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Schooling effects on higher education achievement

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Acknowledgements

Schooling effects on higher education achievement

Summary

Purpose

1.   This report describes research to determine whether the characteristics of an applicant's school or college can be used in an assessment of his or her potential in higher education (HE).

Key points

2.   At the 'Fair Enough' conference on admissions to higher education sponsored by Universities UK in January 2003, it was recommended that school performance data be used to identify applicants with relative educational disadvantage, and, in conjunction with other information, to decide whether some applicants should be made lower offers. The justification for making such differential offers is based on the belief that students from poorly performing schools will achieve better results within higher education than students from better performing schools, all other things being equal.

3.   This document reports the findings from our attempts to assess such 'school performance' effects along with the effects of 'school type', such as whether the school is independent or the responsibility of the Local Education Authority (LEA). To reduce the complexity of the analysis we have restricted it to 18 year-old entrants with A-level qualifications to degree courses in 1997-98. These entrants were followed through to 2001-02 and their HE achievement was assessed by whether they had discontinued their studies, whether they had gained a qualification and, if they graduated, the class of degree they obtained. We found that:

   a.   A-level grades, as summarised by A-level points, were the single most important factor in determining the expected HE achievement. However, other factors – like the gender of the student, characteristics of the school and the university, subject studied – were also associated with HE achievement, in a rather complex way.

   b.   The effect of school performance was inconsistent. That is, under certain conditions, students from poorly performing schools are likely to do less well in HE than similar students from better performing schools. Whether a student from the poorly performing school does better or worse can depend on A-level points, the gender of the student, the subject of study in HE, and the measure of HE achievement used.

   c.   Students from independent schools appear to consistently do less well than students from other schools and colleges, when compared on a like-for-like basis. For all but those students attending the most highly selective institutions, we would expect a student from an independent school to achieve as well as a student from an LEA school who has between one and four fewer A-level points.

d. For the most highly selective higher education institutions the effect of having been to a further education college or grant maintained school is unclear, though we still find that students from LEA schools do consistently better than similar students from independent schools. However, at these most selective institutions, it is not possible to measure this difference in HE achievement in terms of equivalent A-level points, because the majority of the students have 30 A-level points, the maximum recorded value.

4. We have not attempted to establish the cause of the lower expected HE achievement for students from independent schools, and have simply discussed the explanations that others have offered. We think it unlikely that there will ever be clear evidence to answer such questions, and we leave it to the judgements of those deciding whether and how to use the evidence we have presented.

5. Aspects of our analysis could usefully be taken further including: extending the analysis to other cohorts, looking at other attributes of schools and exploring whether schooling effects related to a student's school at age 16 are important.

6. More generally, our experience in assessing schooling effects suggests that assessments of new ways of selecting applicants to HE are unlikely to be conclusive if based on small-scale studies. The models presented here provide a possible framework for systematic studies to find out what works and what does not in identifying potential.

Action required

7. No action is required in response to this document.

Queries

8. Comments or questions about this study should be sent to: Mark Gittoes, tel 0117 931 7052, e-mail m.gittoes@hefce.ac.uk

Introduction

9.   Prior educational attainment is usually the main criterion used by higher education institutions (HEIs) in deciding whether to accept an applicant. There are, however, continuing discussions about how these decisions could be improved by making use of other information. In particular Universities UK's 'Fair enough?' project has recommended that school performance data be used to identify applicants with relative educational disadvantage, and, in conjunction with other information, to decide whether some applicants should be made lower offers[1].

10.   The justification for making such differential offers is based on the belief that students from poorly performing schools will achieve better results within higher education than students from better performing schools, all other things being equal. Whether such a justification is necessary is an interesting question in itself, but it is not one that we will examine here[2].

11.   In this document we report the findings from our attempts to assess such 'school performance' effects along with the effects of 'school type', such as whether the school is independent or the responsibility of the LEA. To reduce the complexity of the analysis we have restricted it to 18 year-old entrants with A-level qualifications to degree courses in 1997-98[3]. In this analysis we made use of the Higher Education Statistics Agency (HESA) individualised student records, and data files provided by UCAS along with DfES school performance data.

