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Determinants of degree performance in UK universities: a statistical analysis of the 1993 student cohort

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I. Introduction

This paper presents the results of an analysis of the determinants of the academic performance of undergraduate students leaving UK universities in 1993. The analysis is based on a unique data-set which matches the administrative records of the full cohort of students at 'old universities' with DfEE information on the characteristics of the last school attended by each student prior to university entrance. The data also include information on students' prior qualifications and on their social class background. At a time when the UK government is implementing a series of policy initiatives into the higher education sector, there are a number of motivations for our analysis of the factors influencing university students' academic performance.

Our first motivation concerns the current debate surrounding the recent introduction of tuition fees for full-time UK undergraduate students following the Dearing Report (Dearing, 1997) based on the work of the National Committee of Inquiry into Higher Education. It is a widely held view that the

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class of degree obtained by students is an important determinant of success in the graduate labour market. Degree class acts either as a signal of a graduate's ability or as a measure of acquired human capital and employers often make job offers conditional on applicants achieving at least an upper second class honours degree. Given evidence that the level of academic performance affects post-university earnings (see, for example, Naylor, Smith and McKnight, 2000), differences in performance by social class background will imply that the rate of return to a degree may also vary by student background. A primary focus of our work is to examine the extent to which academic performance by university students is influenced by background characteristics such as previous schooling and the occupation-based social class of the student's family background. Furthermore, evidence of an effect of family background on degree performance will indicate a link between students' academic performance and their financial well-being. This would add to the concerns that student learning might be adversely affected by increasing the private costs of higher education.

A second motivation for our analysis concerns the importance of developing a better understanding of the factors associated with the academic performance of university students in the light of the UK government's policy of introducing performance indicators for higher education institutions. The first wave of such indicators was introduced in December 1999 (see HEFCE, 1999) and included an indicator of university performance against the criterion of students' course completion rates. It is likely that more refined measures of student performance will be introduced at a later stage. To be valid, university performance measures should adjust for relevant differences in student characteristics (see Johnes and Taylor, 1990 and, in the context of graduate labour market outcomes, Smith, McKnight and Naylor, 2000). Our analysis uses individual-level data to examine the determinants of degree performance and indicates the factors which should be controlled for in the design of adjusted measures of university performance. It is also interesting to note that in Teaching Quality Review assessments of university departments, there is a clear importance attached to the analysis of student progression and performance. We think it valuable at this time to stimulate a debate both on the methodology of analysing student performance and on the results arising from such analysis.

A third motivation for our study comes from recent policy discussions surrounding the issue of gender differences in pupil performance at schools in the UK. There is much concern that boys are performing poorly relative to girls at many age levels: see, for example, Epstein, Elwood, Hey and Maw, 1998. We analyze the extent to which gender differences persist into higher education. We are also interested in examining whether gender differences vary by factors such as university attended and subject studied, *inter alia*.

A fourth motivation relates to the debate on how individuals' schooling impacts both on subsequent human capital development. In general, the literature on schooling has found that school characteristics have surprisingly little effect on pupils' later achievements (see for example, Eide and Showalter, 1998 for the US and, for the UK, Dearden, Ferri and Meghir, 1997). We are particularly interested in examining the effects of prior school characteristics on students' university performance. Related to this, there are current and ongoing reforms to the structure of A-levels, the final school examinations taken prior to university entry. Dolton and Vignoles, 1999 argue that there is a case for encouraging wider participation in mathematics courses in school. In this context, we examine the association between prior qualifications, subject studied and university student degree performance.

The analysis of degree performance has a long tradition in the UK. Many previous studies have focused on differences in degree performance by age and gender, but typically have not controlled for a wide range of personal or other characteristics and have been based either on aggregate data or on individual level data covering relatively small samples.[1] Much of the previous work has focussed on the variation in degree performance by personal characteristics and by A-level scores.[2] In an influential analysis of university-level data, Johnes and Taylor, 1990 found that inter-university differences in degree results were largely explained by: entrants' mean A-level scores, percentage of students living at home, proportional expenditure on libraries, and university type. We are interested to compare these findings with results based on a micro-econometric analysis of individual student-level data. We are also interested in the effects of students' family background characteristics.[3]

The structure of the paper is as follows. Section II describes the data and modelling strategy. Section III presents and discusses the basic results, while Section IV develops further the analysis of the effects on degree performance of the key variables of interest: school type, social class background and gender. Section V closes the paper with conclusions and further remarks.

II. Data and Modelling

Our data on individual students come from the archived records of the former depository for university records, the University Student Record

[1] An exception is McNabb, Sarmistha and Sloane, 1998.

[2] See, for example, Hoskins, Newstead and Dennis, 1997, Rudd, 1984, Chapman, 1996a, Chapman, 1996b, Bee and Dolton, 1985, Sear, 1983 and Peers and Johnston, 1994.

[3] From an analysis of NCDS data, Blundell, Dearden, Goodman and Reed, 1997 and 2000, find that characteristics such as parental occupation and education are significant determinants of higher educational attainment.

(USR). We analyze the record for 1993-94 which contains information on the full cohort of undergraduates who left university in 1993. University student record data are very rich in the quality of information they provide on the academic characteristics of individuals, their course and their institution of study. The principal variables held in the USR undergraduate records can be categorised as (i) *Personal information*, including: date of birth, sex, marital status, country/county of domicile, country of birth, home or overseas fees status, occupation of parent or guardian, (ii) *Academic history*: last full-time school attended, other education, GCE A-level or SCE higher grade results, course for which admitted, (iii) *Annual information*: university, subject, duration, type of course, enrolment date, method of study (e.g., part-time/full-time), qualification aimed for, source of fees, accommodation, and (iv) *Leavers details*: qualification obtained and class of degree.

From the academic history information, we have been able to create a unique data-set by merging into the USR data information on the school each student last attended prior to university entry. This enables us to investigate whether school characteristics impact on a student's degree performance, after controlling for the student's own personal academic history (for example, A-level results). From the personal record, we have information on parental occupation and so have also been able to match in socio-economic background information to see whether this influences student educational outcomes, *ceteris paribus*.

With such a large and comprehensive data-set, we are able to obtain very precise estimates of the influence of different variables on degree performance. One limitation of student record data, however, is that they provide information only on individuals who have attended university: there is no information on any control group of individuals not attending university. Therefore, in interpreting the effects of a number of the variables, we should recognise the issue of sample selection. For example, we are able to estimate the coefficient on an individual's A-level score in the equation determining degree classification. However, an individual will be observed in our sample only if their A-level score is sufficiently high to permit entry to university. Hence, we have to be careful to interpret the A-level effect on degree class as a marginal effect, conditional on attendance at university. As Heckman, 1990 has demonstrated, when samples are selected on the basis of the exogenous variables only, as is the case with our data, there is no problem in making valid conditional inferences.

The 1993-94 USR data-set contains information on 117,801 individuals who left university in 1993. In constructing our dependent variable, we drop those cases in which students either (i) did not aim at a degree level qualification or (ii) left university for non-academic reasons, such as ill

health.[4] This produces a final population sample of 94,485 students (42,212 females and 52,273 males) on the basis of which our statistical analysis was conducted. Table 1 presents summary statistics on the key variables of interest. The average number of first class degrees awarded across all university students is 8.4 percent. 40.3 percent of students obtained an upper second, 27.9 percent a lower second, and 5.1 percent a third class honours degree. 4.8 percent of students achieved some other qualification below the level of an honours degree. Academic failure is surprisingly high, with 13.4 percent of students failing to obtain any qualification.

There are interesting differences in degree class awards by gender. In particular, 53.4 percent of women obtained a 'good' degree (that is, at least an upper second class degree), while only 45.0 percent of men attained this level of performance. We are interested in examining whether the difference in performance between men and women survives the inclusion of relevant control variables and the extent to which performance differences by gender can be explained by gender differences in observed characteristics. We also examine the variation in the gender performance gap by factors such as university type. The fact that degree performance is so different by gender leads us to analyse the determinants of performance separately for men and women. A test of the hypothesis that the estimated coefficients are the same across the two equations is very clearly rejected.

