Does UK Higher Education Discriminate Against Women?

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ABSTRACT

Using a sample of 2.3 million observations on applicants to UK Higher Education institutions from 1996-2001, the paper explores whether the selection process into Higher Education is discriminatory. The answer is no discrimination, even though women are better qualified and are less likely to be offered a place. The lower tier Higher National Diploma sector is a key issue because women (excluding nursing) are less likely to undertake these courses, which are `male orientated'. The policy conclusion is that to encourage less well-qualified females to undertake Higher Education, more appropriate provision is necessary that recognizes the reality of subject gender segregation.

1. INTRODUCTION

DATA FROM THE *Universities and Colleges Admissions Service* (UCAS) show that over the period 1996-2001, 78.42 percent of male applicants were accepted into UK Higher Education (HE) in contrast to 76.77 percent of female applicants. Given the large number of applicants (2.3 million), this is a significant difference. Furthermore, women applicants were generally better qualified. So this provides a *prima facie* case for discrimination at the entry level. So how can it be that women with apparently better average qualifications have a smaller acceptance rate? To address this issue a measure of qualification quality is developed.

Three related issues are also investigated. First, there is a strong upward trend in acceptance rates of around 8 percent over the six year period of this study. The second issue is subject choice. Considerable segregation is apparent in subject choices. This opens a whole area as to whether these differences reflect taste or discrimination. Subject choices to some extent reflect deeply held prejudices about the type of job to which women are best suited (Wajcman, 1998). As examples, 92.3 percent of those entering nursing degrees are women, whereas only 8.2 percent opt for mechanical engineering. Clearly, these large differences in subject choices have a major impact on career patterns and in a truly 'nongendered' labour market such differences would not arise. Women still face disadvantage in the UK labour market, even though its extent has diminished considerably since the 1970 Equal Pay Act

and the 1975 Sex Discrimination Act. Bebbington (2002), as an example, draws attention to the issue of the under-representation of women in academia, especially sciences, but this is less surprising given the smaller numbers that study sciences. Graduate pay differentials may partly be explained by these subject choice differences.[2]

The third issue, which is strongly related to subject segregation, is Higher National Diploma (HND) provision.[3] This largely explains the lower overall female acceptance rates. The reason for its relative unpopularity among female applicants is shown to be the range of subjects on offer. These tend to be male orientated, although nursing which absorbs large numbers of sub-degree females is a special factor, which is not fully accounted for in the UCAS data. Once the HND sector is stripped away, female acceptances onto degree level courses are higher. Better qualifications account for this. Finally, male/female acceptance differences are compared with ethnic differences to show that there is no racial discrimination against UK domiciled ethnic minority females.

2. The data

Full-time UK undergraduates apply via UCAS, resulting in a comprehensive dataset of the characteristics of applicants and whether they are accepted.[4] There are 1,099,786 UK domiciled male applicants and 1,230,441 UK domiciled female applications from 1996-2001. Not surprisingly given the higher number of applicants, there are more female acceptances at 944,613 compared with 862,469 males.

Table 1 compares male and female qualifications averaged over the 1996-2001 period. A-levels are still the Gold Standard qualification taken by 54.7 percent of applicants. These are given a point score, with 30 representing the highest possible score. The typical applicant sits 3 A-levels; UCAS records the best three for those with four or more. There are five passing A-level grades, from A (highest) to E (lowest). Grade A earns 10 points; B earns 8 down to E, which scores 2. It can be seen that the acceptance rate is very much linked to the point score. 'Highers' are the Scottish equivalent of A-levels because Scotland has a considerable degree of independence in the organization of its education. As with the traditional A-level, it can be seen that the acceptance rate works in the expected way; a greater number of Highers means a greater chance of acceptance. Notice, however, that there is far from a 100 percent acceptance rate, even for those with near maximum A-level points.

Access/Foundation course are a miscellaneous group of qualifications usually taken by mature students in the Further Education sector without formal qualifications looking to enter the HE sector. The Baccalaureate is an international qualification taken by 7,156 of applicants. BTEC and its Scottish equivalent SCOTVEC are vocational qualifications, usually offered within the Further Education sector and by employers. The three grades (distinction,

merit, pass) of GNVQ (General National Vocational Qualifications) are distinguished — once again the better the GNVQ score, the better are the chances of success. These are mainly vocation-related qualifications. 'Other' refers to qualifications, which do not readily fit into any of the listed categories.[5] At first sight the high acceptance rate of the `none or unrecorded' category seems somewhat implausible. The reason is that this category includes a lot of missing information, not only failures. For example, late registrants do not always record the qualification actually achieved — only a minimal return is sent to UCAS for the purpose of record keeping.

