-10.11	-12.39	-7.83
31+	-4.07	-6.29	-1.86	-4.12	-5.89	-2.35
Social class (SC II)						
SC I	1.20	-0.30	2.70	0.49	-0.70	1.67
SC IIINM	0.66	-0.78	2.10	-0.10	-1.26	1.06
SC IIIM	0.32	-1.09	1.74	0.94	-0.15	2.03
SC IV	-0.73	-2.44	0.98	-0.39	-1.79	1.00
SC V	-1.84	-4.76	1.08	-1.24	-3.74	1.26
AF	-4.07	-7.82	-0.31	-4.29	-7.99	-0.58
Not known	-2.18	-3.37	-0.98	-1.77	-2.73	-0.82
Retired	-0.32	-7.27	6.62	-5.91	-13.84	2.03
Unemployed	-0.63	-5.06	3.79	-5.32	-9.15	-1.48
Disability (No disability)						
Dyslexia	-1.65	-4.65	1.35	-2.38	-5.49	0.73
Blind	-1.73	-8.31	4.85	-4.67	-12.59	3.25
Deaf	-2.73	-8.68	3.22	2.97	-1.17	7.11
Wheelchair	4.16	-1.75	10.07	-0.45	-7.31	6.40
Mental	4.07	-5.02	13.17	2.16	-6.06	10.39
Diabetes	0.60	-1.78	2.99	0.47	-1.40	2.34
Multiple	-0.30	-7.28	6.68	-6.18	-14.11	1.75
Other	-0.02	-4.32	4.28	-0.76	-4.73	3.20
Not known	-2.35	-4.32	-0.38	-1.29	-2.89	0.32
Ethnicity (White)						
Black	-9.20	-11.88	-6.52	-7.89	-9.97	-5.81
Indian	-7.83	-9.86	-5.80	-4.51	-6.11	-2.90
Chinese	-7.05	-9.68	-4.42	-5.38	-7.60	-3.17
Other	-7.18	-10.13	-4.23	-5.87	-8.33	-3.41
Not known	-3.05	-4.58	-1.51	-1.68	-2.91	-0.44

Table 3 (cont'd): ME (%) on the probability of responding to the FDS (R) - Males and Females[1]

	MALES			FEMALES		
		95% CI			95% CI	
Variables[2]	ME	Lower	Upper	ME	Lower	Upper
Course type (Business)						
Medical related	6.21	4.51	7.91	4.45	3.34	5.56
Biological Science	2.95	1.45	4.45	2.66	1.48	3.85
Agriculture + related	4.13	1.75	6.52	2.39	0.31	4.48
Physical Science	3.83	2.42	5.24	3.87	2.63	5.11
Mathematical Science	2.45	1.01	3.89	3.09	1.69	4.48
Engineering	4.11	2.78	5.44	3.66	2.01	5.30
Technology	3.08	0.69	5.46	3.32	0.86	5.78
Architecture + building	4.70	3.23	6.17	1.71	-0.41	3.82
Social Science	-0.49	-2.41	1.43	-0.38	-1.75	1.00
Economics	-1.89	-4.08	0.30	0.97	-1.32	3.26
Politics	-1.84	-4.22	0.54	-1.43	-3.56	0.71
Law	5.03	3.38	6.69	2.90	1.60	4.21
Communication	-0.01	-2.66	2.63	-1.06	-3.19	1.07
Literature + Classic	-2.59	-4.73	-0.45	0.74	-0.61	2.09
Modern European Language	0.38	-2.11	2.88	2.09	0.59	3.60
Humanities	-1.10	-3.02	0.83	0.61	-0.84	2.07
Creative Arts	-0.25	-2.04	1.55	0.87	-0.46	2.20
Education	7.58	5.93	9.22	6.58	5.61	7.56
Other subject	1.16	-0.41	2.73	0.98	-0.26	2.21
Study method (Non-sandwich)						
Sandwich	1.26	0.42	2.10	2.14	1.33	2.95
Accommodation type (Own accommodation)						
Institution	1.26	0.45	2.08	0.80	0.05	1.54
Parent	3.50	2.69	4.31	2.25	1.52	2.98
Other	-0.07	-1.00	0.87	-0.69	-1.52	0.13
Not known	-0.24	-1.28	0.79	-1.31	-2.22	-0.40
Degree class (Upper second)						
First	4.44	0.40	8.47	6.63	4.02	9.23
Lower second	-4.42	-6.49	-2.34	-3.25	-5.04	-1.45
Third	-6.91	-10.12	-3.69	-4.62	-7.80	-1.44
Other	-16.28	-19.90	-12.66	-10.28	-13.70	-6.87