From Table 1 we also note that 2.9 percent of students were part-time, 8.2 percent were non-UK students and 78.2 percent were aged less than twenty-four at graduation. With respect to social class background, the table shows that 16.1 percent of students reported a parental occupation associated with Social Class I (professional workers), 37.4 percent came from Social Class II (intermediate professions), 9.9 percent from Social Class IIINM (skilled non-manual), 10.2 percent from Social Class IIIM (skilled manual), 6.5 percent from Social Class IV (partly skilled) and 1.1 percent came from Social Class V (unskilled). These figures reveal that the university population is drawn disproportionately from professional occupational backgrounds: in the population as a whole only about 4 percent of households are categorized as Social Class I. In part, this is likely to reflect the superior average performance at A-level of pupils from professional backgrounds.

A key part of our analysis concerns the effects of school characteristics on an individual's degree performance. Table 1 shows that 27.0 percent had attended an Independent school prior to entering university and 44.2 percent

[4]We also omitted from the analysis students who took courses in the fields of medicine and dentistry as the degree classification system for these students is very different from that for other students.

TABLE 1
Summary statistics on key variables

Variable	*ALL*	*Female*	*Males*
UNIVERSITY INFORMATION			
Degree class			
First	8.40	6.87	9.63
Upper second	40.33	46.47	35.37
Lower second	27.90	28.02	27.82
Third	5.14	3.12	6.77
Other	4.82	4.10	5.40
Fail	13.42	11.44	15.02
Degree subject			
Medical related (B)	3.40	5.15	1.98
Biological science (C)	8.71	11.45	6.50
Agriculture (D)	1.43	1.53	1.35
Physical science (F)	9.71	6.40	12.38
Math science (GA)	4.62	3.73	5.35
Computing (GB)	3.56	1.15	5.50
Engineering (H)	12.18	3.20	19.43
Technology (J)	1.17	0.80	1.46
Architecture (K)	1.59	0.94	2.11
Social Studies (L)	11.06	12.18	10.15
Law + Politics (M)	8.27	8.73	7.91
Business Admin. (N)	6.03	6.14	5.94
Communications (P)	0.40	0.54	0.29
Lit + Classics (Q)	6.87	10.22	4.16
Modern Euro Lang (R)	4.53	7.47	2.15
Other Language (T)	1.06	1.52	0.68
Humanities (V)	7.71	8.30	7.24
Creative (W)	1.89	2.67	1.27
Education (X)	2.09	3.62	0.86
Other subjects (Y)	3.71	4.24	3.28
Part-time	2.91	3.30	2.59
University type			
Oxbridge	6.25	5.71	6.70
Old civic	35.39	35.72	35.12
New civic	16.97	17.76	16.33
Ex CAT	14.92	11.78	17.45
1960s univ.	16.39	18.19	14.94
Other Scottish	7.36	7.84	6.97
Other Welsh	2.72	3.00	2.50
PERSONAL CHARACTERISTICS			
SC I	16.08	16.13	16.03
SC II	37.38	38.05	36.83
SC IIINM	9.88	9.74	9.98
SC IIIM	10.21	9.52	10.77

TABLE 1
(continued)

Variable	*ALL*	*Female*	*Males*
SC IV	6.46	6.05	6.79
SC V	1.08	0.93	1.21
Unemployed	15.29	16.05	14.68
Age < 24	78.16	78.96	77.51
Age 24–27	12.30	10.31	13.90
Age 28–33	4.70	4.36	4.96
Age 34+	4.85	6.37	3.62
Married	4.70	6.08	3.59
Non-UK	8.15	7.66	8.55
Overseas fee	7.14	6.25	7.86
ACADEMIC BACKGROUND			
School Type			
LEA	44.18	46.13	42.62
Independent	26.96	25.41	28.21
FE	10.34	10.72	10.02
Other	18.52	17.73	19.15
Single	25.44	27.41	23.86
Qualifications			
A-levels	74.18	74.48	73.93
Highers	7.65	7.93	7.43
BTEC, etc	4.33	3.09	5.33
No formal quals	8.36	8.84	7.97
Other quals	5.48	5.66	5.34
A-level bands per subject			
⩾ 8.5	25.58	23.75	27.08
7.5– < 8.5	15.06	15.64	14.59
5.5– < 7.5	37.66	39.55	36.12
< 5.5	21.70	21.06	22.22
A-level subjects			
Chemistry	30.65	24.98	35.26
English	30.42	43.24	19.98
Math	46.59	33.43	57.30
Physics	32.30	15.77	45.74
Highers bands per subject			
⩾ 2.8	7.67	7.40	7.89
2.2– < 2.8	33.70	33.96	33.48
1.7– < 2.2	35.69	36.98	34.57
< 1.7	22.95	21.66	24.05
Higher Subjects			
Chemistry	60.46	53.71	66.26

continued overleaf

TABLE 1
(continued)

Variable	*ALL*	*Female*	*Males*
English	91.83	95.38	88.78
Math	75.24	68.90	80.67
Physics	54.34	36.10	69.99
Obs	94485	42212	52273

a Local Education Authority (LEA) school. Our data-set also contains matched information from official DfEE school "League Table" information, which records, amongst other things, school size measures and school 'performance' indicators such as the average A-level score for each school, based on students taking 2 or more A-levels. The modal student in our data-set left school in 1990. The earliest year for which detailed DfEE school-level information became available was 1992. Thus, there is a short time interval in which school characteristics might have changed, but this is the best approximation we can achieve. If school performance indicators are measuring anything fundamental about a school, they would not be expected to change substantially over such short periods. Measured school performance does not necessarily indicate school 'quality'. There is much evidence that school performance is highly influenced by the socio-demographic characteristics of its catchment area (see, for example, Goldstein and Spiegelhalter, 1996 and Gibson and Asthana, 1998). School 'quality' is better measured by value-added over and above the characteristics of the school intake. Nevertheless, educational research shows that pupils' performance is a function of the level of peer performance and hence it is interesting to investigate whether and how the degree performance of university students is influenced by previous school performance. In analyzing the effects of school characteristics, we are careful to control both for social class background and for students' own levels of performance in prior qualifications.

III. Results

In this section we present the results of an ordered probit regression of the individual's degree class against selected control variables. The dependent variable is the individual student's degree classification, which is a discrete ordered dependent variable categorized into one of six response codes: first class honours degree, upper second class honours degree, lower second class

honours degree, third class honours degree, other qualification,[5] failure to obtain a degree level qualification. Table 2 reports the main results separately for the 42,212 female students and the 52,273 male students. The table shows the estimated coefficients on the key variables of interest. It also shows for

TABLE 2
Estimated coefficients and marginal effects from the ordered probit regression

	FEMALES			*MALES*		
Variables	*Coeff*	*ME 'Good Degree'*	*ME Fail*	*Coeff*	*ME 'Good Degree'*	*ME Fail*
	Degree subject					
Medical related	−0.004	−0.2	0.1	0.041	1.6	−0.8
Biological science	0.174***	6.8	−2.3	0.118***	4.7	−2.2
Agriculture	−0.184***	−7.3	3.1	−0.072	−2.8	1.5
Physical science	0.008	0.3	−0.1	0.011	0.4	−0.2
Math science	−0.205***	−8.2	3.5	−0.171***	−6.6	3.8
Computing	−0.125**	−5.0	2.0	−0.072**	−2.8	1.5
Engineering	−0.058	−2.3	0.9	0.006	0.3	−0.1
Technology	0.041	1.6	−0.6	−0.050	−2.0	1.0
Architecture	−0.306***	−12.1	5.6	0.025	1.0	−0.5
Law + Politics	−0.069***	−2.7	1.1	0.029	1.2	−0.6
Business Admin.	−0.021	−0.8	0.3	−0.026	−1.0	0.5
Communications	0.011	0.4	−0.2	−0.026	−1.0	0.5
Lit + Classics	0.059**	2.3	−0.8	0.098***	3.9	−1.9
Modern Euro Lang	−0.245***	−9.8	4.3	−0.083**	−3.2	1.7
Other Languages	−0.314***	−12.5	5.8	−0.102*	−4.0	2.2
Humanities	0.054**	2.1	−0.8	0.152***	6.0	−2.8
Creative	0.028	1.1	−0.4	0.195***	7.7	−3.5
Education	−0.192***	−7.6	3.2	−0.108*	−4.2	2.3
Other subjects	−0.272***	−10.8	4.8	−0.305***	−11.6	7.3
	Personal characteristics					
Overseas fee	−0.252***	−11.0	5.0	0.036	0.9	−0.4
Home accom.	0.091***	3.6	−1.3	0.083***	3.3	−1.6
Part-time	−0.473***	−18.5	9.7	−0.333***	−12.6	7.9
Age 24–27	0.117***	4.7	−1.8	0.059***	2.3	−1.2
Age 28–33	0.268***	10.5	−3.7	0.177***	7.0	−3.3
Age 34+	0.447***	17.2	−5.5	0.077**	3.0	−1.5
Married	0.082***	3.2	−1.2	0.220***	8.7	−3.9

continued overleaf

[5]The lower second class degree includes a small number of 'Undivided' second class honours degrees. The other qualification consists of: unclassified honours degree, pass degree, aegrotat degree, and other degree level qualification. The results are robust to re-specifications of the dependent variable in which each of these categories is included separately or grouped differently.

