

Annex E

Employment indicators – technical notes and more detailed information

1. The benchmarks for the performance indicators of access to HE and for the retention rates are sector averages that allow for the effects of age, subject of study and entry qualifications. So, for example, an institution with a large medical school would be expected to have a higher retention rate than a similar institution with no medical school, because medical students have a low leaving rate compared with students of other subjects.
2. A similar principle has been used in defining benchmarks for the employment indicators. Each benchmark is the value that would be expected by looking at all students across the sector who are similar to those at the institution. However, many other factors have been taken into account for this indicator. Table E2 below shows what factors have been used. Where the definitions have not been covered in Annex A, or are different from those used for the other indicators, these factors are detailed later in this annex.
3. In addition to factors specific to the student, we have looked at factors that refer to each institution, and its locality. Three institutional factors have been included in the benchmarks, also shown in Table E2.

Table E2 Factors used in the benchmark

Student factors	No. of categories	Comment
Subject of study	19	Different categories used from those for other indicators
Entry qualifications	11	
Age on entry	4	
Gender	2	
Ethnic group	10	
Social Class	3	Definition in Annex A
From low participation neighbourhood or not	3	Definition in Annex A2
Degree classification	5	Only included in indicator which excludes those going on to further study
Institutional factors		
Average A-level/Highers score		Based on entrants in 2000-01 with A-levels or Scottish Highers
Unemployment among 20-29 year olds		Figures based on the LO definition, for the institution's locality
Percentage of jobs classified as graduate jobs		For the institution's locality, with definition based on IER work

Student factors

4. The subject, entry qualifications and age group used in constructing the benchmarks for other indicators. The student and data at an institution level, comes from the files, the First Destination Supplement, and the 2000 Annual Labour Force Survey.

Subject of study

5. The subject groupings used, and the HESA codes defined broad subject groups, and allocated each student to one of them, based on the HESA fields 'Subjects of qualification aim', SBJQA1/2/3. A student whose subjects cover different groups will be included in the 'Combined studies' group.

6. The groups were chosen to be as homogeneous as possible as regards employment rates, but bearing in mind that there should not be too many groups, nor groups containing small numbers. For example, it was found that among subjects allied to medicine there were two distinct sub-groups. Graduates from Pharmacy, Ophthalmics, Nursing and Medical technology showed much higher employment rates than graduates from the other subjects in this group, so were treated separately. Conversely, as graduates from Languages and Humanities showed similar employment rates, these two subject areas were combined.

Entry qualifications

7. Institutions return data to HESA about the entry qualification of their students, by providing a code to denote the type of qualification (QALENT2), and by providing the point score for those entering with level or Scottish Highers. In cases where the institution has not provided this information, it has been taken from UCAS. It was found that fewer groups could be used here than were needed for the other indicators. The groups are shown in Table E4.

Ethnicity

8. The HESA record contains details of each student's ethnic origin, based on information provided by the student to the institution. The groups used are those from the 1991 Census, shown in Table E5.

9. Over 80 percent of graduates class themselves as 'white', and we considered combining some of the other groups, as they contained relatively small numbers. As the employment rates varied considerably between these groups, it was decided to retain each one separately.

Degree classification

10. For the indicator excluding those going on to further study, it was agreed that degree classification should be included as a factor in the benchmark. The groups are given in Table E6.

Institutional factors

11. The average A-level/Scottish Highers score, for those entrants to the institution who have such qualifications, is a proxy for the overall selectivity of the institution. It is calculated for home-domiciled entrants to full-time first degree courses in 2000-01. It has been introduced partly to make allowance for those situations where individual student entry qualifications are missing. It will also compensate for the fact that we have only a simplified summary of entry qualifications available.

12. The other two institutional factors used are related to employment prospects in the neighbourhood of the institution. The institution's neighbourhood has been defined by reference to where its graduates get jobs, as these of local authority areas closest to the institution in which at least half of the institution's graduates

have found jobs on graduation. This information comes from the FDS, and depends on the postcode of where the graduate works being supplied. For some institutions there is not sufficient postcode information available, and in such cases the national rates have been used. These institutions have been noted in the table.

13. The unemployment rate in the neighbourhood among 20-29 year olds has been taken from the Labour Force Survey for 2000. The percentage of all jobs in the neighbourhood which can be classified as graduate jobs also comes from that survey, and is based on the classification through Standard Occupational Classification as developed at the Institute of Economic Research (IER) at Warwick University for the report 'Moving On – graduate careers three years after graduation'. They identified three job categories, graduate jobs, graduate-track jobs and non-graduate jobs. The SOC codes used in defining these categories are listed in Table E7.