1. Model also includes controls for region of residence, university attended and interactions between degree class and (i) social class, (ii) disability, (iii) ethnicity, and (iv) course type.
2. The default category for each group of categorical variables is noted in brackets.

Table 4: ME (%) on the probability of employment or further study (EFS) - Males and Females[1]

Variables[2]	MALES			FEMALES		
		95% CI			95% CI	
	ME	Lower	Upper	ME	Lower	Upper
Prior qualifications (A-levels)						
HNC,HND	0.28	-1.09	1.65	-1.15	-2.63	0.34
Highers	-2.92	-5.34	-0.51	-1.23	-3.22	0.77
ONC, OND	-0.11	-1.60	1.39	-0.77	-2.33	0.79
Not known	1.10	-0.27	2.48	-0.50	-1.89	0.88
Other	0.27	-1.01	1.55	-0.11	-1.26	1.04
Point scores						
A-levels	0.19	-3.34	3.72	-0.01	-0.06	0.04
Age groupings (<24)						
24-26	-0.87	-1.75	0.02	-1.50	-2.43	-0.56
27-30	1.39	-0.48	3.26	-3.04	-5.04	-1.05
31+	-2.16	-4.28	-0.04	-5.93	-7.88	-3.98
Social class (SC II)						
SC I	0.79	-0.55	2.12	0.67	-0.40	1.75
SC IIINM	1.30	0.03	2.58	0.35	-0.73	1.43
SC IIIM	0.53	-0.75	1.81	0.22	-0.82	1.26
SC IV	0.37	-1.16	1.89	1.44	0.23	2.66
SC V	1.25	-1.22	3.73	0.63	-1.64	2.89
AF	0.95	-2.21	4.11	2.85	0.09	5.61
Not known	0.41	-0.68	1.50	-0.21	-1.10	0.69
Retired	-2.93	-10.56	4.71	0.25	-6.25	6.74
Unemployed	-1.66	-5.96	2.64	0.55	-2.47	3.57
Disability (No disability)						
Dyslexia	-0.66	-3.48	2.16	-1.61	-4.51	1.28
Blind	-3.15	-9.88	3.58	1.87	-4.05	7.80
Deaf	-6.76	-13.06	-0.46	-2.75	-7.61	2.10
Wheelchair	-7.76	-15.89	0.36	3.35	-1.48	8.18
Mental	-16.08	-30.45	-1.72	-4.51	-13.88	4.86
Diabetes	-0.60	-2.86	1.65	1.00	-0.66	2.65
Multiple	-7.47	-15.52	0.58	-5.86	-13.86	2.13
Other	-3.48	-7.99	1.03	-0.48	-4.18	3.22
Not known	-2.60	-4.48	-0.72	-0.77	-2.23	0.69
Ethnicity (White)						
Black	-3.75	-6.35	-1.16	-2.16	-4.07	-0.26
Indian	-2.96	-4.88	-1.04	-4.94	-6.69	-3.20
Chinese	-3.39	-6.00	-0.79	-3.85	-6.08	-1.63
Other	-1.47	-4.20	1.27	-0.54	-2.67	1.60
Not known	-0.52	-1.93	0.90	-1.49	-2.70	-0.27