Table 1: Qualifications 1996-2001

Qualifications	*% female with this qualification*	*female acceptance rate*	*% male with this qualification*	*Male acceptance rate*
0 to 5 A level pts	1.01	64.43	1.09	68.88
6 to 10 A level pts	8.81	73.74	9.08	77.30
11 to 15 A level pts	9.16	81.37	8.92	83.66
16 to 20 A level pts	14.86	86.63	13.45	88.27
21 to 25 A level pts	9.50	89.42	8.32	90.64
26 to 30 A level pts	12.71	91.41	12.36	91.86
Access/Foundation	7.16	68.51	5.01	67.75
Baccalaureate	0.34	74.75	0.27	75.12
BTEC/SCOTVEC	8.72	66.65	11.14	69.86
Deg/Partial Degree Credits	1.59	55.65	1.25	53.61
GNVQ Distinction	2.03	82.11	1.41	87.39
GNVQ Merit	2.43	75.87	2.73	82.89
GNVQ Pass	3.27	53.05	4.61	57.25
Highers 3 or less	1.20	44.26	1.23	54.67
Highers 4	1.16	77.82	1.05	81.95
Highers 5	1.56	86.88	1.48	89.99
Highers 6 or more	1.75	94.24	1.44	94.78
None or unrecorded	5.43	70.67	7.68	74.38
Other qualificaton	7.30	52.07	7.48	57.46
All applicants		76.77		78.42

It can be seen that female applicants are generally better qualified. The quality difference is actually small, but this should be set against the much larger number of female applicants. The key factor that accounts for the higher overall male acceptance rate is that the male acceptance rate for poor qualifications is considerably higher than that for females. As an example, the

female acceptance rate for 0-5 A-level points is around 4 percent lower and the GNVQ qualifications show a similar pattern.

Table 2: Qualifications by year (females)

Qualification	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
0 to 5 A level pts	1.34	1.17	1.04	0.93	0.86	0.76
6 to 10 A level pts	10.36	9.77	9.01	8.44	7.93	7.53
11 to 15 A level pts	9.68	9.55	9.25	8.98	8.89	8.66
16 to 20 A level pts	14.46	14.56	14.96	15.14	15.06	14.97
21 to 25 A level pts	8.73	9.06	9.59	9.78	9.79	10.00
26 to 30 A level pts	11.28	11.35	12.57	13.22	13.61	14.05
Access/Foundation	8.26	7.84	7.12	6.72	6.74	6.42
Baccalaureate	0.39	0.35	0.39	0.38	0.28	0.25
BTEC/SCOTVEC	8.58	8.81	8.57	8.54	8.77	9.02
Deg/Partial Degree Credits	1.26	1.29	1.49	1.66	1.87	1.96
GNVQ Distinction	1.52	1.71	1.99	2.21	2.34	2.36
GNVQ Merit	2.18	2.21	2.43	2.47	2.69	2.60
GNVQ Pass	2.44	3.17	3.47	3.37	3.45	3.64
Highers 3 or less	1.44	1.18	1.26	1.23	1.04	1.10
Highers 4	1.27	1.13	1.16	1.18	1.11	1.10
Highers 5	1.60	1.54	1.50	1.57	1.58	1.60
Highers 6 or more	1.73	1.71	1.70	1.73	1.74	1.87
None or unrecorded	4.57	5.71	5.35	5.71	5.54	5.60
Other qualification	8.93	7.90	7.17	6.76	6.69	6.51
Acceptance rate						
0 to 5 A level pts	58.65	63.43	64.87	67.31	66.16	69.06
6 to 10 A level pts	69.62	73.87	73.16	72.98	75.53	78.29
11 to 15 A level pts	78.08	80.74	80.52	81.32	82.9	84.67
16 to 20 A level pts	84.51	86.62	85.7	86.44	87.37	88.79
21 to 25 A level pts	87.85	89.05	88.36	89.42	90.30	91.11
26 to 30 A level pts	90.74	91.66	90.79	90.95	91.90	92.16
Access/Foundation	67.07	68.84	68.20	68.12	68.56	70.46
Baccalaureate	71.78	72.67	70.45	75.39	78.62	82.87
BTEC/SCOTVEC	62.53	63.72	65.06	67.72	69.15	71.06
Deg/Partial Degree Credits	50.80	50.30	50.98	57.12	57.30	62.52
GNVQ Distinction	79.24	79.61	81.88	82.58	83.36	84.07
GNVQ Merit	69.66	71.70	74.43	77.55	78.63	80.92
GNVQ Pass	41.67	49.06	51.04	53.57	57.05	60.91
Highers 3 or less	40.48	40.05	44.38	45.16	49.49	47.20
Highers 4	76.13	76.98	76.18	77.79	79.05	80.91
Highers 5	86.11	85.45	87.00	87.51	87.29	87.78
Highers 6 or more	94.44	94.29	93.86	93.60	94.54	94.66
None or unrecorded	48.81	67.12	67.79	75.19	77.96	81.20
Other qualification	48.36	51.17	49.79	51.14	53.62	59.43
Overall acceptance rate	72.34	75.31	75.62	77.29	78.78	80.78
Expected acceptance rate using 1996 acceptance rates	72.34	72.28	72.82	73.08	73.18	73.26