12.   Schooling effects (see definition in paragraph 14) are both complex and small compared to the effects of individuals' prior educational attainment. Also, the measure of prior educational attainment which is currently available from the sources we used, A-level points, is only a limited summary of A-level results. If we had been able to take account of the number of A-levels and the actual A-level grades – rather than, for example, treating 'AA', 'ABE', 'BCC' and so on, as the same '20 points' – and if we had taken into account the A-level subjects, we might have made a different assessment of schooling effects. Therefore our findings are to be treated with caution.

13.   Establishing an association between any factor and subsequent HE achievement may not be sufficient to justify using such a factor in deciding whether to make an offer, and this publication does not advise on the implications of our findings for admissions policies. For example, it would be possible to make offers to women with lower grades without reducing the expected HE achievement[4], but such a policy would be illegal[5]. Leaving aside the legal issues, should a factor – say, the characteristics of the school – be used if we do not have an explanation for the association? Unfortunately, establishing the causes of such associations is even more difficult than establishing that the association exists in the first place. We have not attempted such an analysis ourselves, and have simply described the attempts of others and set out possible explanations. We think it unlikely that there will ever be clear evidence to answer such questions, and we leave it to the judgements of those using the evidence presented here.

Outline of discussion

Schooling effects

14.   The discussion centres on assessing the extent of the effects of school performance and school type on HE achievement. These effects are defined as the expected difference in HE achievement between students from relatively disadvantaged schools, compared to students with the same characteristics (apart from their schools) which are relatively advantaged. 'Relatively disadvantaged' in this context may be characterised by a school being 'low performing' or of a particular type – say, under LEA control compared to an independent school. If the expected HE achievement of the students from the disadvantaged schools is greater than the students from the advantaged schools, then the school effect is said to be positive. If it is less, the school effect is negative.

Structure of the document

15.   The discussion is set out as follows:-

    a.   A-level points of entrants and HE achievement.

    b.   School performance effects examined through simple summaries.

    c.   School type effects examined through simple summaries.

    d.   Models of schooling effects.

    e.   Variation in schooling effects for different sub-groups of students.

    f.   Possible causes of schooling effects.

    g.   Summary and conclusions.

    h.   Further work.

16.   We first show, through simple univariate summaries, the apparent effects of individual A-level points, school performance and school type ('a' to 'c' above). We then look at these factors more carefully, taking into account a range of other factors, by employing modelling techniques ('d' above). We then describe how the schooling factors take effect at different groups of institutions, depending on their selectivity, and within different subject areas ('e' above). Finally we speculate on what the causes of the school effects might be ('f' above), summarise, set out our conclusions and describe future work ('g' and 'h' above).

17.   More detailed results and descriptions of what we did can be found in the annexes:

      a.   Annex A: Definitions and data sources.

      b.   Annex B: Tabulations of HE achievement and main report tables/figures

      c.   Annex C: Modelling of HE achievement.