Table 4 (cont'd): ME (%) on the probability of employment or further study (EFS) - Males and Females[1]

Variables[2]	MALES ME	MALES 95% CI Lower	MALES 95% CI Upper	FEMALES ME	FEMALES 95% CI Lower	FEMALES 95% CI Upper
Course type (Business)						
Medical related	6.98	5.66	8.30	6.16	5.26	7.06
Biological Science	-0.29	-1.89	1.31	-1.56	-2.94	-0.18
Agriculture + related	-0.68	-3.44	2.08	1.72	-0.41	3.85
Physical Science	0.66	-0.84	2.15	-0.27	-1.79	1.24
Mathematical Science	4.08	2.86	5.30	0.34	-1.26	1.95
Engineering	3.40	2.15	4.66	0.41	-1.52	2.35
Technology	1.29	-1.15	3.74	2.79	0.20	5.37
Architecture + building	4.18	2.84	5.52	2.02	-0.08	4.12
Social Science	-2.60	-4.62	-0.58	-1.08	-2.50	0.33
Economics	-0.51	-2.53	1.52	0.27	-2.14	2.67
Politics	-2.38	-4.72	-0.04	-1.57	-3.71	0.57
Law	3.71	2.10	5.31	3.85	2.66	5.04
Communication	-0.10	-2.69	2.50	-2.87	-5.20	-0.54
Literature + Classic	-1.45	-3.47	0.57	0.45	-0.88	1.78
Modern European Language	-0.17	-2.63	2.29	1.27	-0.25	2.80
Humanities	-2.54	-4.47	-0.60	-0.18	-1.65	1.30
Creative Arts	-4.12	-6.13	-2.12	-1.70	-3.20	-0.19
Education	6.15	4.60	7.69	5.75	4.79	6.72
Other subject	-0.89	-2.51	0.72	-1.41	-2.76	-0.05
Study method (Non-sandwich)						
Sandwich	3.50	2.75	4.24	1.69	0.87	2.51
Accommodation type (Own accommodation)						
Institution	0.21	-0.59	1.02	1.31	0.60	2.02
Parent	-0.27	-1.14	0.59	0.15	-0.63	0.92
Other	-0.20	-1.12	0.72	-0.11	-0.93	0.71
Not known	-0.18	-1.22	0.86	-0.07	-0.98	0.85
Degree class (Upper second)						
First	3.80	0.10	7.51	0.76	-2.58	4.11
Lower second	-1.84	-3.78	0.10	-0.72	-2.44	1.01
Third	-2.81	-5.95	0.32	0.71	-2.07	3.48
Other	0.65	-2.00	3.30	2.20	-0.12	4.51

1. Model also includes controls for region of residence, university attended and interactions between degree class and (i) social class, (ii) disability, (iii) ethnicity, and (iv) course type.
2. The default category for each group of categorical variables is noted in brackets.

Table 5: ME (%) on the probability of EFS (probit model with selection) - Males and Females[1]