3. TRENDS

Table 2 gives a year-by-year breakdown of the female data (the male pattern is the same). One interesting point to note is grade inflation — the percentage of people with top A-level grades increases inexorably over time. Grade inflation is a somewhat pejorative term, as some claim that this reflects a real improvement in quality. The second feature, apparent from the second part of the table, is the marked increase in the acceptance rate from 72.34 percent in 1996 to 80.78 percent in 2001.

So what is the main cause of the rise in female acceptance rates, grade inflation or higher acceptance rates for a given grade? One way to tell is to do the following counterfactual experiment. Take the 1996 acceptance rates for each qualification and then use these to predict what the acceptance rate would be in each year if each qualification had the 1996 acceptance rate. If it was all a question of grade inflation, then the predicted acceptance rate would be close to the actual acceptance rate. The results of this experiment are shown in the last row of the table and grade inflation only accounts for just 12.3 percent of the rise in the average acceptance rates over time. A lowering of acceptance standards has largely driven the rising acceptance rate. It is apparent that it is the dramatic rise in acceptance rates for those with lower qualifications that is accounting for this upward trend. It confirms the perception that for both men and women with weaker qualifications it has never been easier to participate in HE.

Around 30 percent of 18-30 year-olds currently enter the HE sector and because the British government has set an ambitious target (recently downgraded to an 'aspiration') of 50 percent participation by 2010, HE will represent an increasing part of women's pre-labour market experience. Those with lower qualifications and where they end up are, therefore, of special interest.

4. MEASURING APPLICANT AND ACCEPTANCE QUALITY

The primary purpose here is to show that female applicants are better qualified than men by deriving a measure of average qualification quality. Clearly, it would be uncontroversial that the A-level point score ranks quality and that the three types of GNVQ qualification and number of Highers also reflect quality differences. It should also be noticed from Table 1 that a higher A-level point score means a greater proportion are accepted. This ranking also carries through with GNVQ qualifications and Highers. The problem is to map all 19 qualifications into one single quality scale. Leslie (2003) has developed such a measure, which is based on the particular institutional setting of the UCAS system.

Individual applicants are assumed to be expected utility maximisers. Briefly, the typical applicant is allowed to select two offers prior to the result of examinations, known as the firm and the insurance offer. In choosing which to go for, each applicant has an idea of likely examination performance. Likely performance is a noisy signal of the actual outcome and those who

expect to do well seek out better HE institutions. So it can easily turn out that unlucky applicants who made ambitious choices and under-performed could end up with no place.

There are two countervailing forces at play in selecting offers. A better institution, given ability, means a lower acceptance chance and higher ability means a greater acceptance chance, given institution. If applicants maximize utility it turns out that higher ability applicants are more likely to seek out better institutions, but also allow themselves to have a greater probability of acceptance. Those who have disappointing outcomes may very well find themselves without an acceptance, even though they may have better qualifications than someone who is accepted. Utility maximisation means that applicants with higher qualifications have a higher probability of acceptance. In this way it can be shown that the proportion of those accepted with a particular qualification can be used as a measure of its quality. Leslie (2003) offers more detail.

Over and above the theoretical justification, the measure has a strong intuitive appeal. A qualification, which has a greater success rate in a competitive system, is plausibly a better qualification. The measure of quality is the weighted average $\sum_{i=1}^{19} \alpha_i \overline{p}_i$ for the group of interest, where α_i is the relevant proportion among the 19 possible qualifications and $\overline{p}_i$ is the proportion that successfully gains an acceptance with the ith qualification level. This is the overall success rate for everyone averaged over the whole period 1996-2001. These numbers are then normalised to lie between 1 (the score if everyone in the group had the top ranked qualification) to zero (the score if everyone in the group had the bottom ranked qualification).

As well as measuring average quality, another question of interest is the spread of quality. Arulampalam *et al.* (2002) argue that the spread of ability as well as average ability influences student drop-out rates. Spread can be measured using the standard Gini coefficient inequality measure, with higher values indicating a more spread-out distribution of quality. The Gini coefficient is bounded between zero (everyone in the group has the same quality) and one.