TABLE 2
(continued)

	FEMALES			*MALES*		
Variables	*Coeff*	*ME 'Good Degree'*	*ME Fail*	*Coeff*	*ME 'Good Degree'*	*ME Fail*
SC I	0.045***	1.7	−0.5	0.047***	1.9	−0.7
SC IIINM	−0.083***	−3.2	1.0	−0.035**	−1.4	0.6
SC IIIM	−0.434***	−17.1	6.7	−0.308***	−12.2	6.0
SC IV	−0.449***	−17.7	7.0	−0.321***	−12.6	6.3
SC V	−0.695***	−27.1	12.8	−0.407***	−15.9	8.4
Unemployed	−0.926***	−35.2	19.5	−0.855***	−30.7	22.0
	Academic background					
A-level Pts	0.109***	9.3	−3.9	0.118***	10.4	−5.5
Chemistry	0.113***	4.5	−1.7	0.044***	1.7	−0.9
English	0.020	0.8	−0.3	0.029*	1.1	−0.6
Math	0.134***	5.3	−2.0	0.091***	3.6	−1.8
Physics	0.045**	1.8	−0.7	−0.062***	−2.4	1.3
Independent sch	−0.215***	−8.6	3.6	−0.218***	−8.5	4.6

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level.

each variable the marginal effect on the predicted probabilities of (a) obtaining a 'good' degree (i.e., at least an upper second class honours degree) and (b) failing to graduate. The analysis included a number of controls whose estimated effects are not reported in Table 2. These included: (i) a set of variables controlling for course characteristics, such as course length, (ii) a set of variables relating to university and university department characteristics, and (iii) a set of 52 regional dummies controlling for region of residence in the UK prior to university entry. A brief summary of the effects of some of these variables is provided at the end of the results section. In presenting the results, we group the explanatory variables into distinct categories and describe in turn their effects on degree performance.

Subject studied

From Table 2 it is clear that degree class outcomes show variation by subject studied, for both men and women. Relative to the omitted case of a degree in Social Studies, female students of Biological Science, Literary and Classical Studies, and Humanities performed significantly better in terms of their degree classification. Female performance was worse in Agriculture, Mathematics, Computing, Architecture, Law and Politics, Languages, Education

and Other subjects, relative to Social Studies. Among males, performance relative to that in Social Studies was significantly better in Biological Science, Literary and Classical Studies, Humanities, and Creative Arts and worse in Mathematics, Computing, Modern European Languages, Other subjects and (weakly) in Other Languages and Education. Given these differences across subjects, it is interesting to examine whether there is variation across subjects in the estimated effects of other control variables, such as previous school attended. This issue is addressed in the next section where we show the results from estimating the determinants of degree performance both for different subject groups and through the inclusion of interactions between subject studied and other explanatory variables.

Personal characteristics

Personal characteristics include age, marital status, overseas or home student status, and part-time/full-time study status. The impact of gender is discussed in detail below. The effects of age are estimated through the inclusion of age-band dummies. In other specifications, we have also included a quadratic term in age: the results are similar. Table 2 shows that, for female students, degree performance is increasing monotonically in age. The omitted age-band dummy is for students who are aged less than 24 at graduation. For men, degree performance seems to peak prior to the age of 34. The table also shows that, for both men and women, married individuals do better than non-married students and that part-time students do less well than full-time students. The variables for overseas student status imply that, *ceteris paribus*, overseas students perform less well than home students, on average. Lastly, we note that in contrast to the result reported by Johnes and Taylor, 1990, better performance is associated with students who live at home: i.e., at the parental address.

Table 2 also shows the estimated effects of parental occupation background on degree performance. For both men and women, there is a very well-determined and monotonically positive effect defined over Social Classes I to V: *ceteris paribus*, academic performance at university is better the more 'advantaged' is the student's home background.[6] It is notable that this effect survives the inclusion of variables controlling both for region and for school background as well as for the student's own prior qualifications. Relative to the omitted case of a Social Class II (intermediate professional or technical worker) background, a student from a Social Class I (professional worker) family is about two percentage points more likely to obtain a good

[6]There is some evidence from Smith and Naylor, 2000b that the effect of social class background on degree performance may be working predominantly through its impact on the probability of failing to complete a degree.

honours degree. This performance gap is similar to that between Social Class II and Social Class IIINM (skilled non-manual worker) students. The gap widens enormously when one compares Social Class II with Social Class IIIM (skilled manual workers): a student from the latter background is 17 percentage points less likely to obtain a good degree in the case of women, and 12 percent in the case of men. It appears that, although the social gradient in university degree performance is monotonic, it is not smooth: there is a big jump between skilled non-manual and skilled manual occupations. In the case of women, there is a further discontinuity between Social Class IV (partly skilled workers) and Social Class V (unskilled workers): students from the latter family background are 27 percentage points less likely to obtain a good honours degree, and are 13 points more likely to fail to obtain a degree. There is a huge negative impact on the probability of good performance at university for students from an occupational background described as unemployed.

Academic background

Table 2 reports the effect of A-level points on degree performance and shows that, for women, an extra two points per A-level subject (i.e. one grade higher per subject) raises the probability of a good degree by over 9 percentage points. There is a similar effect for men. The table also shows the effects of the subjects taken at A-level. For women, there are significant and sizeable benefits associated with the prior study of Mathematics, Chemistry and Physics: English confers no such benefit. For men, a significant advantage of having previously studied Mathematics is again evident, together with evidence of a positive, though weak, effect of having studied English. The premium on Mathematics is consistent with findings reported by Dolton and Vignoles, 1999. The estimated equations included dummy variables for the type of pre-university qualification studied, other than A-levels or Highers. The effects of these are not reported in Table 2. The main finding is that, relative to a student with A-levels or Highers, average degree performance is no different for a student with either a BTEC or a Baccalaureate qualification.

The estimated regression equations included control variables for school type, school admissions policy, school size, average school points at A-level (or Highers) and whether the school is single-sex or co-educational. School type is categorised as either Local Education Authority (LEA) school (the default case in the regression analysis), Further Education (FE) college, Independent school or other school type. The most striking result is that, compared to the default case of a student having attended an LEA school, attendance at an Independent school is associated with a statistically sig-

nificantly lower level of degree performance. This is shown in Table 2. The effects are similar for both male and female students. A student who previously attended an Independent school is about 9 percentage points less likely to obtain a good degree than is an otherwise equivalent student who had attended an LEA school. Possible explanations for this result are discussed in Section III(i).

Results not reported in Table 2 include the finding that school performance against DfEE 'league table' criteria also has a statistically significant influence on student performance at university: performance is better, *ceteris paribus*, for a student who attended a school performing well against Df EE criteria. We also find a (weakly) negative effect on degree performance of having previously attended a FE college. School admissions policy has no effect over and above the Independent school effect. Previous research has found that girls benefit more from being educated in a single-sex school than do boys. Interestingly, we find that degree performance is better for students who attended a single sex school only in the case of boys: the effect is small. Finally, we note that there was also a significant positive association between degree performance and the student's A-level or higher score *relative* to the average score at the previous school attended by the student.