Table E3 Subject groups

	Subject	HESA codes
A	Medicine, dentistry, veterinary science	A1-A4, D1
B	Pharmacy, Ophthalmics, Nursing, Medical technology	B3, B5, B7, B8
C	Other subjects allied to medicine	B1, B2, B4, B6, B9
D	Biological sciences	C1-C9
E	Agriculture	D2-D4, D8, D9
F	Physical sciences	F1-F9
G	Mathematical sciences	G1-G4, G9
H	Computer science	G5
I	Engineering and technology	H1-H9, J1-J9
J	Architecture, building and planning	K1-K9
K	Economics, Social work, Geography	L1, L5, L8
L	Other Social and Political studies, Law	L3, L4, L6, L7, M1, M3, M9
M	Business and administrative studies	N1-N9
N	Librarianship & information science	P1-P6
O	Languages, Humanities	Q1-Q9, R1-R8, T1-T9, V1-V9
P	Music, Drama	W3, W4
Q	Other Creative arts	W1, W2, W5-W9
R	Education	X1-X9
S	Combined studies	Y1-Y6

TableE4 Entryqualifications

Code	Entryqualifications	HESAcodes
1	A-levelsorHighers,pointsunknown	QUALENT2=39,40
2	A-levelsorHighers,upto8points,orBaccalaur eate	QUALENT2=39,40,47
3	A-levelsorHighers,9to12points	QUALENT2=39,40
4	A-levelsorHighers,13to18points	QUALENT2=39,40
5	A-levelsorHighers,19to24points	QUALENT2=39,40
6	A-levelsorHighers,25pointsorover	QUALENT2=39,40
7	Accessqualification	QUALENT2=29,43,48
8	BTECorequivalent	QUALENT2=41
9	GNVQlevel3orabove	QUALENT2=40
10	Highereducation	QUALENT2=01to16,21to30
11	Other,ornotknown	QUALENT2=55,56,92,93,97,98,99

TableE5 Ethnicity

Code	Ethnicgroup	HESAcodes
1	White	ETHNIC=10
2	BlackCaribbean	ETHNIC=21
3	BlackAfrican	ETHNIC=22
4	Blackother	ETHNIC=29
5	Indian	ETHNIC=31
6	Pakistani	ETHNIC=32
7	Bangladeshi	ETHNIC=33
8	Chinese	ETHNIC=34
9	Asianother	ETHNIC=39
10	Other,orunknown	ETHNIC=80,90,98,99

TableE6 Degreeclassification

Code	Degreeclass
1	Firstclasshonours
2	Uppersecondclasshonours
3	Lowersecondclasshonours,orundividedsecondclasshonours
4	Thirdclasshonours
5	Otherclassification

TableE7 Definitionofgraduateandgraduatetrackjobs

Jobtype	SOCcodesused
Graduate	100101102103110111113120123124125 12613115015115215315415517017619019120 0 201202209210211212213214215216217218219 220221222223224230231232233234235 239240241242250251252253260261262270271 2902912922933003301302303304310311 312313320331340341342343344347348350360 361362363364480381382383384390392 394395396399
Graduatetrack	1121211221271301321391401411 42160169171172173174175177178179199309 330332 345346349370371385386387391393400401410 420421450463491511512513515516517 518520521522523524525526529532534540541 543556560561570571573592593598610 611612613642643650660661700701702703710 719790791864893904
Non-graduate	41141243044044145145245946046 14624905005015025035045055065075095105 14519 530531533535536537542544550551552553554 555557559562563569573579580581582 590591594595596597599614615619620621622 630631640641644651652659670671672 673690691699720721722730731732733792800 801802809810811812813814820821822 823824825826829830831832833834839840841 842843844850851859860861862863869 870871872873874875880881882883884885886 887889890891892894895896897898899 900901902903910911912913919920921922923 924929930931932933934940941950951 952953954955956957958959990999

Modelusedtoproducebenchmark

14. The benchmarks produced for the performance indicators of access and retention were based on a simple arithmetic model. As there are more factors to take into account in the benchmarks for the employment indicator, it has not proved possible to use this simple method of construction. Instead, it was decided to use a statistical model. A number of models were investigated, and a random-effects multi-level model was chosen to construct the benchmarks.

15. Multi-level models are used when the outcomes of individuals may be affected by both individual characteristics and characteristics of groups to which the individuals belong. In this case, whether a graduate is employed or not will depend on individual characteristics of the graduate, but possibly also on characteristics of the institution or its location. The form of model used is:

$$y_{ij} = \beta_0 + \sum_{k=1}^m \beta_k x_{ijk} + \sum_{l=1}^n \gamma_l x_{jl} + u_j + e_{ij}$$

where y_{ij} is an indicator of employment for student i at institution j (that is, y_{ij} is 1 if the student is employed, and is 0 otherwise), and there are m student-level factors x_{ijk} , and n institution-level factors x_{jl} .

