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GRADUATE EMPLOYABILITY: POLICY AND PERFORMANCE IN HIGHER EDUCATION IN THE UK*

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The UK government is introducing new sets of indicators designed to measure the performance of universities. A first wave of indicators was published in December 1999. A performance indicator based on graduate employment outcomes will follow. This paper proposes a method for developing employment-related performance indicators based on the analysis of data on the first destinations of a full cohort of leavers from pre-1992 universities in the United Kingdom. We analyse the determinants of graduate first destinations and suggest a method for the construction of university performance indicators. We also discuss limitations of league tables based on university performance indicators.

> 'Given the substantial public investment in university students, it is particularly important that they are employable upon graduation. Better information is crucial to this aim. Work is already in progress on improving performance indicators, including those on employment outcomes, that will better inform the choice of prospective students. Those relating to employment outcomes will take effect in 2000.'
> Rt. Hon. Gordon Brown, Chancellor of the Exchequer, cited in PISG/HEFCE Report 99/11, February 1999.

In the education sector in the United Kingdom, the publication of performance-based league tables of schools, colleges and universities has become an important aspect of public policy. This is also true of other sectors, especially health, and is an increasingly common feature of both regulated and quasi-markets in many countries. In the absence of price competition in such markets, performance tables are typically intended to provide information relevant to consumer choice. For secondary schools in England and Wales, annual rankings of schools based on public examination results first appeared in 1992. This was extended to primary schools in 1998. Following the recommendations of the National Committee of Inquiry into Higher Education (Dearing, 1997), the UK Government is currently in the process of developing performance indicators for universities and other higher education institutions. The first set of indicators was published in December 1999 by the Performance Indicators Steering Group (PISG), with a membership representing HM Treasury, the higher education funding council, and the Department

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for Education and Employment, among others. Given this representation, it seems inevitable that performance indicators will be incorporated into the funding formulae for higher education.

Whereas league tables of schools focus primarily on examination performance, it is clear from the work of the Performance Indicators Steering Group (see, for example, PISG (1999)) that university performance will be measured against a wide range of criteria. Assessment of the quality of both research and teaching in UK universities is already well established. For other dimensions of university performance, however, prior to the publication of performance indicators, the only information available has come from annual publications by the Higher Education Statistics Agency. These implicitly provide university league tables on, for example, degree classes awarded, staffing levels and students' first destination outcomes. Such league tables, based on the 'raw' data for each institution, are regularly reported in the press and media. Individual universities are understandably sensitive to their positions in the published tables, and argue that important differences in circumstances are not taken into account. The main point of constructing a valid performance measure is to take proper account of such differences, in order to compare universities on a like-for-like basis.

Although university performance is to be measured against a range of criteria, it is noticeable that, in his 1999 pre-Budget report, the Chancellor of the Exchequer attached particular importance to the construction of university performance indicators based on students' employment outcomes. From the Chancellor's statement quoted above, and from the PISG reports, it is clear that university performance indicators are intended to serve two main purposes. First, they will act as a management tool, further enabling government to link the allocation of higher education funds to measured performance. Second, there is an intention to produce better information for students concerning possible career routes that might follow particular university courses. The government has set up a 'Student Information Needs Group' to examine this issue. Performance measures of graduate labour market outcomes are likely to feature as an important element in the prospective student's information set.

As the Performance Indicators Steering Group has acknowledged, the task of constructing institution performance measures in the area of graduate employment raises particular difficulties. The purpose of the current paper is to stimulate a deeper debate on this important topic. We proceed by conducting an analysis of the determinants of graduate first destination outcomes. From this analysis, we derive a method for constructing employment-based university performance indicators. We are particularly mindful of the need to discuss important issues concerning the use and interpretation of performance measures.

The analysis is also intended to shed light on other current public policy issues in the area of higher education. One of these concerns the recent introduction of tuition fees for full-time UK students and the related debate on the funding of students through higher education. Tuition fees for UK

students were introduced for the first time in 1998 and were set at a fixed level of £1,000 per year, independent of the subject studied or the university attended. There has been much discussion on the question of whether fees should instead be differentiated by subject and/or institution. Dolton *et al.* (1997) have recommended that studies be undertaken to investigate how the labour market rewards different degree subjects. Our analysis provides some results on the relationship between labour market outcomes and subject and university of study and hence serves to inform this debate. We also examine the relationship between a student's social class background and their labour market outcome. As we discuss further below, our results are relevant for the issue of fees exemptions for students from poorer backgrounds.

The rest of the paper is set out as follows. In Section 1 we provide a short summary of relevant results from the literature on the construction of performance indicators for educational institutions. We also refer to the related literature analysing graduates' labour market outcomes. In Section 2 we provide a brief overview of the data and methodology we employ in our analysis. Section 3 discusses the results of the analysis of individual graduates' labour market outcomes. The focus in this Section is on the determinants of the probability that the individual is unemployed or out of the labour force following graduation. Section 4 then describes how the results of the individual-level analysis can be used in the construction of a university-level performance indicator. In Section 5 we extend the approach to capture dimensions of labour market outcomes other than just unemployment and inactivity. Section 6 considers possible problems, limitations and modifications of the approach adopted in Section 4. Section 7 closes the paper with conclusions and further remarks.

1. Performance Indicators for Educational Institutions

There is an extensive literature on the measurement of school peformance and a lively debate on the validity of league tables derived from school performance measures. It is generally accepted that school performance tables are potentially misleading if based on crude output measures with no adjustment for 'contextual' factors such as school intake. Awareness of the need to take account of the prior academic achievements of pupils has led to an emphasis on 'value-added' measures of school examination performance. The Government has declared support for this approach (see, for example, DfEE, 1995): although published annual league tables continue to be based on unadjusted data. Goldstein and Spiegelhalter (1996) express strong concern with the publication of unadjusted league tables of institutional performance in both the health and education sectors. We discuss similar concerns in the context of higher education in Section 6 below.

Much research shows that school performance is influenced by factors such as the socio-economic profile of school populations. For example, in an analysis of the productive efficiency of secondary schools in England and Wales, Bradley *et al.* (1999) find the occupational composition of the local

authority district to be a significant influence on school performance. Gibson and Asthana (1998) have argued that measures of school examination performance should take into account not only pupils' prior achievements, but also socio-demographic characteristics and other school characteristics, such as type, size and resources. It is interesting to note, however, that in the large literature on the effect of school quality on pupil 'performance', there is no clear evidence of significant positive effects (see, for example, Burtless (1996) and Dearden *et al.* (1996)). In analysing student outcomes and university performance, we allow for the possibility that similar sets of variables are influential in the context of higher education.

The issue of performance indicators for higher education institutions has received surprisingly little attention, with the exception of the lively debate concerning the measurement of research output (see for example, Francis *et al.* (1993)). This exception probably reflects the importance of the Research Assessment Exercises in UK universities. It is likely, however, that the work of the Performance Indicators Steering Group (henceforth, PISG) will stimulate a renewed interest in other aspects of university performance measurement. This occurred to a limited extent with the publication of the White Paper on *Higher Education: Meeting the Challenge* (1987), in which the Government first called for greater accountability and monitoring of universities. In 1990, Johnes and Taylor produced an influential book setting out a methodology for constructing a variety of institution performance indicators for the university sector. Johnes and Taylor (1990) viewed universities as multi-product organisations and proposed a method for deriving indicators of university performance with respect to outputs such as student non-completion rates, degree results, graduate post-university destinations and research activity. The analysis we develop in this paper is similar to that of Johnes and Taylor. However, our analysis exploits individual student-level data rather than aggregated university-level data. Individual-level data have only recently become available and provide a rich set of information on which to base the construction of university performance indicators. Although our focus in this paper concerns graduate labour market destinations, we suggest that our analysis is capable of being generalised to the construction of performance indicators for other outputs of universities.

Although there is relatively little statistical work focusing on the construction of university performance indicators, especially in the area of graduate transitions into the labour market, there is rather more analysis of the determinants of individuals' labour market outcomes post-university. Much of this work focuses on earnings outcomes of graduates (see, for example, Blundell *et al.* (1997)). There are also studies which focus on the early transitions from higher education to work. Connor *et al.* (1999), for example, chart the careers of Sussex alumni six years after graduation and find significant effects of degree subject, gender and age. McKnight (1999) reports on the results of a survey of approximately 11,000 1995 graduates and diplomates from 33 higher education institutions, tracking their early career paths over the first three and a half years. The results suggest important differences by subject, class of

degree, gender, background and institution attended in terms of early career trajectories.