	MALES			FEMALES		
		95% CI			95% CI	
Variables[2]	ME	Lower	Upper	ME	Lower	Upper
Prior qualifications (A-levels)						
HNC,HND	0.28	-1.16	1.71	-1.07	-2.52	0.37
Highers	-3.02	-5.50	-0.54	-1.21	-3.16	0.74
ONC, OND	-0.09	-1.63	1.44	-0.73	-2.25	0.79
Not known	1.15	-0.28	2.58	-0.43	-1.79	0.93
Other	0.31	-0.99	1.62	-0.01	-1.13	1.12
Point scores						
A-levels	0.16	-3.47	3.78	1.76	-1.08	4.60
Age groupings (<24)						
24-26	-0.94	-2.33	0.44	-1.70	-2.64	-0.76
27-30	1.38	-0.69	3.44	-3.60	-5.63	-1.56
31+	-2.27	-4.58	0.04	-6.60	-8.52	-4.68
Social class (SC II)						
SC I	0.85	-0.53	2.24	0.72	-0.36	1.79
SC IIINM	1.36	0.02	2.69	0.36	-0.72	1.44
SC IIIM	0.53	-0.78	1.85	0.21	-0.83	1.25
SC IV	0.35	-1.21	1.92	1.49	0.27	2.71
SC V	1.26	-1.29	3.81	0.59	-1.66	2.84
AF	0.94	-2.32	4.19	2.89	0.09	5.69
Not known	0.34	-0.78	1.46	-0.38	-1.27	0.51
Retired	-3.13	-10.85	4.59	-0.03	-6.49	6.42
Unemployed	-1.77	-6.14	2.59	0.38	-2.62	3.38
Disability (No disability)						
Dyslexia	-0.70	-3.58	2.19	-1.66	-4.51	1.18
Blind	-3.26	-10.06	3.54	2.11	-3.72	7.94
Deaf	-6.93	-13.32	-0.53	-2.91	-7.68	1.85
Wheelchair	-7.86	-15.89	0.18	3.55	-1.33	8.43
Mental	-16.18	-30.14	-2.22	-4.54	-13.55	4.47
Diabetes	-0.62	-2.91	1.68	1.08	-0.58	2.73
Multiple	-7.64	-15.67	0.39	-5.92	-13.48	1.64
Other	-3.59	-8.14	0.97	-0.44	-4.06	3.17
Not known	-2.69	-4.69	-0.69	-0.80	-2.24	0.64
Ethnicity (White)						
Black	-3.79	-7.14	-0.44	-1.99	-3.88	-0.10
Indian	-3.22	-5.57	-0.86	-5.34	-7.04	-3.63
Chinese	-3.63	-6.57	-0.68	-4.19	-6.35	-2.03
Other	-1.65	-4.61	1.32	-0.73	-2.83	1.37
Not known	-0.56	-2.06	0.94	-1.59	-2.79	-0.39

Table 5 (cont'd): ME (%) on the probability of EFS (probit model with selection) - Males and Females[1]

	MALES			FEMALES		
		95% CI			95% CI	
Variables[2]	ME	Lower	Upper	ME	Lower	Upper
Course type (Business)						
Medical related	7.44	5.31	9.57	6.57	5.62	7.52
Biological Science	-0.18	-1.82	1.45	-1.39	-2.74	-0.05
Agriculture + related	-0.63	-3.45	2.19	2.00	-0.11	4.11
Physical Science	0.81	-0.80	2.41	0.00	-1.49	1.48
Mathematical Science	4.34	2.78	5.89	0.54	-1.04	2.12
Engineering	3.64	2.03	5.25	0.57	-1.35	2.49
Technology	1.47	-1.08	4.02	2.97	0.35	5.58
Architecture + building	4.47	2.64	6.31	2.26	0.17	4.36
Social Science	-2.58	-4.67	-0.49	-0.97	-2.35	0.40
Economics	-0.46	-2.53	1.62	0.41	-1.95	2.77
Politics	-2.40	-4.83	0.04	-1.52	-3.60	0.56
Law	3.99	2.03	5.94	4.22	3.01	5.43
Communication	0.02	-2.60	2.65	-2.69	-4.93	-0.46
Literature + Classic	-1.46	-3.58	0.65	0.60	-0.71	1.91
Modern European Language	-0.03	-2.51	2.46	1.61	0.11	3.10
Humanities	-2.56	-4.58	-0.55	-0.09	-1.54	1.36
Creative Arts	-4.15	-6.26	-2.03	-1.62	-3.08	-0.15
Education	6.48	4.15	8.81	6.12	5.09	7.16
Other subject	-0.86	-2.50	0.77	-1.31	-2.64	0.01
Study method (Non-sandwich)						
Sandwich	3.79	2.77	4.82	2.04	1.23	2.85
Accommodation type (Own accommodation)[3]						
Institution	0.10	0.05	0.15	0.13	0.07	0.19
Parent	0.27	0.20	0.34	0.31	0.25	0.37
Other	-0.01	-0.06	0.05	-0.10	-0.17	-0.04
Not known	-0.02	-0.08	0.04	-0.18	-0.25	-0.10
Degree class (Upper second)						
First	4.07	0.15	7.99	1.10	-2.22	4.42
Lower second	-1.95	-4.08	0.18	-0.80	-2.51	0.90
Third	-3.05	-6.42	0.32	0.44	-2.32	3.20
Other	0.51	-2.70	3.72	2.03	-0.30	4.35
Rho	-0.26	-0.67	0.28	-0.61	-0.83	-0.24