Gender

From Table 1 we observed that 53 percent of female and 45 percent of male students obtained a good degree: that is, at least an upper second class honours degree. From the estimated coefficients in the gender-specific degree performance regressions, we can calculate the predicted probabilities of a good degree for men and for women with gender-specific population mean characteristics. These predicted probabilities are about 51 percent for women and 44 percent for men, implying a gender difference of 7 percentage points.[7] It is then informative to compute the Oaxaca decomposition of the gender difference into that part 'explained' by differences in observed characteristics and the 'unexplained' residual difference which is attributable to gender differences in unobserved individual characteristics. This decomposition analysis produces the result that a mere 3 percent of the gender difference is explained by differences in observed characteristics of men and women (for example, the fact that women are more likely to be taking subjects associated with high levels of degree performance and are less likely to come from low-ranked social class backgrounds). Thus, the overwhelming proportion of the gender gap in performance cannot be explained by differences in observed characteristics.

[7]Predicted probabilities are presented in Table 3.

Other results

The estimated equations also included variables on university and department characteristics. Among other results, we found that degree performance was positively associated with the average level of staff salaries at the institution of study, positively associated with the level of academic expenditure per student, and – unlike the finding reported in Johnes and Taylor, 1990 with respect to the 1989 Research Assessment Exercise (RAE) – negatively related to the institution's rating in the 1992 RAE.

(i) Interpretation

The results reported above include three findings which merit further analysis. These relate to the effects on student degree performance of: type of previous school attended, social class background, and gender. Each of these factors has relevance for current policy debates in the general areas of education and social policy in the UK. The government and other interested parties in the sector are very concerned about the relationships between, on the one hand, educational outcomes and, on the other, factors such as school quality and social background. There is also concern among educationalists about growing evidence concerning the poor academic performance of boys relative to girls in both primary and secondary education: our analysis suggests that this carries over into performance in higher education, too.

Perhaps our most surprising finding is the significant academic performance gap between students who had previously attended an Independent school and those who had attended a Local Education Authority school. In order to have equal predicted probability of obtaining a good degree, the average Independent school educated student would need about one grade higher at A-level than the LEA-educated student for each of their three A-level subjects (e.g., an A-level grade portfolio of BBB compared to CCC). This is a substantial gap.

A number of hypotheses might be put forward to explain the difference in school performance by school type. First, there is evidence that Independent schools have a positive effect on pupils' A-level scores, other things equal.[8] Thus, comparing two students with identical A-level scores and equivalent in all other observable characteristics but with different school backgrounds, on average the former LEA pupil is likely to be drawn from a higher point in the underlying ability distribution. *Ceteris paribus*, once at university the LEA-educated student is likely to perform better, on average. It is possible that the capacity of Independent schools to raise pupils' A-level performance varies by A-level subject. This would imply that the performance gap at university

[8]See, for example, Blundell, Dearden, Goodman and Reed, 1997.

might vary by subject studied. Similarly, it is likely that the A-level premium associated with attendance at an Independent school varies according to pupil characteristics such as ability and social class background. It has been argued, for example, that the return on an investment in private education – in terms of securing enhanced A-level grades – is greatest for children whose underlying academic ability is not high in the ability distribution. In part, this is based on evidence that the academic performance of bright children is relatively insensitive to school characteristics. Hence, we might expect the degree performance gap between Independent and LEA educated students to vary by the students' A-level scores and – given imperfect capital markets – by social class background.

A second hypothesis is that the environment of instruction and of preparation for examinations may differ by school type. It is possible that the environment and methods of the Independent schools are relatively successful in producing good results at A-level but are less successful at equipping pupils for independent study at university: the extent to which this is a problem might well vary across universities. Hence, it is interesting to see whether the effect of school type varies with university type. We might also expect the Independent school effect to weaken the longer is the interval between leaving school and entering university. Accordingly, we estimate separate regressions for different age groups of graduates.

A third hypothesis is that students' effort levels at university may differ by previous school background. We have examined the occupational earnings of university leavers and have found that, although earnings of graduates are higher if the previous school attended was an Independent school, the earnings premium on a good degree is lower for an Independent-educated graduate than it is for a graduate who had been educated in an LEA school.[9] This suggests that there may indeed be a reduced incentive for Independent-educated students to work hard for a good degree. If this were the case, however, one might expect that the difference in degree performance between LEA and Independent educated students would be more pronounced in those subjects in which there is a greater difference in the earnings premium for a 'good' degree between LEA and Independent-educated graduates. In other words, one would expect that the variation by subject studied in the degree performance gap between LEA and Independent educated students would be positively correlated with the variation by subject in the difference by school type in the earnings premium associated with a good degree. Examining the occupational earnings of graduates – from evidence on occupational outcomes recorded in the First Destination Survey supplement to the USR data – reveals no evidence of such a correlation. This undermines the hypothesis.

[9]For more details, see Naylor *et al*., 2000.

We attempt to shed light on the first and second hypotheses concerning school type effects by running separate regression equations for different groups of students.

Table 2 reported very significant effects of social class background on degree performance, with much lower probabilities of good degrees for students from lower-ranked occupational backgrounds. In part, this may reflect greater financial pressures on these students inhibiting effective study. Alternatively, it might be that there are academic advantages for students whose parents experienced higher education: Blundell, Dearden, Goodman and Reed, 2000 report that educational attainment is positively associated with parental years of education. We examine whether estimated social background effects are robust to different splits of the data. One might expect, for example, that if financial considerations are driving the effect of social class background on degree performance, the effect would be less severe for students who could be relatively optimistic about their expected future earnings – e.g., students with high A-level points scores – as this will enable greater consumption smoothing. Similarly, it is interesting to investigate whether the estimated gender difference in degree performance is constant across different sub-groups of students.

IV. Further Analysis of School and Social Class Background

We are interested in examining how differences in university students' degree performance by school type, social background and gender might vary with the characteristics of students, including their subject studied and the type of university attended. There are two methods by which we address this issue. The first method involves estimating gender-specific ordered probit regressions for separate sub-samples of students. We split the full student population by gender and by: (i) grouped subject of study, (ii) type of university, (iii) A-level point bands, (iv) social class, (v) school type and (vi) age group of student.[10] We estimate separate equations for each sub-sample. This method has the advantage of allowing all coefficients to vary across different groups. However, it prevents simple comparison of the derived marginal effects across groups because the estimated probit threshold parameters dividing the degree classes are allowed to differ across sub-samples when separate regressions are run. Given this problem, the second method involves re-running the gender-specific single-equation model with the additional

[10]To economise on computation costs, we identify just six separate subject groupings (rather than the full 20 for which controls were included in the regressions reported in Table 2). Similarly, we distinguish between: four A-level points-per-subject score bands, seven university types, four parental occupation groups, two school types (LEA and Independent) and two age bands.

inclusion of interaction variables, allowing the coefficients on school type and social class background to vary across different groups.

(i) Regressions for different groups

Tables 3 and 4 report the effects of school and social class background on degree performance estimated from separate gender-specific regressions for particular sub-samples of the graduate cohort. The tables also report the results of a decomposition analysis of the gender difference in the predicted probability of a good degree. In both tables, the rows represent the sub-samples on which the separate regression analyses were conducted: the number of observations used for each of the sub-samples is also reported. In each table, the first row reproduces the corresponding results from Table 2. For example, row 1 of Table 3 (3a for females and 3b for males) corresponds to the last row of Table 2 in reporting the effects of attendance at an Independent school.

Table 3 shows the effect of having previously studied at an Independent school rather than at an LEA school. For females, the Independent school effect is negative in each of the separate subject group regressions and is statistically significant at 1 percent in four of the six cases. For males, the effect is negative and significant in five of the six cases. Similarly, the significant negative effect of an Independent school is seen to be a feature over most university types for both men and women. The same is true over all A-level points bands and for all Social Class groups. Finally, the negative effect is significant for both age bands but, interestingly, better determined for younger graduates, consistent with the second hypothesis described in Section III(i).