2. Employment-related Performance Indicators for UK Universities: Data and Methodological Approach

There are a number of sources of information on university graduates and their labour market outcomes. The majority are *ad hoc* and cover relatively small populations or specific groups. However, by far the largest survey is the First Destination Survey (FDS) of all full-time undergraduate leavers[1] from UK universities, conducted by the Careers Offices of each university and deposited with the Higher Education Statistics Agency (HESA).[2] The response rate to the Survey is about 80% and the results can be matched to individual administrative records for each student. The Survey is conducted approximately six months after students have completed their course and identifies, *inter alia*, the main activity of the student leaver at that time. For UK students, the main activity can be grouped into four categories:

(i) Entering employment (*E*)
(ii) Proceeding to further education or training (*FS*)
(iii) Unemployed and seeking work or further study (*U*)
(iv) Inactive – unavailable for employment or further study (*OLF*)

For those in employment, further information is provided on the type of occupation.

On the basis of the information contained in the FDS, we propose a method for the construction of a set of employment-related university performance measures. First, we distinguish between 'positive' outcomes (*E* and *FS* above) and 'negative' outcomes (*U* and *OLF*). This reflects the view of the Chancellor of the Exchequer that, given the public investment in students, a positive return is expected from graduates. We generate a ranking of universities on the criterion of the probability of graduates being unemployed or inactive. We then distinguish between employment and further study and construct a performance measure for each of these categories. Finally, given the detailed information on the type of occupation entered by those in employment, we construct a performance measure based on the 'quality' of the graduates' employment. This is potentially important because, while some graduates are unemployed, others may be *under*-employed. If the purpose of performance measures is to capture the extent to which higher education institutions affect employability, it is appropriate to look beyond the probability of getting any job to that of obtaining particular types of job.

The performance measures we construct take account of differences across

[1] Additionally, all part-time students are included in the survey for the pre-1992 universities. Postgraduate students are also surveyed.

[2] Prior to the formation of HESA in 1994–5, university student data were held by the Universities' Statistical Records (USR).

universities in relevant 'contextual' charactistics, as occurs in most statistical analyses of school performance. Similarly, Johnes and Taylor (1990), in their analysis of university-level data, recommended that employment-related university performance measures be adjusted to take account of differences in subject mix across universities. They also suggested that one should allow for other factors which might be likely to affect a graduate's first destination: such as academic ability, social class background and gender. Previous analysis has been restricted to the use of university-level information. Indeed, the first report of the PISG states that although university PIs will take account of some relevant contextual characteristics of universities, they will be based on university-level (rather than individual student-level) information.

In our analysis, we exploit the fact that, for the first time, individual student-level data have become available for a full cohort of UK university graduates. The data refer to students graduating from pre-1992, or 'old', universities: that is, those pre-dating the abolition of the binary divide in UK higher education. The data match the First Destination response of the individual student to administrative records which are rich in information on: the student's higher education record (including institution and course details), prior qualifications, previous schooling and personal characteristics (including social class background). As the previous school attended is identified, DfEE information on school characteristics can be merged in to the dataset. Hence, the data are much richer than aggregated university-level information, and permit analysis of the determinants of the individual student's first destination outcomes. Consequently, the data also enable greater detail on student characteristics when controlling for these in constructing university performance measures. We now sketch the methodological approach we adopt for the development of adjusted indicators of university performance. Further details are provided in subsequent sections of the paper.

First, we exploit the individual-level data for the cohort of 1993 university leavers to model the probability that the student leaver is either unemployed or inactive (*OLFU*), rather than employed or in further study (*EFS*), six months after graduation. We examine the effects of prior qualifications, previous schooling, personal attributes and course characteristics, *inter alia*. We also obtain estimates of the effect of the university attended on the probability of *OLFU*. This can be interpreted as an 'adjusted' university effect after controlling for university differences in student and course-related characteristics. We then compare this measure of university performance against a 'raw' measure, which does not adjust for differences across universities in student or course-related characteristics. In particular, we compare the rankings or 'league tables' of universities on the bases of the adjusted and unadjusted measures.

We then extend the analysis in order to construct university performance measures, and hence derived rankings, for other dimensions of the first dimension outcome. Thus, for those in employment or further study, we model the probability of further study and calculate the marginal effects of each university on the probability of further study. Similarly, for those in

employment we distinguish between those in 'graduate' rather than 'non-graduate' occupations, and develop a university performance indicator on the basis of the marginal effect of attending each university on the unconditional probability of being in a graduate occupation. Similarly, one could split the *OLFU* probability into the probabilities of unemployment and inactivity, respectively, and construct performance indicators on the basis of the two separately.

We note that the approach we adopt in this paper of using individual-level data in order to compare adjusted with unadjusted university effects could, in principle, be extended to the construction of other university output indicators, such as those for degree performance and progression rates. Currently, the PISG proposals for performance indicators in these areas do not exploit individual student-level data.

3. Modelling Graduates' First Destination Outcomes

Table 1 presents the results from modelling the probability that the university graduate[3] is either unemployed or inactive (*OLFU*) – rather than employed or in further study (*EFS*) – six months after graduation. A binomial probit model is used. The analysis is conducted separately for men and women, as a test supports the hypothesis of marked differences by gender. The total number of UK-based undergraduate degree students in the cohort of 1993 leavers from the 'old' universities was 84,439. Of these 77% responded to the First Destination Survey, giving a sample of 65,347 students. We omit Medical students, as there is essentially no variation in their reported main activity on leaving university. The final sample consists of 62,018 graduates.

Of the 33,171 male graduates, approximately 19% were unemployed or inactive six months after graduation. 18% were in further study and 64% in employment. Of those employed, 83% were in a graduate occupation. Of the 28,847 females, 14% were unemployed or inactive, and 12% were in further study. 74% were employed of whom 76% were in graduate occupations.

Table 1 shows the estimated marginal effects (with p-values) on the *OLFU* probability of the individual's educational background and personal characteristics and of the variables relating to the graduate's degree subject and classification. With respect to the graduate's educational background, Table 1 shows that the individual's total A-level points score has a significant negative impact on the post-university *OLFU* probability for males (though not for females). For male students, an extra four points (equivalent to two grades higher) at A-level, *ceteris paribus*, reduces the *OLFU* probability by 0.38 percentage points. There are few significant effects associated with the particular A-levels an individual may have taken, after controlling for degree subject studied. The exception to this is Mathematics which reduces the *OLFU* probability of both men and women. For students who have previously taken

[3] We use the term 'graduate' as an abbreviation for any university leaver. Thus, failing students are classified as 'graduates' in our discussion.

Table 1

Marginal Effects on the Probability of Unemployment/Inactivity

	Males		Females	
	ME	p-value	ME	p-value
Educational background				
A-level pts	−0.38**	0.02	0.00	0.99
Chem	−0.14	0.82	0.51	0.47
Eng	0.24	0.73	0.26	0.64
Math	−1.10*	0.08	−2.34***	0.00
Phys	−1.02	0.98	−0.78	0.31
Higher pts	−0.75	0.21	−0.92**	0.05
Chem	−2.74*	0.09	1.66	0.22
Engl	−0.94	0.70	2.33	0.34
Math	−4.74**	0.02	0.28	0.95
Phys	3.92*	0.06	−2.36**	0.05
Ind sch	−0.14	0.90	0.46	0.62
Personal characteristics				
Age 24–27	0.21	0.63	2.05***	0.01
Age 28–33	1.53	0.22	3.03**	0.03
Age 34+	6.02***	0.00	0.74	0.56
Married	−4.22***	0.01	4.22***	0.00
SC I	−0.24	0.69	0.03	0.96
SC IIINM	−0.11	0.87	−1.07	0.11
SC IIIM	1.17	0.11	−0.72	0.32
SC IV	1.69*	0.06	1.63*	0.08
SC V	3.52	0.11	1.22	0.60
Degree information				
Medic. rel	−9.04***	0.00	−7.54***	0.00
Biol. sci.	1.58	0.24	0.97	0.38
Agric.+rel	−0.93	0.68	0.51	0.82
Phys. sci.	−1.21	0.34	−1.55	0.23
Math. sci.	−0.95	0.45	−1.99	0.16
Comp.+rel	−1.90	0.16	−2.17	0.40
Engineer	−2.81**	0.02	−2.88*	0.09
Technology	−1.35	0.53	−2.18	0.42
Arch.+build	2.19	0.28	−1.45	0.61
Law+Politic	−4.91***	0.00	−4.95***	0.00
Bus. Admin.	−1.74	0.16	−2.46**	0.05
Communic	2.51	0.55	−5.58*	0.07
Lit+Class	6.91***	0.00	0.08	0.94
MEu Lang	2.06	0.29	−1.99	0.11
Oth Lang	3.25	0.30	−2.83	0.16
Humanities	3.74***	0.00	−0.40	0.70
Creative	2.10	0.34	−1.81	0.23
Education	−7.32***	0.01	−7.65***	0.00
Other subj	3.56**	0.03	−0.43	0.76
Part-time	2.63	0.42	−4.43*	0.10
Degree class				
First	−7.48***	0.00	−3.59***	0.00
Lower 2	8.72***	0.00	4.26***	0.00
Third	16.90***	0.00	7.35***	0.00
Other	13.78***	0.00	9.12***	0.00
n	33,171		28,847	

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

Scottish or Irish Highers, the points score is significant, and negative, only for females. For males, Chemistry and Mathematics have the effect of lowering the *OLFU* probability. For women, only Physics has this effect. In the absence of separate measures of ability, prior qualifications capture the effects of both ability and prior acquisitions of human capital.