1. Model also includes controls for region of residence, university attended and interactions between degree class and (i) social class, (ii) disability, (iii) ethnicity, and (iv) course type.
2. The default category for each group of categorical variables is noted in brackets.
3. Accommodation type is only included indirectly through the responding to the FDS equation.

Figure 1: University ME and 95% CI for obtaining a qualification (OQ) - Males

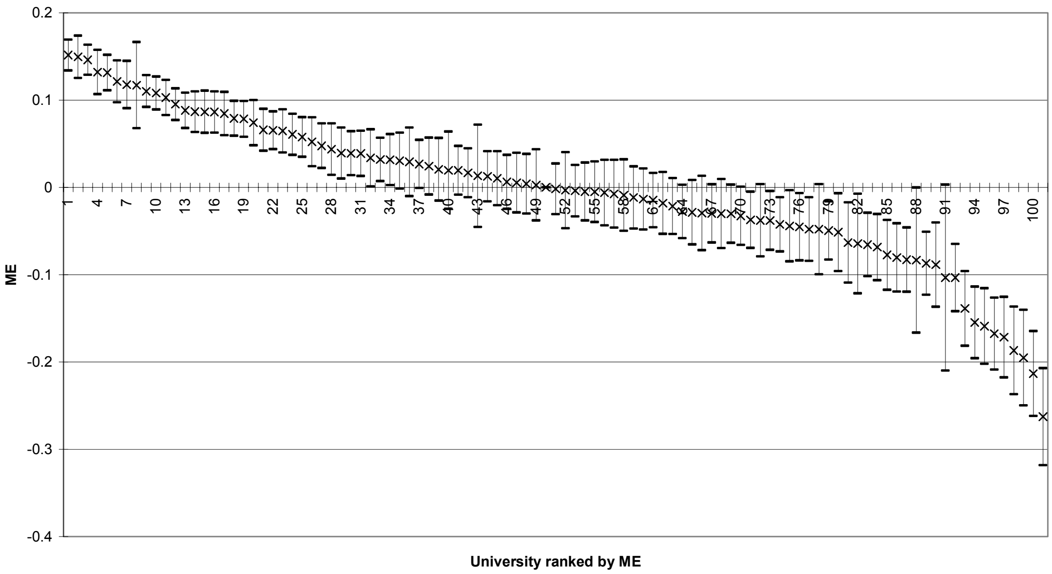

Figure 2: University ME and 95% CI for responding (R) to the FDS conditional on OQ - Males