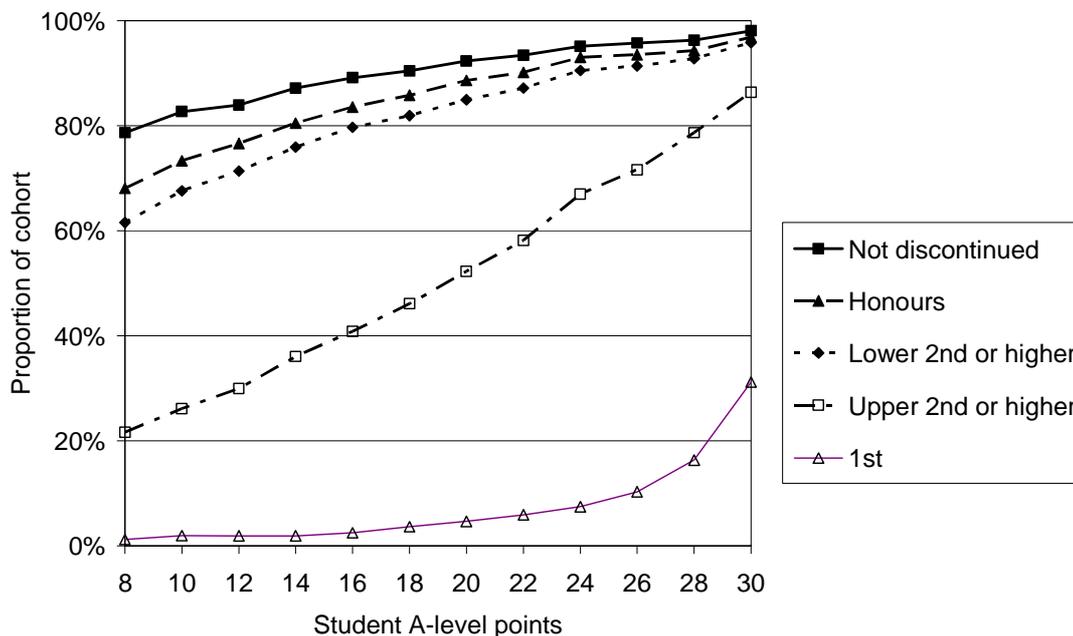**A-level points of entrants and HE achievement**

18.   There is a long-standing belief that achievement at A-level bears little relationship to what happens once students start their degree courses. Recently it was claimed that basing admissions on A-level results led to only marginally better decisions than choosing candidates by tossing a coin[6]. This claim was made without making clear what the difference in A-level performance was that was being considered; and, of course, a very slight difference in A-level performance would be expected to be associated with a small difference in HE achievement. Such statements cannot therefore be either confirmed or refuted. They do, however, create the false impression that ' A-levels do not matter', which is far from the case.

19.   Of course, it is true that students' HE achievements are not totally determined by their A-level results. The point is that no other single item of information provides a better indication of how a student will get on. Rejecting this has policy consequences beyond admission decisions; it could undermine the strong case for additional funding in support of widening participation. HEFCE has published analysis which demonstrated the strong association between A-levels and HE achievement[7,8].

20.   Figure 1 shows the relationship between A-level points and HE achievement for the cohort we chose for this study[2]. The following measures of HE achievement are included:

      a.   Proportion of cohort who have qualified or are still studying in 2001-02.

      b.   Proportion of cohort gaining an honours degree by 2001-02.

      c.   Proportion of cohort getting a lower second or better by 2001-02.

      d.   Proportion of cohort getting an upper second or better by 2001-02.

      e.   Proportion of cohort getting a first by 2001-02.

Figure 1: A-level points and HE achievement

21.   The plots of all five measures appear to show a strong relationship between A-level points and HE achievement. Details of definitions and tabulated results are shown at Annexes A and B. The shape of the curves changes progressively from the measure 'a', in which achievement is having avoided 'dropping out', through to measure 'e', gaining a first. As we move from the lower to higher measures of HE achievement, the curves change from a reducing slope to an increasing slope. The proportion of firsts shows the most marked non-linear effect, with the proportion achieving this class of degree increasing rapidly after 26 A-level points. The measure 'd', the 'proportion of cohort getting an upper second or better' provides the most discrimination, and is approximately linear. An alternative version of Figure 1, based on the logit scale, is given in Annex B.

22.   These five measures of HE achievement have been used throughout the analysis. In the main body of the report we concentrate on measure 'd', the 'proportion of the cohort getting an upper second or better'.

<u>A-level points as a measure of HE achievement</u>

23.   Behind the simple picture presented by Figure 1, the relationship between A-level points and these measures of HE achievement differs for different groups of students, depending on, for example, the sex of the students and the subjects they study at university. However, when we model this data we find that HE achievement is always expected to increase with increasing A-level points, whatever the characteristics of the students and whatever the measure of HE achievement used. It is therefore sensible to use A-level points as a general measure of HE achievement. We can say that 'such and such' is equivalent to, say, 'two A-level points' if its effect on HE achievement is the same as two A-level points for that particular group of students.