Table 1 also shows that there is no statistically significant effect of having previously studied at an Independent school rather than at a state-sector Local Education Authority school.[4] This result contrasts with findings in other work of significant differences in both degree performance and post-university occupational earnings between the two educational sectors (see, for example, Naylor *et al.* (1999)). The effects of other school characteristics, such as size and average A-level performancee, as measured by DfEE schools performance criteria were found to be generally insignificant and are not reported in the table.

With respect to personal characteristics, Table 1 shows the effects of age at graduation on the *OLFU* probability: men aged over 33 are 6 percentage points more likely to be unemployed or inactive than are men aged less than 24 at graduation. Women between 24 and 33 are at least 2 percentage points more likely to be unemployed or inactive. Female graduates who are married have a higher *OLFU* probability than other females: for men there is the reverse association. We note, however, that marital status may not be exogenous. Social Class background, reflecting the parental occupation of the student, has some effects on the *OLFU* probabilities of both men and women: the probabilities tend to be higher for students from lower Social Class backgrounds, *ceteris paribus*. This lends support to the policy of linking financial assistance to students to their parental resources: as occurs currently through means-related exemptions from tuition fees.

Table 1 shows that there are significant marginal effects associated with the subject studied at university, compared to the default case of students studying for Social Science degrees. This confirms the potential importance of controlling for subject studied in developing employment-based measures of university performance. Some might also take this as evidence in support of the differentiation of fees by subject studied. A danger with such a policy, however, would be the risk of deterring students from poorer backgrounds from entry into expensive but ultimately remunerative subject areas: at least in the absence of appropriate exemptions for such students. Students reading subjects defined within the Law and Politics group, for example, had a 5 point lower probability of *OLFU*. This holds for both males and females. Conversely, for male students of Literature and Classical Studies, the probability of *OLFU* was about 7 points higher than for Social Science students. Part-time status of female students emerged as only weakly significant on the probability of being unemployed or inactive six months after graduation.

Table 1 also shows the estimated effects of the student's degree class on the

[4] Dummy variables were included for students who had taken qualifications other than A-levels or Highers and also for other school types.

OLFU probability. Graduates with a higher class of degree are more likely to enter further study or employment than graduates who perform less well. Compared to an otherwise equivalent student with an Upper Second, a male (female) student with a First class degree has an *OLFU* probability which is about 7 (4) percentage points less. Conversely, compared to a student with an Upper Second, a student with a Lower Second is 9 (4) percentage points more likely to be unemployed or inactive and 17 (7) points more likely if they have a Third class degree: class of degree is an important determinant of the student's initial destination.

A number of other control variables were included in the analysis of the individual's probability of unemployment or inactivity, but are not reported in Table 1. These include: region of prior residence, course characteristics (e.g., duration), and characteristics of the department in which the student studied (e.g., RAE score, staff-student ratio, average staff salary, level of expenditure, and proportions of students male, postgraduate and obtaining good degrees). Of the latter group, only the proportion male and the proportion with good degrees have statisticaly significant effects: in each case the effect is positive. A possible interpretation of the latter result is that students have a higher probability of unemployment or inactivity the lower is their class of degree relative to the average in their department at their university. The marginal effects associated with the university attended are the focus of the analysis presented in the next Section.

4. Constructing a Model-based University Performance Measure

In the analysis of the determinants of the probability of graduate employment or inactivity six months after graduation, discussed in the previous Section, we also obtained estimates of the marginal effect of the university attended, relative to an omitted or 'base' case. We interpret the estimated marginal effect as an 'adjusted' university effect after controlling for individual student and course-related characteristics. We then compare the adjusted measure of university performance against a measure based on unadjusted university differences. Unadjusted university marginal effects are obtained from a probit regression of *OLFU* against university dummy variables with no other control variables included. This produces an unadjusted measure which is equivalent to the average *OLFU* probability in the raw data for each university, relative to the base case. Fig. 1 shows both the adjusted and the unadjusted university marginal effects on the *OLFU* probability for males. The universities are ordered by their unadjusted marginal effects. The figure shows that relative to the 'worst' performing university in terms of the unadjusted male *OLFU* probability, the marginal effect of the 'best' performing university is a 24 percentage point lower probability. There are relatively large differences in the unadjusted marginal effects near to the top and bottom of the ordering: in the centre, the gradient on the unadjusted marginal effects is relatively shallow. The differences between the adjusted and the unadjusted marginal effects shown in Fig. 1 are explained by university differences in student and course-

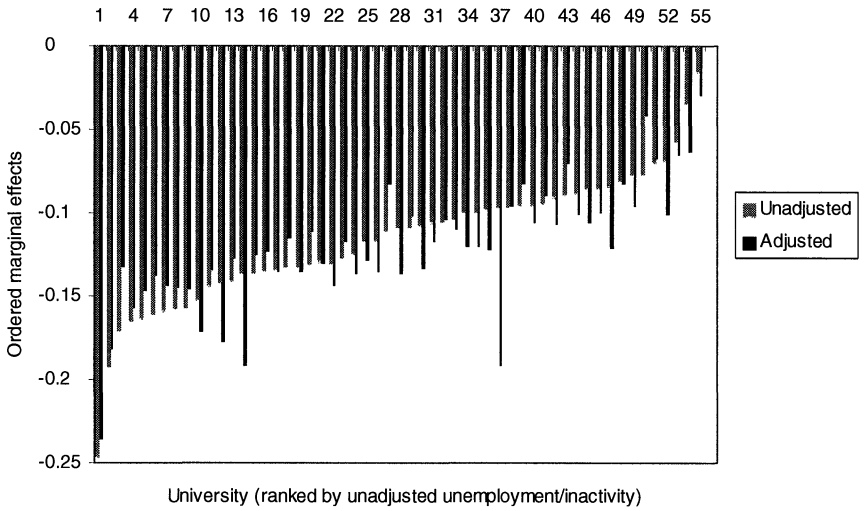

Fig. 1. *University Marginal Effects on Unemployment/Inactivity (males)*

related characteristics. There is a clear relationship between the relative size of the adjusted and the unadjusted university marginal effects. This is explored in more detail in Fig. 2.

As well as comparing the university marginal effects before and after adjustment, we can also compare the derived rankings – or 'league tables' – of

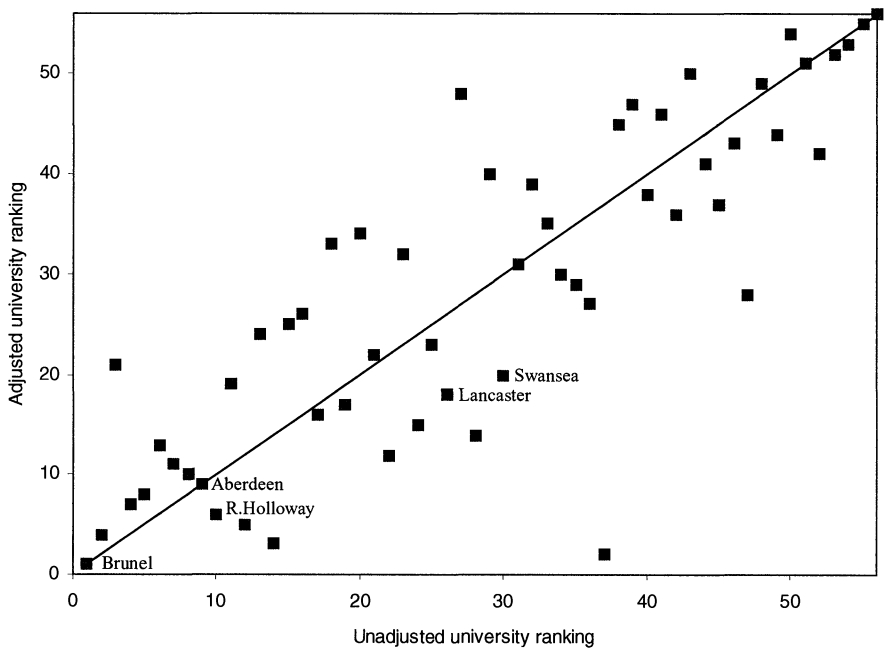

Fig. 2. *Comparison of Adjusted and Unadjusted University Rankings – Unemployment/inactivity (males)*

universities on the bases of both the adjusted and unadjusted marginal effects. This enables us to gauge the sensitivity of league tables to the adjustment for student and course-related characteristics. Figs 2 and 3 show the plots of the adjusted versus the unadjusted university rankings for male and female students, respectively. Each point represents an institution and the co-ordinates represent the adjusted and unadjusted rankings. If a university is observed on the 45° line, this indicates that its rank position does not change after controlling for student and course-related characteristics. For both men and women, the ranking of universities on the basis of the adjusted effects is rather different from the ranking based on the unadjusted effects. It is noticeable that both tails of the original distributions lie relatively close to the line, but that there are big movers elsewhere in the distribution. For example, of the top 10 universities in the unadjusted ranking for males, only the university ranked 3rd shows a big jump and 7 maintain a top-10 ranking. For females, six of the top ten universities in the unadjusted ranking maintain a top ten position. Around the centres of the distribution, relatively few universities maintain a similar ranking after adjustment. In part, this pattern reflects the fact that the gradient of the unadjusted marginal effects, shown in Fig. 1, is steepest close to the tails. Therefore, it is harder to break away from the extremes of the rankings.