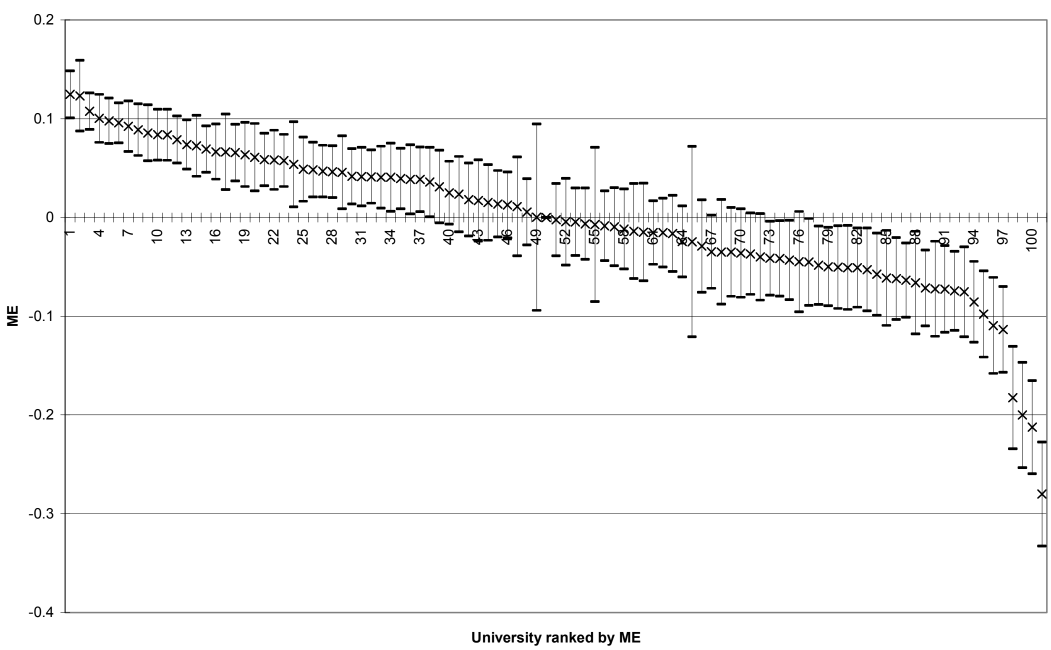

Figure 3: University ME and 95% CI for EFS conditional on R and OQ- Males

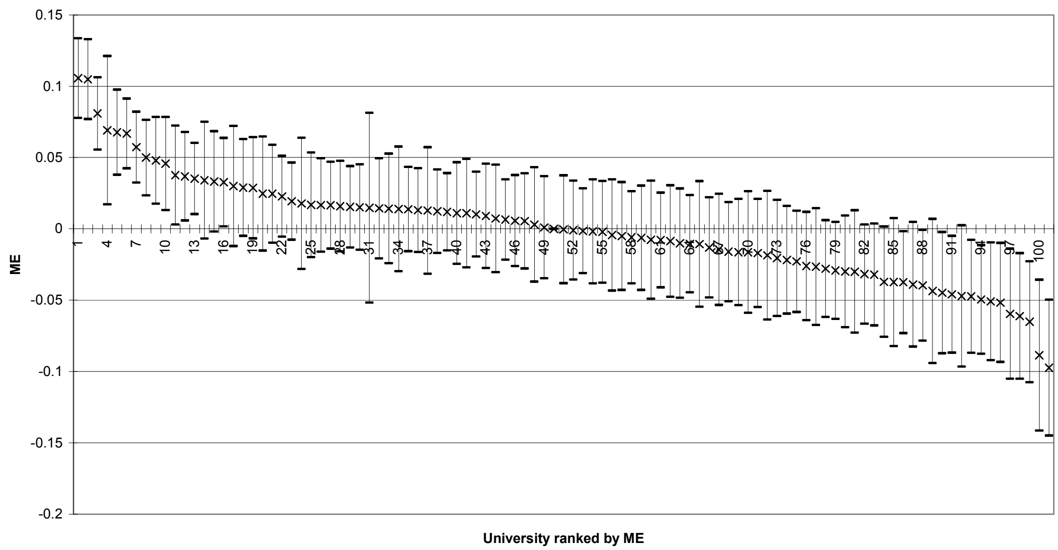

Figure 4: Comparison of University ME rankings by EFS conditional only on OQ vs conditional on OQ and R - Males