The final column of Table 3a shows the predicted probability of a good degree for females and how this varies across the different sub-samples. Column 4 of Table 3b shows the equivalent probability for males and column 5 reports the difference between the female and male probabilities. There is some variation across different sub-samples of students but the difference is always positive (implying a better average performance by females) with the single exception of Oxbridge: where men are about 6 percentage points more likely than women to obtain a good degree. It is interesting to note that even in the typically male-dominated science subjects, women on average are much more likely to obtain a good degree. The last two columns in Table 3b decompose this total gender gap into that part explained by differences in observed characteristics and that due to unobserved differences. As noted above, only about 3 percent of the overall gender performance gap is explained by differences in observed characteristics across the full population. The results for the different sub-samples show that in each and every

TABLE 3a
Estimated coefficients, marginal effects and predicted 'good degree' probabilities for Independent relative to LEA school attendance: separate sub-samples (FEMALES)

Sub-samples	*n*	*Coeff*	*ME 'Good'*	*Predict Prob.*
All	**42212**	**−0.215*****	**−8.6**	**51.0**
	Degree subject			
Medical related	2175	−0.161	−6.4	59.6
C + F + G†	9598	−0.238***	−9.5	50.2
H + J + K	2088	−0.025	−1.0	41.4
L + M + N	11420	−0.299***	−11.9	55.7
Economics	1409	−0.753***	−29.3	55.1
Q + R + T + V	11614	−0.218***	−8.6	58.6
	University type			
Oxbridge	2410	−0.142	−4.8	70.6
Old civic	15079	−0.254***	−10.1	50.5
New civic	7496	−0.331***	−13.1	53.0
Ex CAT	4974	−0.229***	−9.1	46.6
1960s univ.	7677	−0.104	−4.2	50.3
Other Scottish	3308	0.080	3.2	45.0
Other Welsh	1268	−0.327*	−12.7	36.9
	Academic background			
A-level bands				
8.5+	7468	−0.200***	−6.4	78.6
7.5– < 8.5	4917	−0.325***	−12.1	67.3
5.5– < 7.5	12436	−0.235***	−9.4	52.1
0– < 5.5	6620	−0.119*	−4.5	32.3
LEA school	8613	—	—	55.8
Independent sch	15635	—	—	51.4
	Personal characteristics			
SC I	6808	−0.210***	−8.0	60.9
SC II/IIINM	20175	−0.263***	−10.2	58.1
SC IIIM/IV/V	6963	−0.419***	−16.0	45.1
Unemployed	6777	0.225*	8.3	26.8
Age < 24	33331	−0.223***	−8.9	54.2
Age > 24	8881	−0.136*	−5.3	39.5

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. † Degree subject codes are provided in Table 1.

case the overwhelming part of the gender gap is attributable to differences in observed characteristics. For a small number of groups (for example, in Medical-related and in science degrees), women perform better than men despite having *poorer* characteristics, in terms of degree performance.

Table 4 reports how the social class gradient observed in Table 2 varies

TABLE 3b

Estimated coefficients, marginal effects, predicted 'good degree' probabilities and gender differences for Independent relative to LEA school attendance: separate sub-samples (MALES)

Sub-samples	*n*	*Coeff*	*ME 'Good'*	*Predict Prob*	*Total Diff*	*Diff Charact*	*Diff Coeff*
All	**52273**	**−0.218*****	**−8.5**	**43.7**	**7.3**	**0.2**	**7.1**
	Degree subject						
Medical related	1035	0.023	0.9	44.5	15.1	−0.9	16.0
C + F + G†	15536	−0.143***	−5.5	40.7	9.5	−0.4	9.8
H + J + K	12024	−0.269***	9.8	36.6	4.8	0.1	4.7
L + M + N	12548	−0.268***	−10.6	48.3	7.4	0.3	7.1
Economics	3122	−0.217**	−8.6	47.2	8.0	1.0	7.0
Q + R + T + V	7445	−0.323***	−12.6	57.8	0.8	0.5	0.3
	University type						
Oxbridge	3500	−0.156	−4.8	76.8	−6.1	−1.0	−5.1
Old civic	18358	−0.279***	−10.8	42.2	8.3	0.4	7.9
New civic	8538	−0.211***	−8.2	42.2	10.8	0.9	9.9
Ex CAT	9120	−0.163**	−6.0	37.2	9.4	−0.1	9.6
1960s univ.	7808	−0.139**	−5.4	41.5	8.7	0.6	8.1
Other Scottish	3644	−0.462***	−17.3	41.3	3.6	0.5	3.1
Other Welsh	1305	−0.162	6.0	33.7	3.2	−2.0	5.2
	Academic background						
A-level bands							
8.5+	10464	−0.149***	−5.1	71.3	7.3	1.1	6.3
7.5– < 8.5	5637	−0.260***	−10.3	53.9	13.4	1.9	11.5
5.5– < 7.5	13958	−0.237***	−9.1	40.8	11.4	1.4	10.0
0– < 5.5	8589	−0.155***	−5.0	26.7	5.6	0.2	5.3
LEA school	11929	—	—	47.8	7.9	0.5	7.4
Independent sch	18027	—	—	44.1	7.3	0.2	7.1
	Personal characteristics						
SC I	8381	−0.249***	−10.0	52.7	8.3	0.6	7.6
SCII + IIIMN	24471	−0.187***	−7.4	50.2	8.0	0.5	7.4
SCIIIM + IV + V	9810	−0.405***	−14.6	38.8	6.3	0.4	5.9
Unemployed	7674	−0.098	−2.9	23.5	3.3	−0.5	3.8
Age < 24	40519	−0.216***	−8.5	46.1	8.1	0.7	7.4
Age ⩾ 24	11754	−0.170**	−6.1	34.8	4.8	−1.5	6.3

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. † Degree subject codes are provided in Table 1.

across the different sub-samples. The table reports the results only for students from Social Class I, Social Class IIIM and from unemployed backgrounds – relative to the omitted case of Social Class II. Whereas the estimated effect of Social Class I was positive and highly significant in

TABLE 4a
Estimated coefficients and marginal effects for difference social class groups: separate sub-samples (FEMALES)

	SC I		*SC IIIM*		*Unemployed*	
Sub-samples	*Coeff*	*ME 'Good'*	*Coeff*	*ME 'Good'*	*Coeff*	*ME 'Good'*
All	**0.045*****	**1.7**	**−0.434*****	**−17.1**	**−0.926*****	**−35.2**
	Degree subject					
Medical related†	0.023	0.8	−0.317***	−12.2	−1.067***	−40.4
C + F + G	0.013	0.5	−0.374***	−14.8	−1.005***	−37.6
H + J + K	0.086	3.4	−0.416***	−16.1	−0.986***	−33.6
L + M + N	0.070**	2.6	−0.419***	−16.4	−0.935***	−35.7
Economics	0.064	2.5	−0.423***	−16.8	−0.865***	−32.9
Q + R + T + V	0.056*	2.1	−0.531***	−20.8	−0.948***	−36.4
	University type					
Oxbridge	0.090	2.9	−0.485***	−17.8	−0.916***	−34.8
Old civic	0.023	0.9	−0.484***	−19.1	−0.943***	−35.6
New civic	0.049	1.8	−0.445***	−17.5	−1.007***	−38.0
Ex CAT	0.133***	5.1	−0.435***	−17.2	−0.987***	−36.6
1960s univ.	−0.006	−0.2	−0.448***	−17.5	−0.983***	−37.5
Other Scottish	0.060	2.4	−0.321***	−12.7	−0.706***	−26.9
Other Welsh	0.121	4.8	−0.404***	−15.9	−0.851***	−31.0
	Academic background					
A-level bands						
8.5+	−0.017	−0.5	−0.516***	−17.2	−1.282***	−47.0
7.5– < 8.5	0.051	1.7	−0.573***	−21.6	−1.517***	−54.6
5.5– < 7.5	0.019	0.7	−0.404***	−16.0	−1.143***	−41.3
0– < 5.5	0.066	2.6	−0.394***	−14.8	−0.879***	−29.2
LEA school	0.022***	0.9	−0.717***	−27.9	−1.028***	−38.3
Independent sch	0.032***	1.2	−0.383***	−15.1	−1.067***	−39.7
	Personal characteristics					
Age < 24	0.041**	1.5	−0.464***	−18.2	−1.422***	−49.4
Age ⩾ 24	0.038	1.5	−0.283***	−11.1	0.000***	−50.1

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. † Degree subject codes are provided in Table 1.