The correlation between the adjusted and unadjusted *OLFU* rankings of universities is 0.78 for male students and 0.85 for females. These rank correlations are high, but conceal significant variation: the mean absolute movement

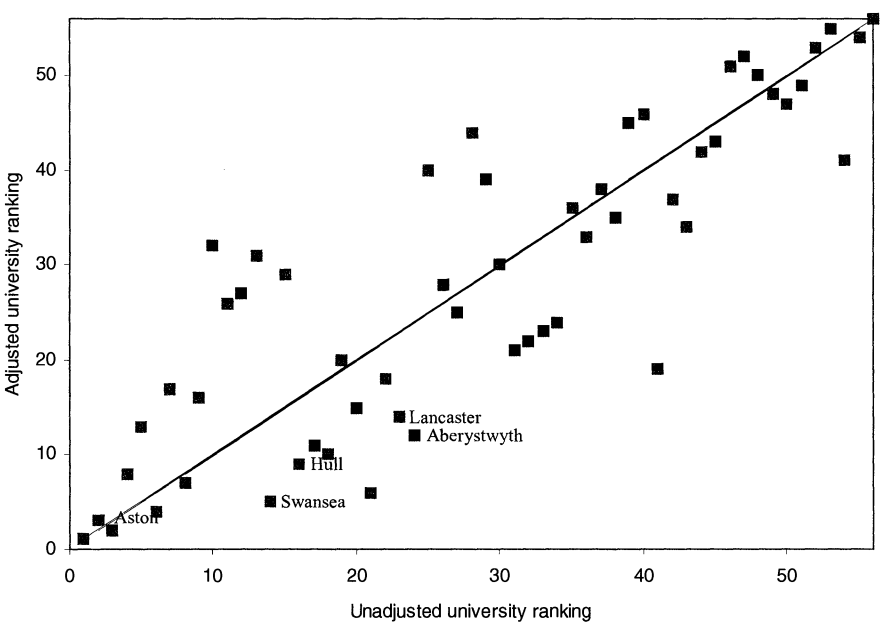

Fig. 3. *Comparison of Adjusted and Unadjusted University Rankings – Unemployment/inactivity (females)*

is 7 for both the male and female samples, with some institutions not changing rank position and others moving by more than 20 places.

For men, the universities which show improvement in the rankings based on the adjusted marginal effects include: Lancaster (which moves from 26th to 18th), Swansea (30th to 20th) and Royal Holloway (10th to 6th). For women, the universities which improve their rankings after adjustments are made include: Aberystwyth (24th to 12th), Hull, (16th to 9th) and Swansea (14th to 5th).

Thus, there are substantial differences in the ranking of universities according to whether one uses the unadjusted or the adjusted university marginal effects on the *OLFU* probability.[5] Although the rank correlations are high, there are big movements associated with adjusting *OLFU* for student and course-related characteristics. If university funding is based on individual unadjusted rank positions on our measure of students' first destination outcomes, then there will be significant winners and losers compared to a formula based on the adjusted ranking. Our results also imply, however, that if universities were grouped into just three bands identifying the top and the bottom groups of 5–10 universities in each case and the rest, then there would be much less mis-classification across funding groups. Table 2 presents adjusted university marginal effects on the *OLFU* probability for a selected group of universities with low *OLFU* probabilities. These marginal effects are based on a weighted average of the adjusted estimates for males and females which underlie Figs 2 and 3.

In this Section of the paper, we have developed an employment-related university performance indicator from an individual-level model which generates an adjusted measure of the university marginal effect on the probability that the individual graduate is unemployed or inactive six months after leaving university. This is just one possible employment-related university output measure. It it based on a simple division between 'positive' outcomes (employment and further study) and 'negative' outcomes (unemployment and inactivity). It is potentially informative to distinguish further between employment and further study and between unemployment and inactivity. In the next Section of the paper, we illustrate how this can be done for the employment-study distinction. We choose this case because, for employed graduates, we can then draw a finer distinction concerning the nature of the occupation in which they are employed. We distinguish between 'graduate' and 'non-graduate' occupations and hence develop adjusted and unadjusted university output measures based not only on the *OLFU* outcome but also on the probabilities of: further study, employment, employment in a graduate occupation and employment in a non-graduate occupation. In this way, the analysis generates

[5] A multinomial logit model using *OLFU*, Employment and Further Study to estimate adjusted university marginal effects produced almost identical rankings to those generated from the binomial probit model presented in this paper. The rank correlations between the probit and multinomial logit models are in excess of 0.99 for both males and females.

Table 2*

Adjusted marginal effects on the unemployment/inactivity probability for selected universities (males and females combined): USR 1993–4

University	Adj ME	University	Adj ME
Aberdeen	−12.4	Lancaster	−14.6
Aberystwyth	−12.8	Leicester	−14.3
Aston	−15.5	Liverpool	−13.3
Bath	−14.9	LSE	−13.1
Birkbeck	−15.7	Royal Holloway	−15.4
Brunel	−20.8	Salford	−14.2
Cardiff	−13.8	St Andrews	−14.7
Durham	−14.9	Strathclyde	−13.0
Exeter	−13.0	Sussex	−12.4
Hull	−14.2	Swansea	−15.0
Imperial	−13.8	Ulster	−13.0

* For illustrative purposes, this Table identifies a selection of 22 out of the 30 universities with the lowest adjusted unemployment/inactivity probabilities. The Table shows the adjusted marginal effects on the probability of unemployment or inactivity six months after graduation. The marginal effects are calibrated relative to the university with the highest adjusted probability. Data are taken from the First Destination Survey conducted by the USR in 1993–94. A simple ranking of universities cannot be produced on the basis of this table both for reasons of omitted cases and of statistical legitimacy, as discussed in the paper.

a finer measure of the *quality* of the employment outcome. The details of the approach are discussed in the next Section.

5. Measuring the Quality of the Labour Market Outcome

Potential university applicants are typically interested in the likely career paths that follow graduation. It is therefore interesting to consider the determinants of the kind of occupation that graduates take up after university. The first destination data provide detailed information on the occupations of employed individuals and this enables occupations to be grouped in various hierarchical ways. For the purpose of the current paper, we distinguish between 'graduate occupations' and 'non-graduate occupations' and, for employed graduates, model the probability that the individual is in a graduate rather than a non-graduate occupation in their first destination.

Not all graduates will have achieved their long-term labour market occupation type only six months after graduation. Over a longer period, the proportion of graduates in a non-graduate occupation will fall. Nonetheless, the results indicate the ease with which particular graduates find employment in graduate occupations. That early career trajectories will differ by subject studied at university further underscores the importance of controlling for degree subject.

We adopt a procedure which enables us to calculate the university marginal

effect on the unconditional probability of being in a graduate occupation as a first destination outcome. As with the university rankings based on the *OLFU* probability, we compare the adjusted and unadjusted league tables of universities on the basis of the unconditional probability of being in a graduate occupation. This graduate occupation measure is potentially interesting to policy-makers given the debate around the issue of whether too many students are working in jobs in which their skills are under-utilised. Our analysis also generates a ranking of universities on the basis of the unconditional probability of students pursuing further study after graduation.

First, for the sample of individuals with employment or further study (*EFS*) as the main first destination activity, we estimate a probit model of the *conditional* probability of being employed (*E*) rather than in further study (*FS*). The explanatory variables are the same as those included in the *OLFU* regression described in Section 3. The *unconditional* probability of being employed is then equal to the conditional probability of *E* multiplied by the probability of *EFS* (which is just one minus the probability of *OLFU*). More formally,

$$\Pr(E = 1) = [1 - \Pr(OLFU = 1)]\Pr(E = 1|EFS = 1). \tag{1}$$

If the equations generating the marginal effects contain explanatory variables in addition to university attended, then the university rankings derived from these marginal effects are the adjusted rankings. The unadjusted rankings can be derived similarly, but excluding explanatory variables other than university attended. It is then straightfoward to derive the marginal effect of each university on the unconditional employment probability, relative to a base case. We also use this approach to generate the university marginal effects on the unconditional probability of further study.