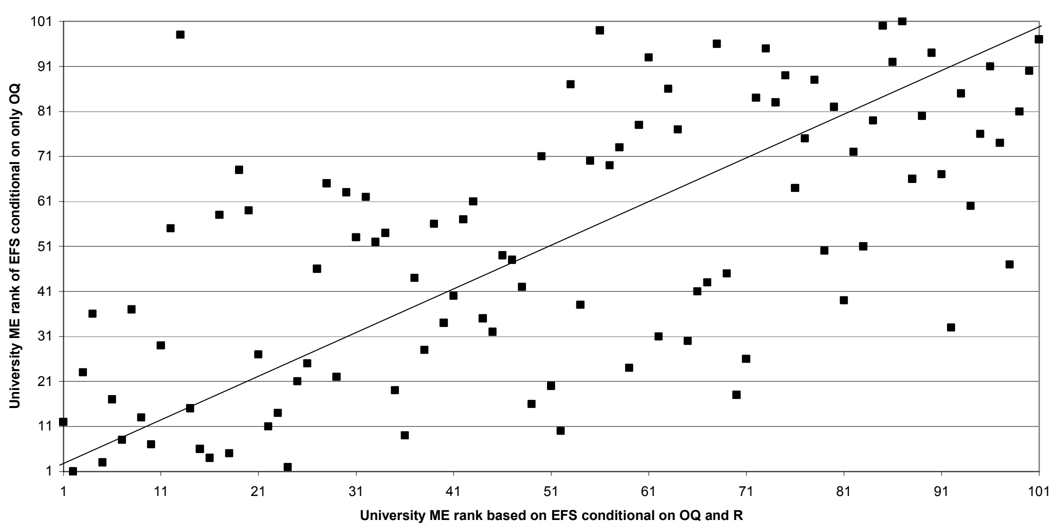

Figure 5: University ME and 95% CI for EFS conditional on R and OQ - probit model with selection - Males

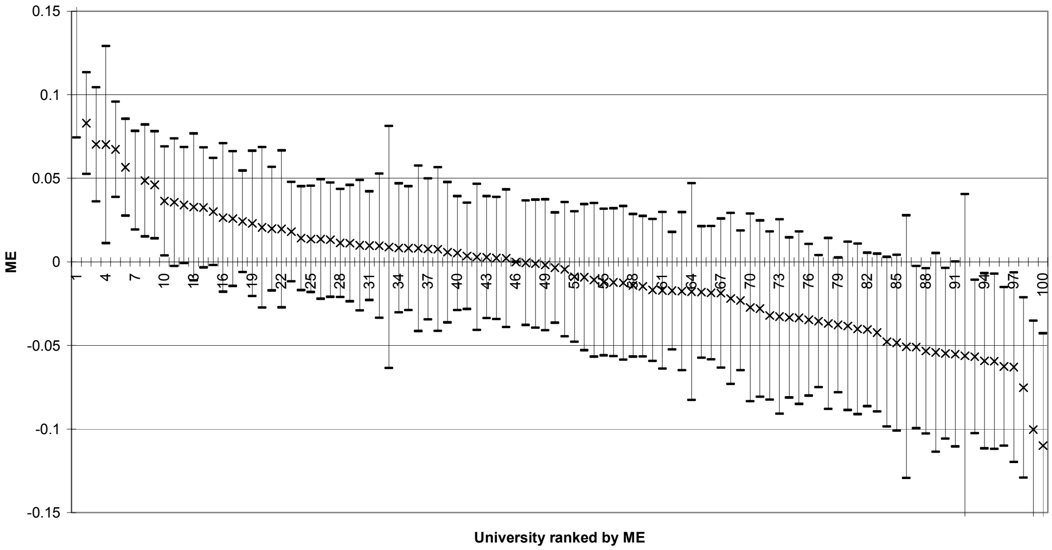

Figure 6a: University ME and 95% CI for the probability of EFS for both responders and non-responders - Males