Table 2, this result is not robust across all sub-samples. In contrast, a well-determined negative effect of having a Social Class IIIM family background rather than a Social Class II background characterises every different split of the data that we have examined: the finding is remarkably robust. The same is true for students reporting unemployment as their occupational background. That the effect of parental occupation background reveals a jump

TABLE 4b
Estimated coefficients and marginal effects for difference social class groups: separate sub-samples (MALES)

	SC I		*SC IIIM*		*Unemployed*	
Sub-samples	*Coeff*	*ME 'Good'*	*Coeff*	*ME 'Good'*	*Coeff*	*ME 'Good'*
All	**0.047*****	**1.9**	**−0.308*****	**−12.2**	**−0.855*****	**−30.7**
	Degree subject					
Medical related	0.038	1.5	−0.266**	−10.5	−0.862***	−30.7
C + F + G†	0.076***	3.0	−0.289***	−11.3	−0.952***	−32.0
H + J + K	0.063**	2.5	−0.239***	−9.2	−0.854***	−28.1
L + M + N	0.020	0.8	−0.358***	−14.2	−0.794***	−29.8
Economics	0.007	0.3	−0.281***	−11.1	−0.821***	−30.2
Q + R + T + V	0.030	1.1	−0.450***	−17.6	−0.829***	−32.2
	University type					
Oxbridge	0.135***	3.7	−0.548***	−18.9	−0.774***	−27.8
Old civic	0.056**	2.2	−0.277***	−10.9	−0.818***	−28.9
New civic	0.003	0.1	−0.379***	−14.8	−1.119***	−37.2
Ex CAT	0.020	0.8	−0.325***	−12.6	−0.995***	−32.8
1960s univ.	−0.042	1.7	−0.230***	−19.1	−0.828***	−29.8
Other Scottish	0.082	3.2	−0.326***	−12.5	−0.508***	−18.8
Other Welsh	−0.093	−3.6	−0.337***	−12.4	−0.697***	−23.4
	Academic background					
A-level bands						
8.5+	−0.090***	2.9	−0.382***	−13.8	−0.909***	−34.6
7.5– < 8.5	0.088**	3.4	−0.351***	−13.9	−0.956***	−35.6
5.5– < 7.5	0.017	0.7	−0.298***	−11.5	−1.116***	−35.0
0– < 5.5	0.053	1.9	−0.291***	−9.6	−0.899***	−23.3
LEA school	0.017***	0.7	−0.677***	−25.6	−1.001***	−35.3
Independent sch	0.068***	2.7	−0.265***	−10.5	−0.940***	−32.8
	Personal characteristics					
Age < 24	0.052***	2.1	−0.358***	−14.1	−1.176***	−39.4
Age ⩾ 24	−0.015	−0.6	−0.115***	−4.4	−0.362***	−13.1

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. † Degree subject codes are provided in Table 1.

between manual and non-manual occupations suggests support for the hypothesis that there are educational advantages to students whose parents received longer formal education.

The results reported in Tables 3 and 4 address the issue of the robustness of the findings reported in Table 2 with regard to the estimated effects of school type, social background and gender. As noted above, comparison of

the estimated marginal effects across the separate regressions is not valid. In order to analyze the quantitative differences in school, social background and gender effects, we re-estimate the ordered probit equations for all female and male students separately, but with the inclusion of interaction variables.

(ii) Regressions with interactions

Table 5 reports results from an analysis of degree performance in which, in addition to the control variables used in the regression reported in Table 2, we included interactions between Independent school status and a series of other control variables. Table 5 reports the estimated coefficients and marginal effects for the interaction variables only.

The first row of Table 5 shows that on average across all female (male) students, attendance at an Independent school is associated with a reduction

TABLE 5
Estimated coefficients and marginal effects Independent school effects from ordered probit regression with interaction variables

	Females			*Males*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
Average	—	**−6.9**	**2.8**	—	**−8.6**	**4.7**
	Degree subject					
Medical related	0.180**	−2.2	0.8	0.132	−4.8	2.3
Biological science	0.107*	−5.0	1.5	0.098*	−6.1	2.8
Agriculture	0.187*	−2.0	0.9	−0.031	−10.7	6.7
Physical science	0.055	−7.2	2.8	0.069	−7.1	3.8
Math science	−0.131	−14.3	8.0	0.078	−6.5	4.4
Computing	−0.040	−11.0	5.3	0.192***	−2.3	1.3
Engineering	−0.083	−12.7	5.7	−0.114**	−14.1	8.1
Technology	−0.055	−11.5	4.5	0.168	−3.3	1.8
Architecture	0.300**	2.5	−1.3	−0.080	−12.9	7.1
Social Studies	—	−9.4	3.7	—	−9.8	5.4
Law + Politics	0.102*	−5.3	2.2	0.071	−7.1	3.7
Business Admin.	0.080	−6.2	2.5	0.144**	−4.2	2.3
Communications	0.417	7.0	−2.1	0.277	1.0	−0.5
Lit + Classics	0.053	−7.2	2.6	−0.068	−12.6	6.2
Modern Euro Lang	0.016	−8.6	4.6	−0.008	−10.0	5.9
Other Languages	0.260**	0.9	−0.5	−0.130	−14.4	9.2
Humanities	0.128**	−4.3	1.5	0.071	−7.2	3.2
Creative	−0.029	−10.5	4.0	−0.088	−13.5	5.9
Education	−0.039	−10.9	5.6	0.080	−6.6	3.9
Other subjects	0.123	−4.4	2.4	0.172**	−2.8	2.2

TABLE 5
(continued)

	Females			*Males*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
	University type					
Oxbridge	−0.012	−8.6	4.2	−0.152***	−13.9	3.8
Old civic	—	−8.1	3.2	—	−8.2	4.9
New civic	0.026	−7.1	2.7	0.009	−8.0	4.4
Ex CAT	0.056	−5.9	2.1	−0.025	−9.2	5.2
1960s univ.	0.085	−4.7	1.8	0.032	−7.1	3.9
Other Scottish	0.045	−6.3	2.2	−0.030	−9.6	4.9
Other Welsh	0.042	−6.4	2.2	0.151*	−2.5	1.2
	Academic background					
A-level 10pts†	−0.147*	−3.2	0.6	−0.084	−4.3	1.0
A-level 8pts	−0.307***	−9.8	2.8	−0.263***	−11.8	4.4
A-level 6pts	−0.367***	−12.6	5.0	−0.318***	−13.7	7.2
A-level 4pts	−0.345***	−11.6	6.0	−0.296***	−12.1	8.5
	Personal characteristics					
SC I	−0.030	−5.1	1.4	−0.032	−5.6	2.2
SC II	—	−4.0	1.2	—	−4.3	1.7
SC IIINM	−0.019	−4.9	1.6	−0.084**	−7.6	3.3
SC IIIM	−0.259***	−14.1	8.2	−0.383***	−17.7	13.0
SC IV	−0.415***	−19.6	12.7	−0.314***	−15.4	11.0
SC V	−0.585**	−21.9	22.1	−1.136***	−33.9	42.0
Unemployed	−0.073	−5.7	5.8	−0.133**	−6.5	8.7
Age < 24	—	−6.8	3.0	—	−7.8	4.3
Age 24–27	−0.154***	−12.9	5.2	−0.133***	−12.9	7.1
Age 28–33	−0.067	−9.2	2.9	−0.181**	−15.0	7.4
Age 34+	0.260**	3.0	−0.6	−0.213*	0.5	−0.2

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. † A-level points score corresponds to A-level bands shown in Tables 1, 3 and 4.

in the probability of a good degree of about 6.9 (8.6) percentage points.[11] The estimated coefficients in Table 5 show substantial variation in the Independent school effect across subject studied. For example, relative to female students studying Social Studies, the negative Independent school effect is significantly weaker among students of Medical-related, Architecture, Other Languages and Humanities courses due to the significantly positive estimated coefficients on these interaction dummy variables, relative to a Social Studies degree. For male students, the negative Independent school

[11]These numbers differ slightly from the corresponding figures quoted in Table 2 as the specification of the equation has changed with the inclusion of interaction variables.

effect is particularly strong for Engineering students. The marginal effects show that for female students studying Social Studies, the probability of obtaining a good degree is 9.4 percentage points lower for Independent relative to LEA-educated students, whereas it is 2.2 percentage points for female students on a Medical-related course.