Table 3 shows qualification quality for males and females separately for various categories by year. The associated Gini coefficient is shown below the measure of average quality. Focusing first on average quality, three features are apparent. First are the better qualifications of females. Second is the improvement in applicant quality over time. This is the grade inflation effect that has been alluded to earlier. However, the quality improvement is actually rather small compared with other differences and degree acceptance quality has not noticeably changed. One reason is that more with poorer qualifications are being accepted, which offsets the grade inflation effect. The third feature is that the selection process leads to large jumps in quality and it

should be noted that female and male degree acceptance quality become much closer as a result of selection. Given that fewer females are accepted, this seems somewhat counterintuitive, but is explained in Section 4. Note that HND acceptance quality is far below degree acceptance quality as would be expected.

Table 3: Applicant and acceptance quality by year

	Year						*Average*
	1996	*1997*	*1998*	*1999*	*2000*	*2001*	*1996-01*
Male applicant quality	0.602	0.607	0.615	0.622	0.623	0.625	0.616
Gini coefficient	0.092	0.090	0.090	0.089	0.090	0.090	0.090
Female applicant quality	0.621	0.625	0.635	0.641	0.642	0.644	0.635
Gini coefficient	0.090	0.088	0.088	0.087	0.087	0.088	0.088
Male degree acceptance quality	0.682	0.686	0.692	0.696	0.695	0.690	0.690
Gini coefficient	0.076	0.075	0.074	0.073	0.074	0.076	0.075
Female degree acceptance quality	0.694	0.694	0.703	0.705	0.704	0.700	0.700
Gini coefficient	0.074	0.074	0.072	0.072	0.073	0.075	0.073
Male HND acceptance quality	0.363	0.383	0.384	0.389	0.396	0.394	0.385
Gini coefficient	0.082	0.081	0.083	0.083	0.081	0.082	0.082
Female HND acceptance quality	0.393	0.403	0.405	0.412	0.420	0.420	0.410
Gini coefficient	0.090	0.087	0.088	0.087	0.084	0.085	0.087

The Gini coefficients do not change significantly through time, and the only real difference between men and women is HND acceptances. Women, although better qualified on average, also have a larger range of qualifications. Another feature is that the selection process, by generally knocking out those with lower qualifications, means a lower Gini coefficient for those accepted onto degree schemes. HND courses do not have such strict acceptance criteria and the Gini coefficients are similar to applicants.

5. Subject segregation

The UCAS data identify 170 separate subject choices and Table 4 shows those twelve subjects with the least concentration of females and the twelve with the largest concentration of females for degree acceptances. The Gini coefficient for subject segregation turns out to be 0.465. This indicates a very high degree of subject segregation.[6]

Given this heterogeneity, gender differences in the graduate premium are less surprising. Elias (1999, p. 46) shows that different degrees command different salaries. As an example mathematics and computing commands the largest graduate premium by far at around 26 percent three and a half years after graduation. This broad subject group attracts only 22.1 percent women,

compared with the average representation across all subjects of 53.4 percent. Engineering also has a substantial premium of 15 percent, which attracts 14.3 percent women. Over-represented female groups such as Arts have a negative premium. This evidence is suggestive that subject choice contributes to lower female graduate earnings - but clearly this is by far the whole story. Naylor *et al.* (2000) show that specific graduate occupations attract significant male premiums. Subject segregation is found in the US, leading to the same question whether this helps explain male female wage differentials (see Brown and Corcoran, 1997).

Table 4: Subject segregation (degree level courses)

Subject (bottom twelve)	*Male grade*	*Female grade*	*Female proportion*
H3 Mechanical engineering	0.718	0.795	0.082
J6 Maritime technology	0.646	0.645	0.083
HJ Combinations	0.656	0.705	0.089
H4 Aeronautical engineering	0.748	0.807	0.097
H5 Electrical engineering	0.688	0.771	0.103
H6 Electronic engineering	0.626	0.625	0.103
G6 Computer systems engineering	0.551	0.559	0.111
D3 Forestry	0.580	0.585	0.115
K2 Building/Construction	0.560	0.590	0.117
J1 Minerals technology	0.584	0.618	0.120
H1 General engineering	0.588	0.663	0.132
G8 Artificial intelligence	0.699	0.690	0.134
Subject (top twelve)			
L7 Psychology	0.649	0.665	0.809
L5 Social work	0.425	0.452	0.811
K9 Other architectural studies	0.657	0.684	0.833
J4 Polymers and textiles	0.592	0.611	0.836
X9 Other topics in education	0.551	0.535	0.839
W6 Craft	0.513	0.597	0.851
X5 Primary all ages (upper and lower primary)	0.605	0.641	0.891
B4 Nutrition	0.539	0.655	0.916
B7 Nursing	0.489	0.586	0.923
X2 Nursery and infants (nursery and lower primary)	0.606	0.636	0.936
W8 Creative therapies	0.509	0.533	0.944
X3 Infants only (lower primary)	0.574	0.614	0.955