16. The terms u_j and e_{ij} represent the random factors at institutional and individual levels respectively.

Both terms are assumed to be normally distributed with a mean of zero. The software package used, MLwiN, not only provides estimates of the coefficients β and γ but also estimates these random terms and their associated standard deviations. The institution term, u_j , provides an estimate of the difference between an institution's benchmark and its indicator, allowing the benchmark and the standard deviation of the difference to be obtained. The estimates of the coefficients are shown in Table E16.

17. Institutions where the value of u_j is large compared with the standard deviation—say, three times the standard deviation in absolute value—are those where the indicator and the benchmark are significantly different. For such institutions the factors used have not completely accounted for the differences from the sector, and it may be that the performance of the institution has been particularly good or particularly poor.

18. Alternatives to the linear form of the model used here include random-effects logistic regression models. In some contexts such models have advantages over linear formulations with dichotomous outcomes, but the logistic approach runs into difficulties when the available predictor variables identify subsets of individuals with 0 percent or 100 percent success rates. This occurs here as some of the smaller specialist institutions have employment rates close to 100 percent. Professor David Draper of the University of California, Santa Cruz, and Mark Gittoes, who was then at the University of Bath, have shown through simulation experiments that random-effects linear modelling provides a reliable basis for identifying unusual universities in this situation.¹

Interactions between factors

19. It was originally intended to use two models, one for males and one for females, to allow for the interactions between gender and the other variables. However, it was found that, although these interactions exist, using a single model with gender as one of the factors did not significantly change the benchmarks produced.

20. The possibility of including a limited number of interaction terms was also looked at, but again these did not change the benchmarks significantly. In particular, the interaction between gender and ethnic group, which appears relatively large, did not make a significant change to the model.

Employment rates

21. Tables E8 to E15 show the base populations for each category of each factor, and the indicator values. These figures are not adjusted for other factors. In each table, the number employed, in further student or unemployedareshown as 'Basepop1', with the number employed or unemployed shown as 'Basepop2'.

¹ A technical report is available from the authors.

'Indicator1'isthepercentageofBasepop1whoa reemployedorstudying;while'Indicator2'isthe percentageofBasepop2whoareemployed.

TableE8 Employmentratesbysubjectofstudy

Subject	Basepop1	Indicator1(%)	Basepop2	Indicator2(%)
Medicine,dentistry,veterinaryscience	4,977	99.6	4,556	99.6
Pharmacy,ophthalmics,nursing,medical technology	4,852	99.3	4,757	99.3
Othersubjectsalliedtomedicine	6,172	96.2	4,959	95.2
Biologicalsciences	12,799	93.7	9,054	91.1
Agriculture	1,537	94.3	1,314	93.4
Physicalsciences	9,403	92.7	6,404	89.4
Mathematicalsciences	3,071	92.5	2,202	89.6
Computerscience	7,777	87.3	7,008	85.9
Engineering&technology	9,728	91.3	8,302	89.8
Architecture,building&planning	3,290	94.1	2,788	93.0
Economics,socialwork,geography	5,498	93.6	4,514	92.2
Othersocial&politicalstudies,andlaw	14,795	93.9	9,428	90.5
Business&administrativestudies	18,210	92.8	16,525	92.1
Librarianship&informationscience	2,925	90.5	2,675	89.6
Languagesandhumanities	18,215	92.9	13,048	90.1
Musicanddrama	3,928	93.7	2,892	91.4
Othercreativearts	10,002	88.3	8,699	86.6
Education	8,764	98.1	8,256	98.0
Combinedstudies	15,900	92.7	12,148	90.4
Allsubjects	161,843	93.2	129,529	91.5

TableE9 Employmentbyentryqualification

Entryqualifications	Basepop1	Indicator1(%)	Basepop2	Indicator2(%)
A-levels*,pointsunknown	2,406	92.7	1,876	90.7
A-levels*,upto8points	12,771	92.2	10,614	90.7
A-levels*,9to12points	14,275	92.9	11,925	91.5
A-levels*,13to18points	28,971	93.6	23,584	92. 1
A-levels*,19to24points	32,968	94.2	25,786	92. 6

A-levels*,25to30points	32,742	95.3	23,725	93.6
Accesscourse	8,040	89.3	6,559	86.8
BTECorequivalent	5,356	89.7	4,745	88.4
GNVQlevel3+	4,873	90.5	4,355	89.4
Highereducation	13,224	91.7	11,394	90.3
Other/notknown	6,217	91.1	4,966	88.8
Allqualifications	161,843	93.2	129,529	91.5