The table shows that there is little variation in the Independent school effect across university types. The exception is the case of male students at Oxbridge, where the negative effect associated with having attended an Independent school rather than an LEA school is particularly strong. The result is consistent with the idea that Oxbridge colleges are more discriminating over ability when recruiting students from the state sector than from the private sector, compared to other universities. We note, however, that this result is not consistent with the finding reported in Table 3b regarding the effect of an Independent school background when estimated separately on the sample of Oxbridge male students. Under the separate regression approach reported in Table 3b, the estimated effect of attendance at an Independent school rather than at an LEA is negative but not statistically significant. In contrast, the effect is significant at most of the other university types. Thus, the two approaches – the separate regression and the regressions with interactions – give inconsistent results for the estimated effect of school type for male students at Oxbridge. This is the only case in which the two methods generate ambiguous results. One explanation for this may be the fact that the size of the Oxbridge sample is smaller than that for each of the other university types associated with significant estimated effects for Independent schools, as reported in Table 3b. The relatively small sample size reduces the precision in the estimated effect. A second explanation would be that the parameter restrictions imposed in the (only partially) interacted model may not be valid in the case of male students at Oxbridge.

Table 5 shows that there are clear differences in the magnitude of the Independent school effect associated with different A-level points bands of students. The adverse effect of having studied at an Independent school, *ceteris paribus*, is small and not strongly significant for students with high A-level points scores, whereas it is large and significant for lower A-level points. This is consistent with the first hypothesis described in Section III(i). It is similarly striking that the Independent school effect on degree performance is statistically significant mostly for students from lower occupationally-ranked social class backgrounds. Finally, we observe that there is no clear pattern in the relationship between the Independent school effect and age, but that, as predicted in the earlier discussion, the effect is *positive* for students aged 34 or more at graduation.

Table 6 (6a for females and 6b for males) reports results from an analysis of degree performance with the inclusion of interactions between social class

TABLE 6a

Social class effects from ordered probit regression with interaction variables (FEMALES)

	SC I			*SC IIIM*			*Unemployed*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
Average	—	**2.8**	**−0.8**	—	**−18.2**	**7.4**	—	**−39.1**	**24.6**
	Degree subject								
Medical related	−0.051	3.0	−0.8	0.079	−14.1	5.2	−0.090	−41.1	26.2
Biological science	−0.013	4.1	−0.9	0.013	−16.3	5.1	0.017	−44.2	24.1
Agriculture	−0.178	−1.9	0.7	−0.004	−17.3	8.0	−0.276*	−41.0	31.6
Physical science	−0.069	2.3	−0.6	0.088	−13.7	5.0	0.007	−38.3	22.8
Math science	−0.162*	−1.2	0.4	−0.085	−20.4	10.2	0.039	−31.4	19.9
Computing	−0.340**	−8.1	2.5	0.053	−15.0	5.3	−0.521***	−52.6	43.2
Engineering	−0.011	4.7	−1.5	0.137	−11.9	5.0	0.138	−29.1	17.0
Technology	−0.030	3.5	−0.7	−0.327	−29.6	11.7	−0.522**	−57.4	44.4
Architecture	−0.204	−2.9	1.1	−0.277	−26.8	16.4	−0.196	−36.2	27.5
Social Studies	—	4.9	−1.3	—	−17.2	5.2	—	−38.5	23.1
Law + Politics	−0.167**	−1.4	0.4	−0.038	−18.7	7.6	−0.165**	−42.6	28.8
Business Admin.	−0.038	3.5	−1.0	0.224**	−8.3	2.8	−0.151*	−42.2	28.2
Communications	−0.254	−4.7	1.2	0.241	−7.4	2.1	−0.395	−53.1	38.9
Lit + Classics	−0.001	4.8	−1.2	−0.041	−18.8	7.1	0.127*	−36.4	19.4
Modern Euro Lang	−0.037	3.7	−1.3	−0.183**	−23.6	13.7	−0.019	−30.8	21.0
Other Languages	−0.059	2.8	−1.0	−0.664***	−38.2	29.4	−0.371**	−41.2	34.6
Humanities	−0.040	3.3	−0.8	−0.057	−19.4	7.1	−0.132*	−45.2	28.5
Creative	−0.065	2.4	−0.6	−0.204	−25.1	10.7	0.118	−36.6	19.7
Education	−0.058	2.9	−1.2	−0.048	−18.5	10.9	0.231***	−19.5	11.7
Other subjects	−0.062	2.7	−1.1	−0.129	−21.4	13.0	0.098	−24.7	16.1

continued overleaf

TABLE 6a
(continued)

	SC I			*SC IIIM*			*Unemployed*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
	University type								
Oxbridge	−0.024	1.3	−0.5	0.056	−17.1	9.0	0.519***	−24.0	14.5
Old civic	—	2.1	−0.6	—	−19.5	8.1	—	−41.6	27.5
New civic	0.051	4.1	−1.1	0.102*	−15.5	6.1	0.125**	−38.0	23.5
Ex CAT	0.088	5.3	−1.3	−0.007	−19.7	7.7	0.061	−40.5	24.1
1960s univ.	−0.051	0.2	−0.1	−0.003	−19.6	8.0	0.040	−40.7	25.8
Other Scottish	−0.054	0.1	0.0	0.108	−15.2	5.7	0.286***	−33.1	17.5
Other Welsh	0.185*	9.0	−2.3	0.107	−15.3	6.0	0.156	−37.0	22.5
	Academic background								
A-levels 10pts†	−0.218***	3.5	−0.5	0.059	−13.4	2.5	−0.363***	−43.7	15.5
A-levels 8pts	−0.314***	1.0	−0.2	−0.068	−20.0	5.6	−0.655***	−53.3	30.6
A-levels 6pts	−0.437***	−3.6	1.0	0.013	−17.7	6.3	−0.312***	−41.9	24.6
A-levels 4pts	−0.418***	−2.9	1.1	−0.029	−19.3	9.6	−0.078	−32.9	21.7
Independent sch.	0.002	3.0	−1.0	−0.262***	−25.6	14.5	0.176**	−33.7	22.7
LEA school	—	2.8	−0.7	—	−16.1	5.9	—	−40.7	24.6
	Personal characteristics								
Age < 24	—	3.3	−0.9	—	−19.0	8.0	—	−42.1	29.0
Age 24–27	−0.024	2.4	−0.7	0.254***	−9.0	3.2	0.475***	−26.9	13.4
Age 28–33	−0.148	−2.3	0.6	0.174	−12.0	3.8	0.485***	−31.5	14.5
Age 34+	−0.051	1.3	−0.3	−0.208*	−27.0	10.8	0.681***	−25.6	10.0

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. †A-level points score corresponds to A-level bands shown in Tables 1, 3 and 4.