The marginal effects of universities on the unconditional probabilities of being in a graduate occupation (*GO*) or a non-graduate occupation (*NGO*) can be derived similarly. Estimating a third probit model of the probability of a graduate occupation on the sample of employed graduates generates an estimate of the conditional graduate job probability. This can be multiplied by the unconditional employment probability, derived from the first and second probits, to give the unconditional probability of employment in a graduate occupation. More formally,

$$\Pr(GO = 1) = \Pr(E = 1)\Pr(GO = 1|E = 1) \tag{2}$$

where $\Pr(E = 1)$ is given by (1). Again, the university marginal effects on this probability can be calculated on both the adjusted and unadjusted bases.

Tables 3 and 4, for men and women respectively, report the conditional and unconditional marginal effects of the key control variables on the probabilities of further study (*FS*) and of employment in a graduate occupation (*GO*). Points scored at either A-level or in Higher examinations are generally associated with lowering the unconditional probability of further study and of raising that of employment in a graduate occupation, *ceteris paribus*. Having a Mathematics A-level has a similar effect, while the effect of an A-level in

Table 3

Marginal Effects on Probability of Further Study and Graduate Occupations – Males

	Further study			Graduate occupation		
	Conditional ME	p-value	Unconditional ME	Conditional ME	p-value	Unconditional ME
Educational background						
A-level pts	−0.51***	0.00	−0.36	0.83***	0.00	1.20
Chem	4.00***	0.00	3.34	1.34*	0.06	−1.44
Engl	−0.41	0.62	−0.38	−1.60**	0.04	−1.07
Math	−1.86***	0.01	−1.35	3.15***	0.00	4.19
Phys	1.78***	0.01	1.48	0.99	0.20	−0.37
Higher pts	−1.22***	0.01	−0.97	1.39**	0.02	2.50
Chem	3.70	0.24	3.81	−3.96	0.20	−3.26
Engl	1.20	0.30	1.23	−1.28	0.81	−1.01
Math	6.98	0.39	7.25	−8.66*	0.10	−7.25
Phys	−4.24	0.48	−4.28	4.59	0.92	3.12
Ind sch	−2.83**	0.04	−2.26	2.38**	0.03	3.45
Personal characteristics						
Age 24–27	1.50	0.12	1.20	1.00	0.28	−0.37
Age 28–33	1.17	0.47	0.69	2.41	0.14	−0.12
Age 34+	4.25*	0.08	2.25	−0.15	0.95	−6.90
Married	−2.16	0.29	−1.15	8.11***	0.00	10.63
SC I	2.80***	0.00	2.37	0.48	0.49	−1.23
SC IIINM	−0.56	0.46	−0.45	−1.78**	0.03	−0.87
SC IIIM	0.49	0.55	0.21	−1.44*	0.10	−2.17
SC IV	0.72	0.48	0.31	−2.20**	0.05	−3.23
SC V	−2.03	0.39	−2.19	−4.73*	0.08	−4.74

Table 3
(Continued)

Degree information						
Medic. rel	0.51	0.80	1.81	6.97***	0.00	11.54
Biol. sci.	11.95***	0.00	9.38	−2.60	0.14	−9.98
Agric.+rel	−5.17***	0.01	−4.15	2.65	0.32	5.81
Phys. sci.	19.40***	0.00	16.34	0.55	0.74	−11.16
Math. sci.	5.57***	0.00	4.77	2.97*	0.06	−0.75
Comp.+rel	−2.75**	0.04	−2.02	11.73***	0.00	11.90
Engineer	−0.31	0.81	0.16	6.41***	0.00	6.95
Technology	10.52***	0.00	8.98	5.03*	0.08	−2.39
Arch.+build	−5.99***	0.00	−5.11	6.26***	0.01	6.59
Law+Politic	−3.74***	0.00	−2.53	6.88***	0.00	11.27
Bus. Admin.	−10.36***	0.00	−8.43	8.36***	0.00	14.24
Communic	2.35	0.62	1.49	−21.49***	0.00	−17.78
Lit+Class	5.27***	0.00	2.93	−9.24***	0.00	−13.59
MEu Lang	0.67	0.75	0.23	−1.04	0.65	−2.57
Oth Lang	3.56	0.30	2.32	−3.65	0.34	−6.81
Humanities	5.68***	0.00	3.90	−2.15	0.14	−7.35
Creative	6.98***	0.01	5.27	−31.47***	0.00	−26.12
Education	−9.70***	0.00	−7.58	7.81***	0.01	18.08
Other subj	2.46	0.16	1.40	2.43	0.22	−2.32
Part-time	−5.36	0.19	−4.75	2.76	0.49	5.54
Degree class						
First	16.15***	0.00	16.57	4.17***	0.00	−4.60
Lower 2	−9.39***	0.00	−9.00	−6.89***	0.00	−5.26
Third	−13.70***	0.00	−12.86	−14.27***	0.00	−13.93
Other	−13.88***	0.00	−12.79	−11.56***	0.00	−9.84
n	26,945			21,105		

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

Table 4

Marginal Effects on Probability of Further Study and Graduate Occupations – Females

	Further study			Graduate occupation		
	Conditional ME	p-value	Unconditional ME	Conditional ME	p-value	Unconditional ME
Educational background						
A-level pts	−0.56***	0.00	−0.49	1.06***	0.00	1.19
Chem	4.11***	0.00	3.50	3.05***	0.00	−0.56
Engl	0.59	0.29	0.49	−1.47*	0.06	−1.70
Math	−1.14**	0.04	−0.75	3.86***	0.00	5.42
Phys	2.73***	0.00	2.47	1.39	0.23	−0.08
Higher pts	−0.53	0.21	−0.42	1.86***	0.00	2.69
Chem	−2.14*	0.09	−2.17	3.41*	0.06	2.90
Engl	−2.92	0.67	−2.95	4.67	0.63	3.93
Math	0.02	0.95	−0.03	−0.23	0.49	−0.34
Phys	4.01	0.91	4.09	−5.82	0.33	−5.37
Ind sch	0.96	0.32	0.79	−0.96	0.49	−1.67
Personal characteristics						
Age 24–27	2.05**	0.02	1.54	−0.35	0.77	−2.94
Age 28–33	3.17**	0.03	2.36	−1.26	0.56	−4.97
Age 34+	4.96***	0.00	4.22	4.07*	0.07	−0.52
Married	0.47	0.73	−0.06	4.37**	0.04	0.07
SC I	1.73***	0.00	1.50	−0.62	0.45	−1.57
SC IIINM	−0.14	0.84	−0.01	0.25	0.79	1.04
SC IIIM	−0.73	0.30	−0.56	−0.20	0.85	0.79
SC IV	0.57	0.53	0.32	−3.73***	0.01	−4.38
SC V	−2.29	0.30	−2.10	−5.79*	0.09	−4.10

Table 4
(Continued)

Degree information						
Medic. rel	−4.03***	0.00	−2.90	−12.23***	0.00	−2.84
Biol. sci.	3.84***	0.00	3.13	−1.63	0.29	−4.17
Agric.+rel	1.54	0.46	1.25	7.71***	0.01	4.51
Phys. sci.	9.76***	0.00	8.65	2.84	0.16	−7.05
Math. sci.	0.38	0.78	0.55	0.19	0.93	1.28
Comp.+rel	−2.93	0.20	−2.33	11.58***	0.00	12.70
Engineer	−4.47***	0.00	−3.62	3.46	0.17	7.63
Technology	11.70***	0.00	10.46	1.55	0.72	−4.83
Arch.+build	−2.95	0.24	−2.40	7.84**	0.03	9.11
Law+Politic	−4.22***	0.00	−3.26	11.98***	0.00	16.22
Bus. Admin.	−7.36***	0.00	−6.19	10.79***	0.00	15.36
Communic	−1.32	0.67	−0.58	−6.76	0.12	−0.93
Lit+Class	1.47	0.16	1.25	−6.15***	0.00	−5.60
MEu Lang	0.56	0.67	0.71	1.25	0.46	1.99
Oth Lang	6.21***	0.01	5.78	0.17	0.95	−1.86
Humanities	1.56	0.14	1.38	−4.21***	0.01	−3.87
Creative	−0.85	0.58	−0.54	−17.71***	0.00	−12.25
Education	−7.58***	0.00	−6.20	19.60***	0.00	27.80
Other subj	0.45	0.74	−0.33	−2.85	0.16	−1.64
Part Time	−5.28*	0.08	−4.36	−5.29	0.23	1.83
Degree class						
First	15.27***	0.00	14.47	4.90***	0.00	−4.85
Lower 2	−5.48***	0.00	−5.13	−4.88***	0.00	−3.40
Third	−8.74***	0.00	−7.99	−8.82***	0.00	−6.83
Other	−9.63***	0.00	−8.76	−13.57***	0.00	−11.28
n	24,757			21,190		

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

Chemistry is in the opposite direction: raising the unconditional probability of further study and lowering that of employment in a graduate occupation. Having previously attended an independent school lowers the male probability of further study and raises that of employment in a graduate occupation. In contrast, there is no significant effect of school type for females.