School performance effects examined through simple summaries

24.   We have used the average grade of the A-levels awarded[9] as a measure of school performance. In Table 1 we show the characteristics of students when ranked by the performance of their school and divided into four groups.

Table 1: Schools grouped by performance

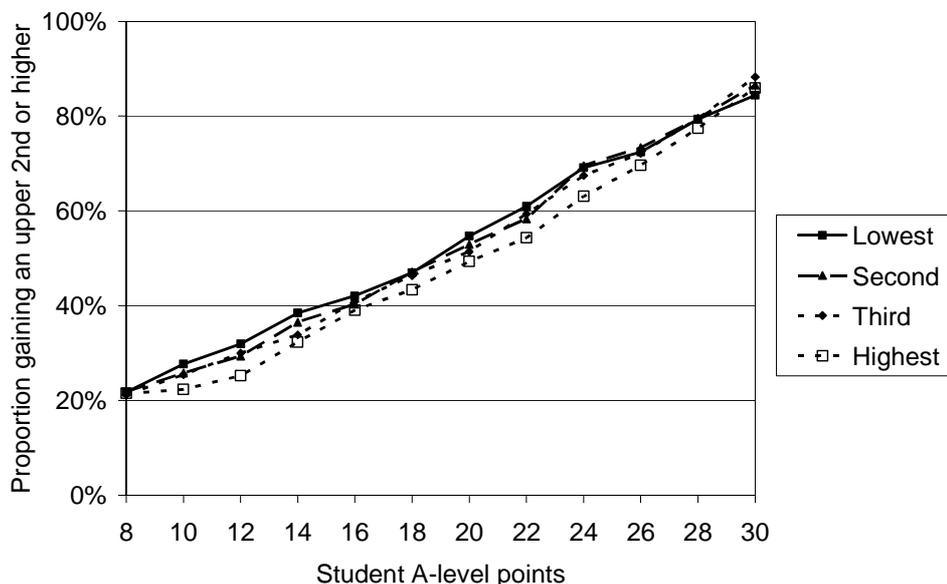| School performance group	School performance range (median in parentheses)	Number of HE entrants	Median A-level points of HE entrants	Proportion of cohort gaining an honours degree getting an upper second or better
Lowest performing	0.6 (4.4) 4.8	22,856	16	47%
Second group	4.9 (5.1) 5.3	19,398	18	51%
Third group	5.4 (5.7) 6.0	17,498	20	54%
Highest performing	6.1 (6.9) 9.0	19,253	24	60%
All schools and FECs	0.6 (5.3) 9.0	79,005	20	53%

Notes to Table 1

a.   The school performance is the average point score per entry. It can range from 0 (no A-level passes) to 10 (all A-level entries grade A).

b.   The median of both the school performance and A-level points of entrants are based on rankings by the respective values of entrants, not schools.

c.   School performance groups were based on performance quartiles on a school's entrants (further information provided in Annex C).

25.   The entrants from the lowest performing schools do least well in HE. This is shown in Table 1 using the proportion of the cohort who gain an upper second or a first. This is to be expected, because these entrants have, in general, lower A-level points and, as we have seen, there is a strong association between A-level points and achievement in HE.

26.   Figure 2 plots the proportion of the cohort getting an upper second or better by A-level points for each of the four school performance groups.

Figure 2: A-level points, school performance and HE achievement

27.   Figure 2 shows the same association between A-level points and HE achievement as Figure 1, for each of the school performance groups. It is hard to separate the students from the lowest, second and third quartiles of school performance groups, but the students from the highest performing schools do appear to have a lower HE achievement than the other students with the same A-level points, except for students with the highest possible A-level points, that is 30 points. (The truncation of A-level point scores at 30 points creates difficulties for our analysis of students with very good A-level results. The issues are discussed further at paragraphs 76 to 78.)

28.   Can this apparent school performance effect be accounted for by other factors, and does the overall difference in achievement apply to all groups of students? These are the questions we will address when we have described the apparent effect of school type.