TABLE 6b

Social class effects from ordered probit regression with interaction variables (MALES)

	SC I			*SC IIIM*			*Unemployed*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
Average	—	**2.2**	**−0.9**	—	**−13.2**	**6.8**	—	**−31.5**	**24.0**
	Degree subject								
Medical related	0.117	5.6	−2.2	0.000	−10.4	5.4	0.047	−25.4	17.7
Biological science	0.016	1.6	−0.5	−0.083	−13.9	5.8	−0.296***	−42.1	33.0
Agriculture	−0.055	−1.2	0.5	−0.010	−10.8	5.5	−0.240	−33.7	28.2
Physical science	0.079	4.1	−1.5	−0.081	−13.6	7.0	−0.184***	−33.5	26.6
Math science	0.095	4.7	−2.3	−0.057	−12.1	7.8	−0.112	−24.2	20.5
Computing	0.102	5.0	−2.1	−0.022	−11.2	6.1	−0.295***	−33.2	29.5
Engineering	0.010	1.4	−0.6	−0.008	−10.8	5.4	−0.124**	−31.0	23.9
Technology	0.163	7.5	−3.1	0.083	− 7.2	3.8	0.082	−21.6	15.3
Architecture	−0.035	−0.4	0.2	−0.002	−10.7	4.8	−0.165	−35.5	26.8
Social Studies	—	1.0	−0.4	—	−10.5	5.2	—	−27.8	19.7
Law + Politics	−0.051	−1.1	0.4	−0.130	−15.5	7.9	−0.081	−31.9	23.2
Business Admin.	0.008	1.3	−0.5	−0.160*	−16.5	9.1	−0.221***	−34.0	27.8
Communications	0.102	4.7	−1.1	−0.719**	−37.2	20.1	−0.722***	−55.7	51.7
Lit + Classics	−0.082	−2.3	0.8	−0.141	−16.1	7.1	−0.205**	−40.0	29.5
Modern Euro Lang	0.071	3.8	−1.5	−0.410***	−25.0	16.3	−0.066	−30.0	22.1
Other Languages	0.096	4.8	−1.8	−0.652***	−32.0	24.5	−0.416**	−38.5	35.4
Humanities	0.043	2.7	−0.9	−0.089	−14.1	6.2	−0.031	−34.2	22.8
Creative	0.088	4.4	−1.3	−0.089	−14.1	6.0	−0.029	−35.4	23.2
Education	0.047	2.8	−1.4	0.053	−8.1	5.0	0.109	−16.7	12.4
Other subjects	0.105	4.9	−3.0	−0.048	−10.9	8.9	0.030	−13.5	11.6

continued overleaf

TABLE 6b
(continued)

	SC I			*SC IIIM*			*Unemployed*		
	Coeff	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*	*Coeff*	*ME 'Good'*	*ME Fail*
	University type								
Oxbridge	−0.065	0.0	0.0	−0.264***	−21.4	6.5	0.514***	−14.6	3.9
Old civic	—	2.6	−1.1	—	−11.3	6.4	—	−30.2	25.7
New civic	−0.022	1.7	−0.7	−0.041	−13.1	6.7	−0.146***	−35.1	29.4
Ex CAT	−0.046	0.7	−0.3	−0.111**	−15.8	8.3	−0.117**	−34.7	27.8
1960s univ.	0.016	3.2	−1.3	0.056	− 9.3	4.8	0.002	−30.8	24.8
Other Scottish	0.048	4.5	−1.7	−0.104	−15.4	8.3	0.220***	−25.1	16.5
Other Welsh	0.004	2.7	−1.0	0.006	−11.4	5.5	−0.220**	−37.1	31.8
	Academic background								
A-levels 10pts†	0.038	7.1	−1.2	0.150**	− 6.4	1.5	−0.109	−32.8	12.4
A-levels 8pts	−0.146**	1.3	−0.3	−0.029	−14.1	4.9	−0.182**	−35.2	18.5
A-levels 6pts	−0.267***	−3.5	1.3	−0.047	−14.8	6.9	−0.352***	−37.7	29.2
A-levels 4pts	−0.280***	−3.9	2.0	−0.142**	−17.3	11.6	−0.135**	−29.0	25.6
Independent sch.	−0.030	1.2	−0.6	−0.350***	−21.9	15.5	−0.022	−30.4	26.5
LEA school	—	2.4	−0.9	—	−10.2	4.7	—	−31.9	22.9
	Personal characteristics								
Age < 24	—	2.9	−1.1	—	−14.9	7.8	—	−34.0	26.9
Age 24–27	−0.080*	−0.3	0.1	0.302***	− 3.2	1.5	0.392***	−20.0	12.6
Age 28–33	−0.280***	−8.3	3.4	0.068	−12.5	5.5	0.287***	−29.5	18.2
Age 34+	0.206	10.9	−5.3	0.046	−12.2	8.9	0.569***	− 5.4	3.5

*** significant at the 1% level, ** significant at 5% level, * significant at 10% level. †A-level points score corresponds to A-level bands shown in Tables 1, 3 and 4.

background and other control variables. The table reports the estimated coefficients and marginal effects for the interaction variables only. The first row reports the estimated average marginal effects on the probabilities of a good degree and of failure, for students from Social Class I, Social Class IIIM and from unemployed backgrounds, respectively, compared to students from a Social Class II background. On average, female (male) students from Social Class I are 2.8 (2.2) percentage points more likely to obtain a good degree than are students from Social Class II, while Social Class IIIM students are 18.2 (13.2) percentage points *less* likely to graduate with a good degree. Relative to Social Studies degrees, there are rather few significant differences in the estimated coefficients on the variables interacting subject of study with social class background, with the exception of students from unemployed backgrounds. Similarly, there are only few differences across university types in the effects of social class background on degree performance. The table also shows that the degree performance gap between Social Class II and Social Class IIIM students, in terms of the probability of obtaining a good degree, is lowest for students with the highest A-level scores. For males, for instance, the significantly positive coefficient on the interaction between Social Class IIIM and the 10 points A-level band implies that for these students the probability of a good degree is 6.4 percentage points lower compared to equivalent Social Class II students. This contrasts with the 13.2 percentage point reduction for the average male student reported in row 1 of the table. This is consistent with the idea that financial pressures inhibiting effective study at university may be less severe for students with better post-university prospects. The table also shows that the degree performance gap is much greater for students who previously attended an Independent school, which is consistent with the results presented in Table 5.

V. Conclusions and Further Remarks

This paper presents the results of an ordered probit analysis of the determinants of degree performance of students leaving UK universities in 1993. The analysis is based on individual-level data for the full population of undergraduates studying at the pre-1992 universities. We focus on the impact on degree performance of students' personal characteristics and, in particular, social class background, gender and academic background. We also control for the effects of degree subject studied and the institutional characteristics of the university attended, amongst other things. In part, the analysis can be thought of as providing a statistical basis for the specification of a university performance indicator of student degree outcomes in the tradition of Johnes and Taylor, 1990 and Smith *et al*., 2000.

We find that degree performance is influenced significantly by personal characteristics such as age and marital status. We also find that degree performance is influenced positively by A-level score, positively by occupationally-ranked social class background, and is significantly lower both for students who previously attended an Independent school prior to university entry and for male students. We find that, with few exceptions, the sign and significance of these effects are robust across separate regressions of degree performance on distinct population sub-samples, such as by university type and subject studied. We also find that the superior performance of females holds across all sub-samples, with the exception of students at Oxbridge where males perform better than females, on average. In general, very little of the gender performance gap can be explained by gender differences in observed characteristics.

More detailed analysis of the difference in degree performance by previous school type reveals that the negative marginal effect associated with previous attendance at an Independent school is, for males, particularly strong at Oxbridge. This would suggest that, relative to other universities, Oxbridge colleges are more discriminating over ability when recruiting students from the state sector than from the private sector. We also find the negative Independent school effect to be weaker for students with higher A-level scores.

There is much research showing that parental occupation and related socio-demographic characteristics are important influences on levels of attainment in primary and secondary education. It is perhaps surprising, however, that social class of parental occupation has such strong effects on degree performance as those estimated in this paper. We find evidence that the performance gap by social class is narrower for students with higher A-level scores and hence with better post-university prospects, *ceteris paribus*. We argue that this may indicate an impact of financial well-being on study effectiveness. A relationship between degree class and parental background has implications for the possible consequences of tuition fees. First, we infer from the results that increasing the financial burden on students is likely to cause degree performance to deteriorate. Second, as graduates' job prospects are linked to degree class, the rate of return to a degree is likely to be lower for students from less privileged backgrounds. The introduction of top-up fees would threaten to exacerbate this problem unless accompanied by appropriate exemptions or other forms of subsidy. In further work, it would be interesting to examine the determinants of degree performance for other cohorts and to see how these might have been changing over time, as the burden of higher education costs has shifted increasingly towards individual students and their families.

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