*orScottishHighers

TableE10 Employmentbyageonentrytohighereducation

Ageonentry	Basepop1	Indicator1(%)	Basepop2	Indicator2(%)
Under21	132,070	93.7	105,198	92.1
21to24	15,118	91.1	12,807	89.5
25orover	14,628	90.6	11,502	88.1
Unknown	27	85.2	22	81.8
Allages	161,843	93.2	129,529	91.5

TableE11 Employmentbygender

Gender	Basepop1	Indicator1(%)	Basepop2	Indicator2(%)
Female	91,535	94.9	72,800	93.5
Male	70,308	91.0	56,729	88.9
All	161,843	93.2	129,529	91.5

TableE12 Employmentbyethnicgroup

Ethnicgroup	Basepop1	Indicator1(%)	Basepop2	Indicator2(%)
White	136,221	93.8	109,784	92.3
BlackCaribbean	1,132	90.3	949	88.4
BlackAfrican	1,610	84.5	1,225	79.6
Blackother	598	91.8	489	90.0
Indian	5,907	90.5	4,589	87.7
Pakistani	2,550	86.4	1,855	81.2
Bangladeshi	735	86.5	555	82.2

Chinese	1,437		88.0	995		82.7
Asianother	1,595		91.2	1,158		87.8
Other/notknown	10,058		91.8	7,930		89.6
Allethnicgroups	161,843		93.2	129,529		91.5

TableE13 EmploymentbySocialClass

SocialClass	Basepop1	Indicator1(%)	Basepop2	Indicator2 (%)
SocialClassI,II,III	32,785	92.8	26,582	91.1
SocialClassIIIm,IV,V	99,790	93.9	78,904	92.3
UnknownSocialClass	29,268	91.3	24,043	89.4
AllSocialClasses	161,843	93.2	129,529	91.5

TableE14 Employmentbyneighbourhoodtype

Neighbourhoodtype	Basepop1	Indicator1(%)	Basepop2	Indicator2 (%)
Lowparticipation	19,473	92.0	15,655	90.0
Other	139,308	93.3	111,554	91.7
Unknown	3,062	94.4	2,320	92.6
Allneighbourhoodtypes	161,843	93.2	129,529	91.5

TableE15 Employmentbydegreeclass

Degreeclass	Basepop1	Indicator1(%)	Basepop 2	Indicator2(%)
Firstclasshonours	15,201	95.6	10,127	93.4
Uppersecondclasshonours	76,239	94.1	59,154	92.4
Lowersecondclass,orundividedsecond classhonours	52,214	91.8	44,197	90.3
Thirdclasshonours	6,878	87.7	6,017	86.0
Otherclassification	11,311	93.9	10,034	93.1
Allclassifications	161,843	93.2	129,529	91.5

TableE16 Coefficientsinmodelexcludingfurtherstudy

Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
Constant	1.079	Entryqual2	0.0004	Male	-0.038
		Entryqual3	-0.0004		
SubjectA	0.026	Entryqual4	0.0010	Ethnicgroup2	-0.016
SubjectC	-0.050	Entryqual5	0.0030	Ethnicgroup3	-0.096
SubjectD	-0.094	Entryqual6	0.0061	Ethnicgroup4	-0.003
SubjectE	-0.069	Entryqual7	-0.0159	Ethnicgroup5	-0.051
SubjectF	-0.104	Entryqual8	-0.0106	Ethnicgroup6	-0.105
SubjectG	-0.100	Entryqual9	-0.0105	Ethnicgroup7	-0.088
SubjectH	-0.111	Entryqual10	0.0033	Ethnicgroup8	-0.092
SubjectI	-0.084	Entryqual11	0.0007	Ethnicgroup9	-0.046
SubjectJ	-0.055			Ethnicgroup10	-0.022
SubjectK	-0.073	Degree2	-0.016		
SubjectL	-0.096	Degree3	-0.029	NotLPN	0.007
SubjectM	-0.073	Degree4	-0.057	Neigh'hoodNK	0.020
SubjectN	-0.104	Degree5	-0.042	NotlowSocialClass	0.002
SubjectO	-0.112			SocialClassNK	-0.008
SubjectP	-0.095	Age2	-0.016		
SubjectQ	-0.130	Age3	-0.045	Institutionalfactors	
SubjectR	-0.029	Age4	-0.124	AverageA-level	-0.001
SubjectS	-0.098			Unemp.rate	-0.526
				%grad.jobs	0.017