School type effects examined through simple summaries

29.   A 'school type' effect has been observed for some time,[10,11] with evidence that students from independent schools do not achieve the same in HE that might be expected given their A-level grades.

30.   We have followed the DfES definitions of school type:

        a.   LEA schools (LEA) –
This group of schools is maintained by the local education authority (LEA). It includes county and voluntary controlled schools where the LEAs are usually responsible for the school's admissions policy, and voluntary aided schools where the governing body is usually responsible for the admissions policy.

b.   Further education colleges (FEC) –

This group includes general further education and tertiary colleges as well as grant maintained, voluntary aided and voluntary controlled sixth-form colleges.

c.   Grant maintained schools (GMS) –

These are grant-maintained schools, outside LEA control, where the governing body is responsible for the school's admissions policy.

d.   Independent schools (IND) –

These are registered independent schools, normally charging fees.

Students recorded as attending schools in other, minor classifications have been excluded for simplicity.

31.   In Table 2 we show the characteristics of students for the different school types.

Table 2: Schools grouped by type

| School type	School performance range (median in parentheses)	Number of HE entrants	Median A-level points of HE entrants	Proportion of cohort gaining an honours degree getting an upper second or better
LEA	0.8 (5.2) 7.8	30,079	18	53%
FEC	0.6 (5.0) 7.2	22,877	18	50%
Grant maintained	1.1 (5.5) 7.9	13,391	20	53%
Independent	1.4 (7.1) 9.0	12,658	24	56%
All schools and FECs	0.6 (5.3) 9.0	79,005	20	53%

Notes to Table 2

a.   The school performance is the average point score per entry. It can range from 0, no A-level passes, to 10, all A-level entries grade A.

b.   The median of both the school performance and A-level points of entrants is the value of the 50th percentile of entrants, ranked by the respective values.

32.   Table 2 shows the proportion of the cohort who gain an upper second or a first. Students from independent schools do the best, which is as we would expect given their A-level results.

33.   Figure 3 plots the proportion of the cohort getting an upper second or better by A-level points for each school type.

Figure 3: A-level points, school type and HE achievement
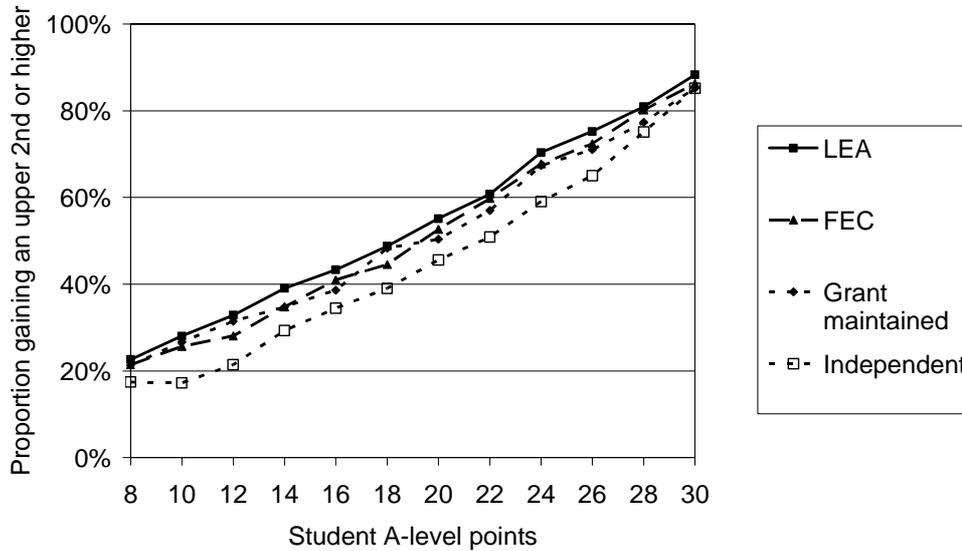
34.   Figure 3 shows the same association between A-level points and HE achievement as Figures 1 and 2, for each of the school types. LEA students appear to perform best, followed by FEC and grant maintained school students with very similar HE achievement, and then students from the independent schools who appear to have a lower HE achievement than the other students with the same A-level points. These differences in achievement by school type, like the differences in school performance, largely disappear for students with 30 A-level points.