There is a significant positive marginal effect of being from a Social Class I background, relative to Social Class II, on the unconditional probability of further study. More strikingly, there are significant effects of social class background on both the conditional and unconditional probabilities of employment in a graduate occupation. For males, for example, the unconditional probability is monotonically decreasing for lower Social Class categories. Finally, we note that there are significant effects of degree class on the probabilities of both further study and employment in a graduate occupation for both men and women. Relative to a graduate with an Upper Second class honours degree, a graduate with a First is 16 (15) percentage points more likely to be in further study, for males (females). Graduates with less than an Upper Second class degree have a much lower unconditional probability of being in a graduate occupation.

Fig. 4 plots the adjusted against the unadjusted rankings of universities based on the university effects on the unconditional probability of further study for males after graduation. The figure shows that six of the top 10 universities on the adjusted basis maintain a top 10 position after adjusting for

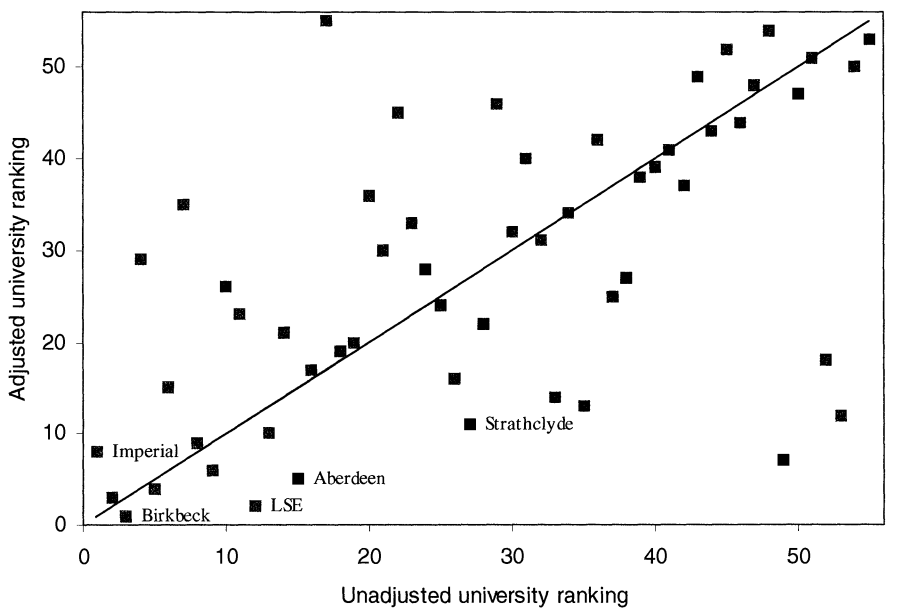

Fig. 4. *Adjusted and Unadjusted University Rankings – Further Study (males)*

student and course-related characteristics. Again, it appears as though one can be reasonably confident that the adjusted and unadjusted measures will identify similar sets of universities at the very top (and bottom) of the distribution: i.e., universities with a strongly positive (negative) effect on the unconditional probability of a graduate job. There are universities close to the 45° line throughout the distribution, but the correlation coefficient is just 0.59. There are very large movements for some universities: with some striking movements by particular universities at the bottom of the unadjusted distribution. For example, the university with an unadjusted rank of 53rd moves to an adjusted rank of 12th. Other universities which improve their position include: Strathclyde (27th to 11th), Aberdeen (15th to 5th) and LSE (12th to 2nd). Similar, though unreported, results hold for the comparison of the adjusted and unadjusted university marginal effects on the unconditional female probability of further study.

Fig. 5 plots the adjusted against the unadjusted rankings of universities based on the university effects on the unconditional probability of male graduates being in a graduate job six months after leaving university. The correlation coefficient is just 0.66 with marked movements of individual universities. For example, Cambridge moves from 17th to 8th place in the ranking after adjustment. Other universities which improve their position after adjustment include Royal Holloway (32nd to 14th) and Durham (15th to 9th).

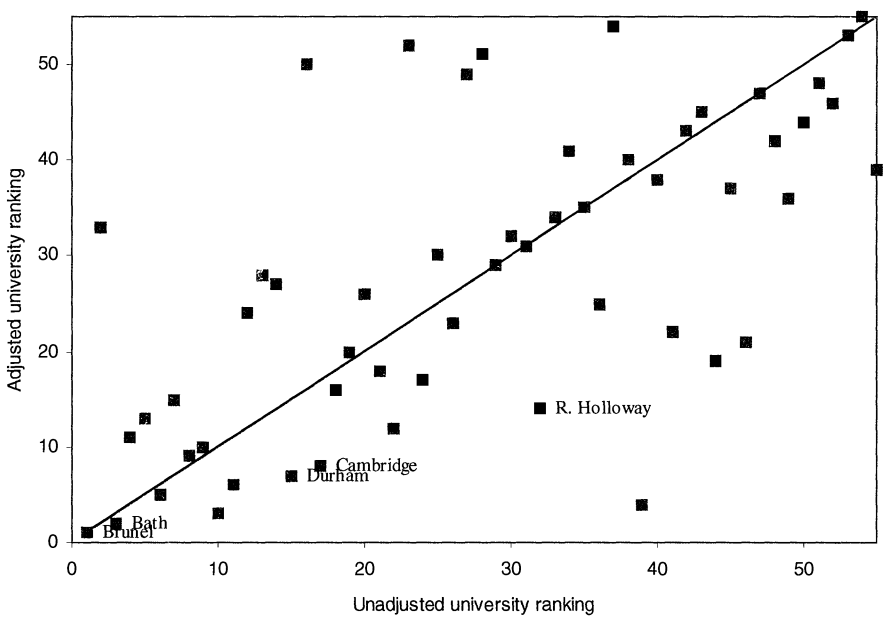

Fig. 5. *Adjusted and Unadjusted University Rankings – Graduate Occupations (males)*

6. Limitations, Validity and Interpretation

In Sections 4 and 5 of this paper, we have developed a methodology for constructing employement-related university performance indicators. In this Section, we address various problems and limitations that might be associated with the approach we have adopted. As we proceed, we suggest possible modifications of the approach. More importantly, perhaps, we discuss the need for care in the interpretation and application of university performance measures.

6.1. *The Validity of the Data*

The main problems with the use of the First Destination Survey data are that: (i) the response rate is incomplete – at about 80% of the eligible population – and is self-selected and (ii) information on the main activity of university leavers relates to destinations only six months after completion of their courses, and this may be an unreliable measure of future career paths. On the other hand, the main benefit of the FDS data is that, despite a less than complete response rate, they do give detailed information on a much larger sample of university graduates than is available elsewhere. A second reason for our use of the FDS data in this paper is that the Performance Indicators Steering Group has announced that the published PIs will be based on information from the FDS returns, and hence it is informative to conduct an analysis of PIs on the same basis.

Those responding to the survey are unlikely to be representative of the whole population of university leavers. For example, the data suggest that they are more likely to have failed to obtain a degree. This would tend to bias the results and reduce the incentives for institutions to obtain information on reluctant respondents. Thus, if PIs are to be based on the FDS data, action must be taken to ensure the response rate is higher and that analysis is therefore based on as representative a sample as possible. In future work, we intend to conduct an analysis which corrects for this problem of endogenous sample selection.

On the issue of the value of information on the first destinations of leavers just six months after graduation, results from a survey of 1995 graduates show that unemployment at that point is indicative of future labour market difficulties (see McKnight (1999)). Graduates unemployed after six months are typically unemployed for more than one year during the first three and a half years after university. This compares with an average duration of unemployment of one month for graduates who were employed after six months. Unemployment at six months is also associated with a higher probability of employment in a non-graduate occupation in the future. Similarly, unemployment after six months, *ceteris paribus*, is associated with 16% lower earnings three and a half years after graduation.

6.2. *Institution Versus Sector Performance*

It is well-known that there are large time-series fluctuations in the state of the graduate labour market as new entrants to the labour market are particularly vulnerable to demand fluctuations given that recruitment is often the first casualty of a downturn in demand. Similarly, policy shocks, such as widening access or changing the costs of higher education, can generate supply shifts which lead to short-term surpluses or shortages of highly educated labour. It would therefore be inappropriate to evaluate the performance of the higher education sector as a whole on the basis of the annual returns to the graduates' First Destination Survey.