Even though there are differences in subject choices, the qualifications of men and women for particular subject choices are very similar. Subjects which are under-represented with women do not therefore attempt to increase numbers by operating a 'dual standard' admissions criterion. A regression of male grade quality against female grade quality for those accepted on degree

level courses (using the measure described) gives the following result:

$$\begin{array}{lll} \text{Male grades} = -0.006 + 0.983 \text{ female grades} & R^2 = 0.75 & \\ \quad\quad\quad\quad\quad\quad (0.035) \quad (0.037) & \text{obs.} = 170 & (1) \end{array}$$

The standard errors (in parentheses) indicate that the intercept is not significantly different from zero, and the slope is not significantly different from one.[7] However, female grades are on average a little higher than males with an unweighted difference across the 170 subject groups of 0.018. So although proportions differ considerably, there are no significant gender differences in average quality across subjects. Furthermore, the spread of qualifications is very similar. A regression of the male Gini against the female Gini gives the following result:

$$\begin{array}{lll} \text{Male Gini} = 0.012 + 0.820 \text{ female Gini} & R^2 = 0.58 & \\ \quad\quad\quad\quad\quad\quad (0.0051) \quad (0.080) & \text{obs.} = 170 & (2) \end{array}$$

Once again, it is subject differences that dominate, rather than gender difference within subjects. One strong feature is that average subject quality and the subject Gini have a strong negative correlation, as seen below:

$$\begin{array}{lll} \text{Quality (M+F)} = 1.022 - 4.829 \text{ Gini (M+F)} & R^2 = 0.72 & \\ \quad\quad\quad\quad\quad\quad (0.047) \quad (0.067) & \text{obs.} = 170 & (3) \end{array}$$

Subjects that have low average quality also have a long tail of poorly qualified people, but this is true for both men and women.

The second major gender difference is acceptances on degree level courses and HND courses. Proportionately more men than women are admitted onto HND courses and this fact accounts for many of the apparent advantages of men over women. On average 10.70 percent of men overall are accepted onto HND courses, compared with 6.59 percent of women. Once this fact is taken into consideration the advantage men enjoyed in terms of acceptances disappears when the percentage accepted onto degree level courses alone is considered. Women on average now enjoy a 1.68 percent advantage over men.

The HND issue explains why acceptance rates for poorly qualified men are higher than poorly qualified women, which was noted in the discussion of Table 1. Poorly qualified women are not taking up HND places to the same extent as men. So is this evidence of discrimination at the low ability level? The heart of the matter seems to be subject segregation. HND provision is much smaller than degree level provision — only 114 out of the 170 subjects are covered at HND level. The subjects that are covered are 'male dominated'. This can be confirmed by taking the proportion of women in degree level courses for each subject and then use these numbers to predict what proportion of women might be expected in HND courses, if HND provision mirrored

the pattern of segregation found at degree level. It turns out that the predicted proportion of women is 7.33 percent, which is only slightly above the actual value of 6.59 percent. So this suggests that HND provision is not well suited for low ability women and that many are dropping out of HE as a consequence. The importance of this finding is the 2010 aspiration for 50 percent of young people to undertake HE. Necessarily, this requires a greater provision of `lower tier' courses. If these merely duplicate what is currently on offer, this will further exacerbate the problem of recruiting lower ability women.

But there is another very important point concerning sub-degree provision, which helps explains the apparent low take-up by women. There is a separate admissions service for nursing and closely related subjects, which is the Nursing and Midwifery Admissions Service (NMAS). Around 54,000 (UK domiciled) entered nursing via NMAS (mainly at Dip. HE level) over the four years 1998-01, and around 46,000 of these were women (NMAS, 2001). These are most probably a significant overestimate because the NMAS data are not that reliable in estimating the true number of overseas acceptances. Notwithstanding this, nursing clearly has a very large impact at the sub-degree level in terms of UK domiciled numbers, which the UCAS data do not take account of.

There were 14,730 unsuccessful female nursing applicants through UCAS and 1,138 men over the six year period. It is possible that some of these would then have secured a sub-degree place through NMAS (an UCAS and a NMAS application is permissible), though what the proportions actually were is anyone's guess. If all were successfully placed through NMAS then the overall success rate for men would have been 78.5 percent and 77.9 percent for women. If nursing is excluded from the UCAS data, the predicted proportion for women on HND courses increases marginally to 7.4 percent. The fact remains HND provision (excluding nursing) is male dominated, but this may reflect a female taste for nursing through the NMAS system.

5. Identifying discrimination using decomposition analysis

Decomposition analysis, independently developed by Blinder (1973) and Oaxaca (1973), offers a way of determining the extent to which any observed difference is a consequence of a characteristic difference (e.g. women are better qualified) or the consequence of discrimination, i.e. men with similar characteristics as women receive more favourable treatment.