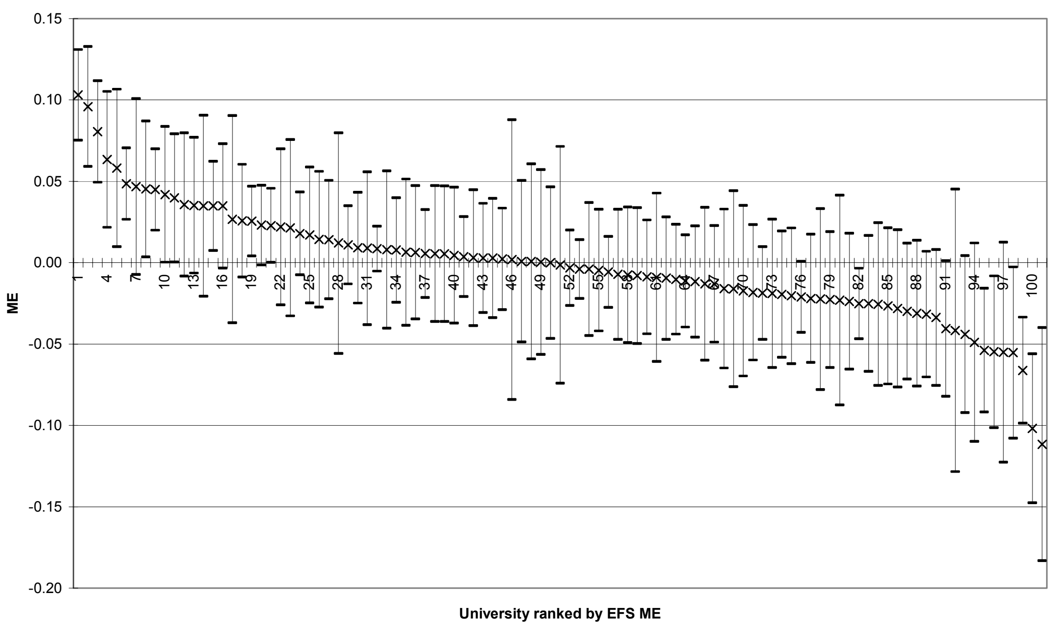

Figure 6b: University ranks and 95% CI based on the probability of EFS for both responders and non-responders - Males

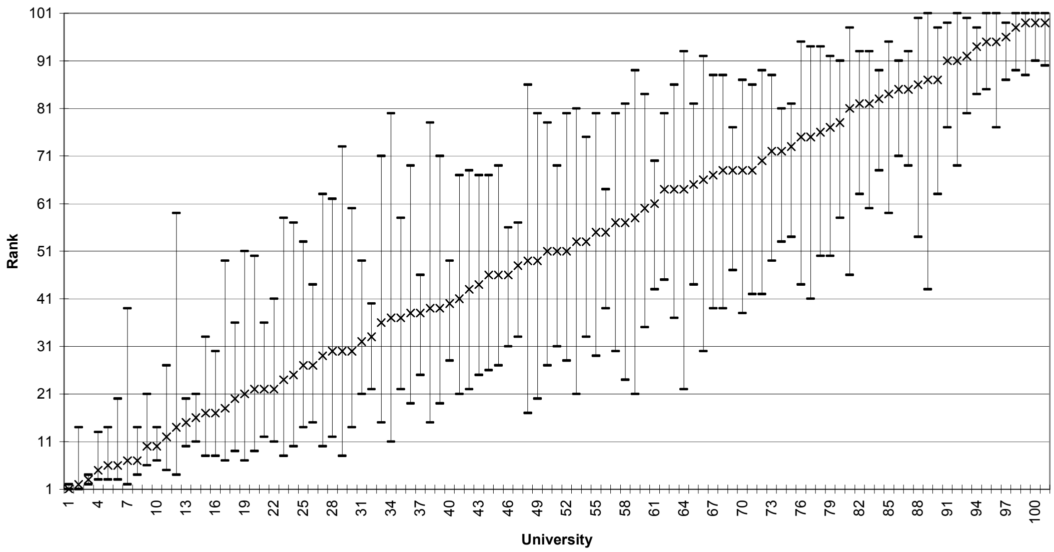

Figure 7: Comparison of University ME rankings by EFS conditional on reponse vs EFS for both responders and non-responders - Males