In view of the possible problem of instability over time, we have examined the sensitivity of the adjusted *OLFU* probability rankings of universities to the choice of the graduate cohort. We have done this by pooling the data for the three cohorts (1991, 1992 and 1993 graduates) on whom we have information and generating a single adjusted ranking of universities over the three-year time period. Fig. 6 shows, for male students, how this 1991–3 ranking compares with the 1993 ranking we have described previously. The correlation coefficient is high, at 0.78 and the top and bottom 10 universities are broadly the same under both measures. However, there are some large individual movers, especially around the middle of the distribution. Given such movements, one conclusion might be that university performance should be measured not on the results for a single cohort, but on the basis of data pooled over a number of years. This has been suggested in the context of school performance measures (see, for example, Goldstein and Spiegelhalter (1996)).

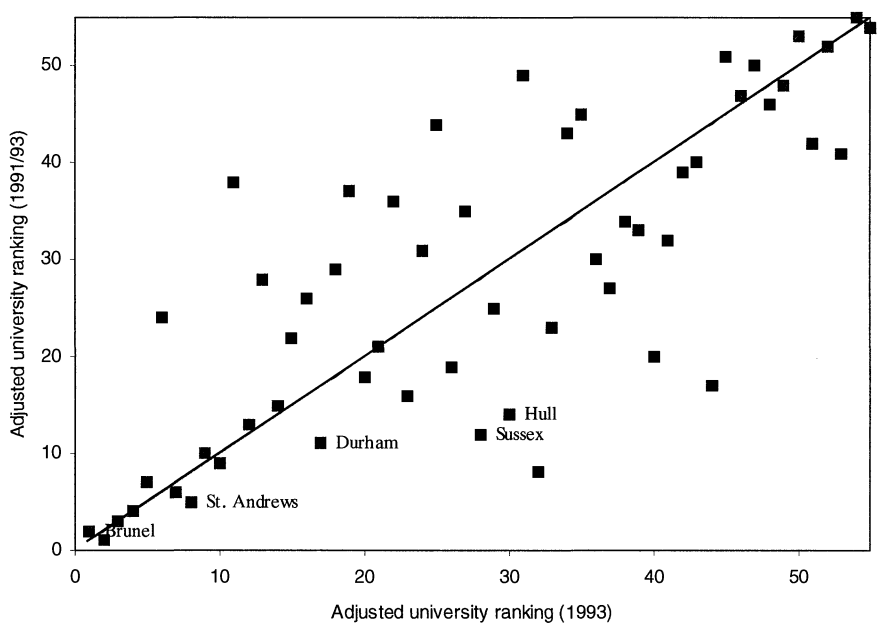

Fig. 6. *Adjusted University Rankings for Unemployment/Inactivity – 1993 vs 1991/3 (males)*

6.3. *Performance Criteria*

In this paper, we have proposed a method for constructing university performance indicators against the first destination criteria of: (i) the probability of graduates being unemployed or inactive, (ii) the probability of being in employment, (iii) the probability of being in further study, and (iv) the probability of being in a graduate job. The separate probabilities of unemployment and inactivity could also be determined within the approach we have outlined. Our method involves using information across all the FDS response categories. This contrasts with recent proposals from the PISG to exclude from their analysis students in further study and inactive students: that is, to consider only employed and unemployed students. The latter approach generates a potential bias in the resulting performance indicators: not least because of the variation across universities in the propensity and preparedness of students to undertake further study. In our analysis, we view further study as a desirable outcome and argue that this should be reflected in the analysis of university performance. Further work might usefully examine the subsequent career paths of postgraduate students.

6.4. *The Choice of Control Variables*

The adjusted performance indicators we have developed are based on individual-level models which include large numbers of control variables. The specification of these models is driven in part by a concern with examining the determinants of individual outcomes. In the literature on measuring performance in regulated industries, there is an emphasis on the need to design PIs so as to minimise the incentives for strategic manipulation by firms. In our context, this would mean that one should not construct PIs which make adjustment for factors which can be influenced by institutions. This presents a difficulty, as universities are able to influence almost all the control variables we have considered: such as the subjects they offer, the characteristics of the students they admit and the class of degrees they award. This difficulty can be alleviated by regulating or evaluating university behaviour in these respects. For example, external examining procedures can be required to restrict institutional flexibility in the award of degree classifications. Similarly, performance indicators on social class composition, for example, can be used to monitor and influence institutional admissions criteria. Nonetheless, however the rules of the game are set, they will not remove the incentive to behave strategically.

In view of these concerns, we have examined the sensitivity of the adjusted university rankings of the *OLFU* measure to the choice of control variables included in the underlying individual model. Fig. 7 shows, for the male sample, the relationship between the ranking described in Section 4 and a ranking based on a restricted set of control variables. This restricted set excludes the student's degree class and all of the departmental information on the grounds that these are the most vulnerable to institutional control. Most of

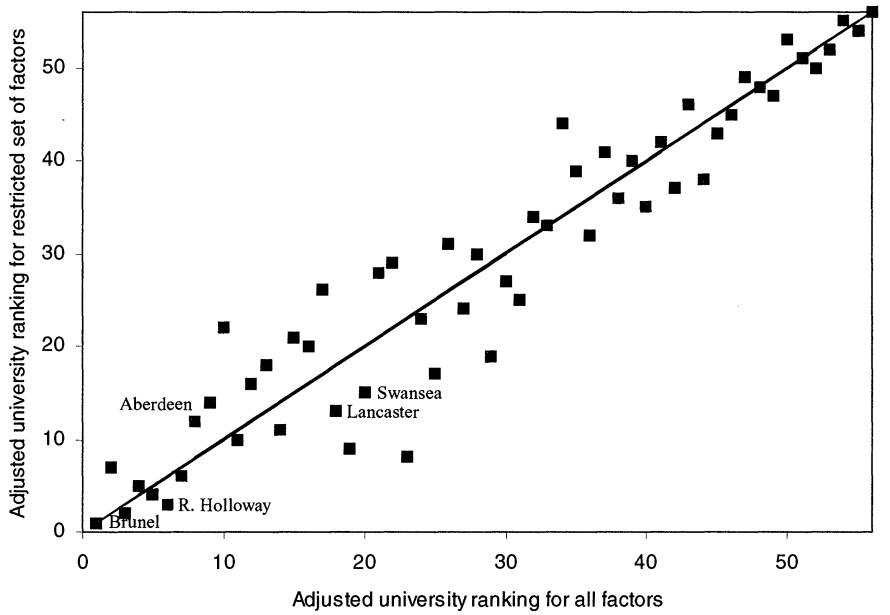

Fig. 7. *Sensitivity of University Rankings to Adjustment Factors – Unemployment/Inactivity (males)*

the observations in Fig. 7 lie extremely close to the 45° line. Only two universities move more than ten places and the correlation coefficient is 0.95. It follows from this that even the more restricted version of the adjusted university performance measure produces a ranking substantially different from that based on an unadjusted measure. Nonetheless, we would suggest that further work should be directed towards the issue of what is the appropriate set of control variables.

6.5. *Gender Differences*

We have conducted our analyses separately for men and women as likelihood ratio tests confirm that influences on first destination outcomes differ by gender. Therefore, separate models provide a better fit of the data. The adjusted university performance rankings derived from the gender-specific models also show clear gender differences. This is demonstrated in Fig. 8 which plots the male adjusted university rankings on the *OLFU* criterion against that for females. Essentially, this plots the adjusted rankings in Fig. 2 against those in Fig. 3. The male-female correlation is only 0.41 and the mean absolute move is 13 places. There is only a weak statistical relationship between male and female rankings of universities on this performance measure.

We do not conclude from this that gender-specific performance indicators should be published. Instead, we present it as further evidence that performance measures should be used cautiously. PIs are *average* measures and do not

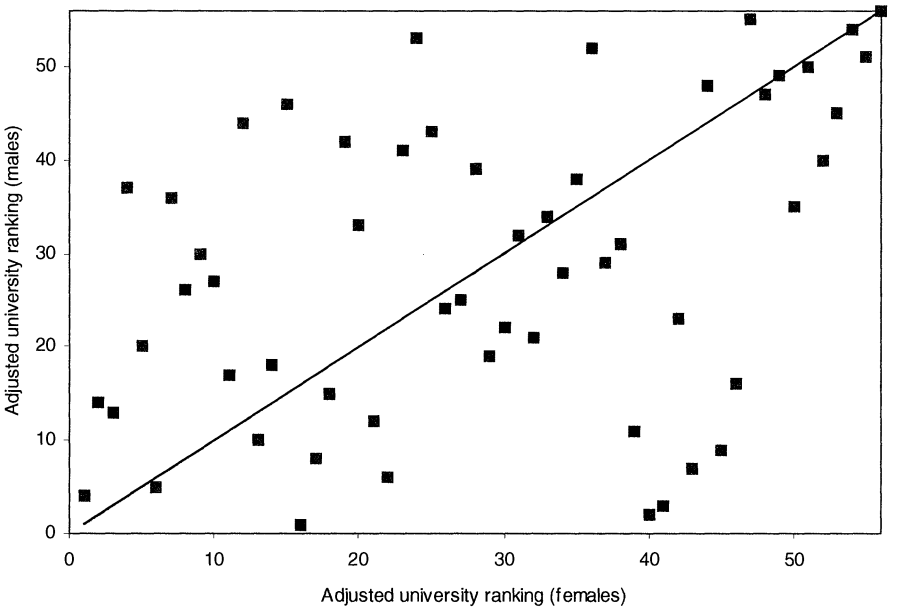

Fig. 8. *Comparison of Adjusted University Rankings for Males and Females – Unemployment/ Inactivity*

indicate which universities perform better than others for all groups of students. Just as there is a general difference in the ranking of universities on the *OLFU* criterion, so there are likely to be differences by other student characteristics on this criterion and, indeed, on many performance criteria. Other characteristics where this may apply include previous qualifications, schooling and subject studied.