Gomulka and Stern (1990) demonstrate how decomposition analysis is applied to probit and logit models. The logit model offers some advantages and is based on the following estimated function for females:

$$P(\hat{\alpha}^F X_i^F) = \frac{1}{1+\exp(-\hat{\alpha}^F X_i^F)} \qquad (4)$$

where $P(\hat{\alpha}^F X_i^F)$ is the probability of the ith female being accepted onto a degree

and where $\hat{\alpha}^F$ is a row vector of estimated coefficients and X_i^F is an associated vector of characteristics that explain the acceptance probability. These characteristics need not only include qualifications, which has been the main focus of attention here, but also other factors such as social background, ethnicity and so on. A second logit model using the same characteristics is fitted for males. A second set of coefficients is then obtained for males. A likelihood ratio test can then be performed to test the hypothesis that the coefficients in the male and female equations are the same. It turns out that the likelihood ratio test easily rejects the hypothesis of coefficient equality. However, given the large number of observations, this is not altogether surprising because standard errors in the fitted equations are typically small, so the smallest differences in coefficients show up as significant. So really it is a matter of the quantitative significance of the overall coefficient effect, rather than immediately asserting some discriminatory process.

The next stage is to determine how much of any difference in the mean acceptance rate is due to differences in characteristics and how much is due to differences in how particular characteristics are rewarded — the coefficient effect. The focus is to explain admission onto degree schemes, exclusive of any HND offer. Women, enjoy a small overall acceptance advantage, but this does not rule out discrimination. Counteracting characteristic and coefficient effects could still mean that women face discrimination.

From eq.(4), construct the probability of acceptance for each individual and then find the average probability for the male and female groups. The difference in these average probabilities is then:

$$\bar{\Delta}^F - \bar{\Delta}^M = \bar{P}(\hat{\alpha}^F X^F) - \bar{P}(\hat{\alpha}^M X^M) \tag{5}$$

In the logit equation this is the same as the difference in the mean sample acceptance rates. This difference can then be decomposed into the two components as follows:

$$\bar{\Delta}^F - \bar{\Delta}^M = [\bar{P}(\hat{\alpha}^F X^F) - \bar{P}(\hat{\alpha}^M X^F)] + [\bar{P}(\hat{\alpha}^M X^F) - \bar{P}(\hat{\alpha}^M X^M)] \tag{6}$$

Here the male coefficients are used to predict the female average probability using female characteristics. This is the $\bar{P}(\hat{\alpha}^M X^F)$ term. The first term in square brackets is the coefficient contribution and the second part is the characteristics contribution to the total difference. A second decomposition uses the female equation to predict male probabilities.

$$\bar{\Delta}^F - \bar{\Delta}^M = [\bar{P}(\hat{\alpha}^F X^M) - \bar{P}(\hat{\alpha}^M X^M)] + [\bar{P}(\hat{\alpha}^F X^F) - \bar{P}(\hat{\alpha}^F X^M)] \tag{7}$$

In principle, each can give a different answer, but in practice they are usually fairly close. Typically in decomposition analysis it is possible to further decompose the total characteristics effect into the separate components of the characteristics used in the logit model. Jones (1983) has shown that it

is not possible to further decompose the coefficients effect. However, since the logit model is non-linear it is not possible to do this directly as in a standard OLS regression model. The log odds form of eq.(4) is linear in the explanatory variables, as below:

$$\ln \frac{P(\hat{\alpha}^{F} X_i^{F})}{1 - P(\hat{\alpha}^{F} X_i^{F})} = \hat{\alpha}^{F} X_i^{F} \tag{8}$$

Here the characteristics component can be split into its various categories and this forms the basis of the finer level decomposition of characteristics.

Table 5 reports the estimated logit equation for females.[8] The male equation is qualitatively similar and is not reported. Altogether seven groups of characteristics are used to explain the acceptance probability and these are all self-explanatory. It turns out that each characteristic group makes a significant contribution, but the most important by far are qualifications, which is exactly what one might expect in a merit based competitive system that characterizes HE in the UK.

Turning briefly to the other characteristic groups, there are ethnic differences in acceptance rates, with the Black groups seemingly disadvantaged. Overall, however, members of the ethnic communities enjoy a slight acceptance advantage. The year effects show the steady upward trend in acceptance rates and the social class variables all have the expected sign — but note that these effects are tiny compared with other coefficients. The educational establishment variables are split into a 1996-97 group and a post 98 group. This simply reflects the way the data are presented with a broader breakdown after 1998.

Table 6 reports the decomposition analysis, shown in eqs (6) and (7), and the results are very telling. Characteristics, not coefficients are the main cause of the difference in the acceptance proportion — and both methods of decomposition show this. The bottom half of the table shows the contribution of the individual components. It is qualifications that once again are the dominant component. So on this basis there is no discrimination; more women are accepted onto degree schemes because they have better characteristics — where those characteristic differences are exclusively in having better qualifications.

Table 7 undertakes exactly the same decomposition analysis comparing white females with non-white females. This is useful because there is a larger acceptance difference at 6.9 percent compared with 1.69 percent. Consequently, the potential for a significant discriminatory effect is greater.[9] The striking feature is the similarity with Table 6. It is qualifications that are once again the dominant influence in explaining the acceptance difference. The coefficient effect indicates a small favourable treatment for ethnic communities, but this more likely reflects a greater determination among the ethnic communities to have an HE experience rather than positive discrimination.

Table 5 Female logit
(dependent variable = 1 if accepted onto a degree, 0 otherwise)

	coeff.	*t-stat.*
Constant	-0.37	(7.83)
Ethnic group (default White)		
Asian Bangladeshi	0.01	(0.52)
Asian Chinese	0.19	(7.85)
Asian Indian	0.15	(13.98)
Asian Other Asian	0.01	(0.34)
Asian Pakistani	0	(0.23)
Black African	-0.11	(7.54)
Black Caribbean	-0.1	(6.37)
Black Other	-0.09	(3.80)
X Other	-0.01	(0.88)
Time effects (default 1996)		
Year 1997	0.11	(15.04)
Year 1998	0.54	(8.00)
Year 1999	0.61	(9.04)
Year 2000	0.67	(9.97)
Year 2001	0.82	(12.18)
Social class (default professional)		
II Intermediate	-0.05	(5.65)
IIIM Skilled Manual	-0.15	(16.63)
IIIN Skilled non-Manual	-0.06	(5.90)
IV Partly Skilled	-0.13	(12.72)
V Unskilled	-0.17	(9.71)
X Unknown	-0.07	(7.67)
Educ. institution (96&97) (default A Other Maintained)		
A Comprehensive	0.38	(8.69)
A Grammar	0.16	(3.51)
A Sixth Form Centre	0.24	(4.36)
B Independent	0.27	(5.93)
C Other FE	0.27	(6.28)
C Sixth Form College	0.32	(7.10)
C Technical	0.16	(2.35)
D Higher Education	0.41	(8.67)
E Other	0.38	(7.93)
F Not known	0.66	(14.96)

	coeff.	*t-stat.*
Educ. institution (98 onwards) (default City Tech College)		
Adult College and Centre	0.2	(2.25)
Agric. & Hort. College	-0.72	(9.38)
Art Design & Perf. Art	-0.1	(1.93)
Comprehensive School	-0.07	(1.40)
Further Education	-0.2	(3.78)
Grammar School	-0.39	(7.34)
Grant Maintained (Spec Schl)	-0.03	(0.26)
Grant Maintained (Former Ind)	0.17	(1.65)
Grant Maintained Sec (State)	-0.09	(1.76)
Higher Education	0.22	(3.46)
Independent School	-0.22	(4.23)
Language School	0.51	(1.89)
Other Secondary School	-0.54	(9.04)
Sixth Form Centre	-0.08	(1.41)
Sixth Form College	-0.11	(2.07)
Special School	-0.56	(2.38)
Technical College	-0.35	(2.66)
Tertiary College	-0.16	(3.04)
Unknown	0.2	(3.83)
Further/Higher Ed (2001 only)	-0.18	(3.48)
Qualification level (default 5 pts or less)		
10 to 6 pts	0.67	(34.83)
15 to 11 pts	1.27	(64.78)
20 to 16 pts	1.73	(89.53)
25 to 21 pts	2.04	(99.64)
30 to 26 pts	2.3	112.38)
BTEC/SCOTVEC	0.21	(10.84)
Baccalaureate	0.88	(22.04)
Deg/Partial Degree Credit	-0.21	(8.74)
Foundation/Access	0.59	(29.93)
GNVQ Distinction	1.02	(43.99)
GNVQ Merit	0.37	(17.25)
Highers 3 or less	-0.69	(27.53)
Highers 4	0.91	(32.90)
Highers 5	1.52	(50.60)
Highers 6 or more	2.34	(62.98)
None	0	(0.25)
Other	-0.64	(32.80)
GNVQ Pass	-0.65	(31.24)
Additions to main qualification		
AS level	0.02	(2.42)
CSYS	0.58	(20.23)
Pseudo R2		0.14
no. obs		1230438

Table 6: Decomposition analysis (females compared with males)
- acceptance onto degrees

Decomposition around female characteristics	*absolute amount*	*%*	*Decomposition around male characteristics*	*absolute amount*	*%*
Total difference (Average female acceptance rate - male acceptance rate)	0.0169		Total difference (Average female acceptance rate - male acceptance rate)	0.0169	
Characteristics effect	0.0184	109.42	Characteristics effect	0.0169	100.50
Coefficients effect	-0.0016	-9.42	Coefficients effect	-0.0001	-0.50
Contribution of characteristic components			*Contribution of characteristic components*		
Ethnicity		-1.81	Ethnicity		-2.26
Time		7.13	Time		5.87
Social class		0.07	Social class		-0.17
Educational establishment		-9.41	Educational establishment		-6.15
Qualifications		102.93	Qualifications		101.48
Additional qualifications		1.08	Additional qualifications		1.23
Total		100.00	Total		100.00