6.6. *Confidence in the Ranking*

An important question concerns how confident one can be in the exact ordering of universities in performance-based rankings. In the literature on school performance measurement, Goldstein and Spiegelhalter (1996) conclude that the best statistical analysis of school performance generates rankings such that most schools cannot be separated with any significant degree of confidence. This result, the authors argue, undermines the validity of the league table exercise for schools. In order to examine this issue in the context of our ranking of universities against the *OLFU* criterion, we calculate the confidence intervals around the point estimates of each university's marginal effect on *OLFU*. Fig. 9 shows the 80% confidence intervals for the adjusted university marginal effects on the male *OLFU* probability. The universities are ordered by the size of the point estimates. A line is drawn through the point estimate of the median university. This line cuts the majority of the confidence intervals, indicating that even at this relatively low level of 80%, one cannot be

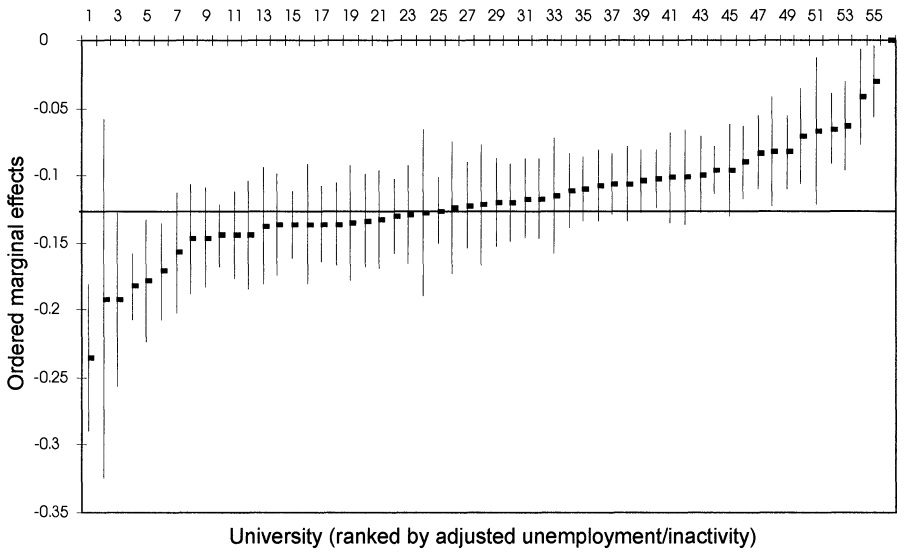

Fig. 9. *80% Confidence Intervals for Adjusted University Marginal Effects – Unemployment/Inactivity (males)*

confident of the rank position of most of the universities relative to the median. Only 5 (12) universities perform significantly better (worse) than the median university. The rest cannot be separated. This result suggests that funding formulae should not be designed so as to be sensitive to small changes in a university's rank position. The creation of a small number of bands would be the most appropriate basis for linking funding to performance against the criterion of graduate unemployment/inactivity.

7. Conclusions and Further Remarks

In December 1999, the UK government introduced a first wave of university performance indicators designed both to meet the needs of prospective students for better information and to encourage improved performance in the higher education sector. Measures of university performance against graduate employment criteria will be introduced in a further wave of indicators to be published in 2000. To date, published PIs are based on aggregate university-level date with relatively minor adjustments for differences in university characteristics. We have proposed an approach to the construction of university performance measures based on the analysis of individual-level data. We have focused on employment-related performance measures based on information obtained from graduates' first destination survey returns matched to administrative data on individual student records.

The analysis of individual-level data has shown that the probability of unemployment or inactivity six months after graduation is influenced strongly by the individual's class of degree, by degree subject studied, by prior qualifica-

tions and by social class background. These factors also influence the individual's probability of further study after graduation and the probability that the individual will be employed in a graduate, rather than in a non-graduate, occupation. A higher degree class raises the unconditional probability of further study and lowers that of employment in a graduate occupation. The level of performance in pre-university qualifications has the opposite effects. The type of previous schooling has no significant influence on the unemployment/inactivity probability, but does affect other outcomes for males: having attended an independent school, *ceteris paribus*, lowers the probability of further study and raises that of employment in a graduate occupation. Whether the graduate studied part-time or full-time at university has little effect on the first destination outcomes.

With respect to university performance, we have examined adjusted and unadjusted university differences in the unconditional probabilities of: (i) unemployment and inactivity (*OLFU*), (ii) employment, (iii) further study and (iv) employment in a graduate occupation. We have found that for each of these four indicators, there are large movements in the derived rank positions of individual universities between the adjusted and unadjusted measures. Typically, however, the adjusted and unadjusted bases identify similar sets of top and bottom universities in each of the rankings. Against this, the confidence intervals around the point estimates for the university differences are sufficiently large – as demonstrated in the case of the *OLFU* probability – that the rank positions of universities are not well determined. Perhaps this is not surprising: our analysis is conducted on the relatively homogeneous group of pre-1992 universities. There may be clearer differences across universities following the expansion of the higher education sector after 1992. In future work, we plan to test this hypothesis by analysing individual-level data for more recent cohorts of students.

From the results of our analysis, we draw a number of conclusions. First, as has been shown in the case of school performance measures, it is important that the evaluation of the performance of higher education institutions adjusts for relevant differences in their characteristics: failure to make such adjustments is likely to lead to very different and potentially misleading institutional rankings. Second, we have shown that, in general, the ranking of universities against the criterion of the unemployment/inactivity probability is not well determined: at best, one can be confident only of the identities of between 5 and 10 universities at the top and bottom of the ranking. Third, it is desirable that indicators measure performance over a period of more than one-year so as not to be sensitive to large annual movements. Similar conclusions have been reached in the literature on school performance.

Fourth, we have shown that there are very big differences by gender in the ranking of universities with respect to the probability of unemployment or inactivity. We regard this as underscoring the fact that any performance measure should be regarded as only indicative of outcomes for the average student: there is likely to be significant variation in the ranking of universities around the average. Prospective students should be advised not to follow

performance rankings slavishly. Finally, our results suggest that there are significant differences across university subjects in the likely first destinations of graduates, *ceteris paribus*. This might be taken by some as evidence in support of the differentiation of fees by subject area. Our concern with such a policy would be the danger of restricting students from poorer backgrounds from access onto expensive courses. The results suggest that students from poorer backgrounds have a lower probability of being employed in graduate occupations after graduation.

The analysis we have presented in this paper is intended primarily to open a debate on the appropriate techniques for constructing university performance indicators. We identify three particular directions for further analysis. First, the issue of which factors should be controlled for in the underlying individual-model is a crucial one. We have offered only a brief discussion of this in the current paper. Second, the selection of students into universities is not random. The data-set we have exploited does not provide the information necessary for us to address issues of endogenous selection. This is potentially very important. Third, in analysing records for the full cohort of university leavers we have used first destination survey evidence which provides information on the main activities of students just six months after graduation. It would be interesting to add both salary and career development information to this data-set.

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Appendix

1. *The Classification of 'Graduate' and 'Non-graduate' Occupations*

In the First Destination Survey returns, employed graduates provide various detailed information on their work, including job titles. These are coded to a classification of occupations which can be mapped into the 371 unit groups of the Standard Occupational Classification. Information from the Labour Force Survey is then used to allocate occupations to the graduate/non-graduate categories with reference to typical entry requirements and the average level of qualifications held by employees within each occupation. Attention is also given to the average age in occupations in recognition of the fact that young workers are more likely to possess educational qualifications, and care was taken not to mis-classify occupations in which students commonly find temporary work. The graduate occupation category comprises occupations which are typically thought of as traditional graduate jobs – doctors, lawyers, qualified engineers, teachers, high level managerial and technical occupations – and occupations which have more recently been considered as graduate jobs: high level sales, skilled clerical, lower level management.

2. *Social Class Definition Based on Occupation of Parent*

SC I	Professional
SC II	Intermediate
SC IIINM	Skilled Non-manual
SC IIIM	Skilled Manual

SC IV	Partly skilled
SC V	Unskilled

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