7. Concluding comments

It has been shown that there is no direct discrimination against women at the entry level into HE, in contrast to their labour market experience as a whole. The key factor is to distinguish the two tiers of HE provision, degree level courses and HND provision. The latter accounts for about 8.6 percent of the HE market (excluding nursing). Men are disproportionately represented at the HND level and this accounts for why more poorly qualified men are accepted into HE as a whole. This does not demonstrate discrimination at the HND level because it was found that it was subject segregation that was largely driving this difference. HND level courses are male orientated, so the lower female participation rate reflects a lack of suitable provision. This has important policy implications given the intention to widen participation to HE. Widening participation would require the provision of more lower tier HND style courses - unless we are happy to accept that nursing will disproportionately absorb large numbers of women at the non-degree level. If these continue to be male dominated, then the small gender difference in acceptance rates is likely to widen.

Table 7: Decomposition analysis (white females compared with non-white females)
- acceptance onto degrees

Decomposition around non-white characteristics	*absolute amount*	*%*	*Decomposition around white characteristics*	*absolute amount*	*%*
Total difference (Average white acceptance rate - non-white acceptance rate)	0.069		Total difference (Average white acceptance rate - non-white acceptance rate)	0.069	
Characteristics effect	0.075	108.43	Characteristics effect	0.079	114.62
Coefficients effect	-0.006	-8.43	Coefficients effect	-0.010	-14.62
Contribution of characteristic components			*Contribution of characteristic components*		
Time		-4.33	Time		-3.07
Social class		4.28	Social class		2.34
Educational establishment		0.34	Educational establishment		-1.38
Qualifications		96.70	Qualifications		98.60
Additional qualifications		3.02	Additional qualifications		3.50
Total		100.00	Total		100.00

HE is still dominated by degree level courses. Over the 1996-2001 period 882,402 women were accepted into full-time undergraduate degrees compared with 770,150 men. The female acceptance rate was also1.68 percent higher on average. Females being on average better qualified largely explain this higher success rate. So overall, apart from the issues arising out of HND provision, there is no evidence of any serious gender issues at the entry level into HE. Nor is there any credible evidence of discrimination against ethnic minority women at the entry level.

ENDNOTES

1. Dept of Economics, Manchester Metropolitan University, Cavendish St Manchester M15 6BG, UK. e-mail d.leslie@mmu.ac.uk. The paper was presented at the 2003 Royal Economic Society special session on 'Career Development in the Economics Profession'. Jim Wilkins of UCAS helped me through some of the intricacies of the data and thanks to Paul Turner and David Blackaby for useful advice. Remaining errors are my own.

2. Blackaby *et al.* (1997); Swaffield (2000); Joshi and Paci (1998); Makepeace *et al.* (1999) provide evidence about pay differentials. Blackaby *et al.* (2001) show that the earnings gap for women is widest at the upper tail of the earnings distribution and Belfield et al. (1997), in a survey of over 18,000 graduates, showed that male gradu-

ates earned 13 percent more that female graduates 11 years after graduation. The Barclays fifth annual Graduate Survey in 1998 showed that male graduate starting salaries were 19 percent higher than females. These figures are significantly lower than an earlier figure of 27 percent male advantage in 1977 for 1970 graduates reported by Dolton and Makepeace (1986), but are still large.

3. There is a broad split between degree level courses, which generally last for three years (four in the case of Scotland) and HND courses, which usually last for two years. HND courses are less demanding and the qualification standard is lower. Many traditional universities will not offer any HND level courses, whereas many of the `new' post 1992 universities offer a mixture of HND and degree level courses.

4. A description of the UCAS application process is given in Leslie (2003). Abbott and Leslie (2004) explore an aggregate model of applications and acceptances by HE institution. The data are available at www.ucas.ac.uk.

5. Details of specific qualifications are in *UK Qualifications for Entry to Higher Education*, published annually by UCAS (see UCAS, 2001).

6. This method has a long history as a measure of the degree of segregation among US ethnic minorities, see Duncan and Duncan (1955).

7. The standard errors are heteroscedastic adjusted using the procedure of White (1980).

8. A small number of observations are excluded, consisting of those applying to HE from the prison service.

9. Leslie *et al.* (2002) argued that the far larger ethnic differences are not evidence of discrimination. Modood and Shiner (1994) also investigate ethnic disadvantage. Poorer qualifications are evidence of pre-labour market discrimination.

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