Models of schooling effects

School performance and school type

35.   All the highest performing schools, which are those schools with performance of 8.0 or higher, are independent schools. For these schools their performance defines their type, and we cannot easily answer the question as to whether it is the school performance or type that accounts for the HE achievement of the students. That still leaves 86 per cent of students from independent schools which have a performance which can be matched, or bettered, by state schools. It therefore makes sense to ask whether the lower achievement of students from independent schools, compared to students from state schools with the same A-level points, could be accounted for by the high average performance of these schools. Conversely, we might postulate that the lower achievement of students from high performing schools compared to students from low performing schools, with the same A-level points, could be accounted for by differences in school type composition of these different groups of schools. It is also possible that there are two quite separate and distinct effects.

Outline of the models used

36.   To try and see what is the case, we have employed regression techniques. Details are at Annex C. The following factors were included in the modelling:

    a.   For each individual student:
        • A-level points
        • subject of HE study
        • length of course (three or four years)
        • sex.

    b.   For each HEI:
        • average A-level points of entrants included in the model.

    c.   For each school:
        • school performance
        • school type
        • selectiveness
        • all girls school or not.

These data have a multi-level structure. That is, there are attributes associated with students, with HEIs, and potentially subjects within HEIs, and with schools. In general, the results presented in the main report are based on a simple single-level model which does not take account of this structure. Models which took account of the student and institutional levels, and models which took account of students and school levels, were created separately and the results are reported in Annex C.

37.   The model was restricted to the same cohort on which the descriptive statistics were based, that is home full-time A-level 18 year-old entrants to degree courses in 1997-98[3].

38.   Though the number of variables employed is restricted, the resulting models are complex, with large numbers of significant interactions; consequently, the interpretation of the models is not straightforward.

39.   The models were first developed using the measure of performance, 'proportion of cohort getting an upper second or better'. Models were then created, using a similar structure, using the four other measures of achievement described at paragraph 18.

Output from the models: school performance effects

40.   The school performance effect, as defined in paragraph 14, is the expected difference in HE achievement between students, or groups of students, from relatively poor performing schools compared to a student, or group of students, with the same characteristics apart from their schools, which have higher performance. If the average HE achievement of the students from the lower performing schools is greater than the group from the higher performing schools, then the school performance effect is said to be positive. If it is less, the

school performance effect is negative. We measure increases or decreases in HE achievement using the equivalent in A-level points that an individual would require to make the same improvement.

41.   In Table 3 we show the school performance effects expected for a decrease in school performance of one grade or two points. The average effects are tabulated by individual A-level points and by sex. The proportion of students in each group who are expected to have a positive school performance effect is also shown.

Table 3: School performance effect – A-level point equivalent for increased chance of getting upper second or better
for decrease of two points (one grade) in school performance

Individual student A-level points	Mean increase in HE achievement (Percentage of students increasing achievement)			
	Males		Females	
low (5-8)	3.8	(100%)	0.9	(100%)
10	3.4	(100%)	0.7	(100%)
12	2.9	(100%)	0.5	(100%)
14	2.4	(100%)	0.3	(100%)
16	2.0	(100%)	0.1	100%)
18	1.6	(100%)	-0.1	(7%)
20	1.2	(100%)	-0.3	(8%)
22	0.8	(100%)	-0.5	(8%)
24	0.4	(100%)	-0.6	(8%)
26	0.0	(3%)	-0.9	(6%)
28	-0.4	(2%)	-1.1	(5%)
30	-0.8	(1%)	-1.2	(0%)

Note to Table 3

All students in the data set had their school performance reduced by a small amount (0.1 point), and the corresponding reduction in A-level points was calculated to achieve the same HE achievement (Y point). The table values equal 20 x Y points.

42.   A policy of making discounted offers to students from lower performing schools is based on an assumption that, all other things being equal, students from a lower performing school will go on to higher average HE achievement[1]. Table 3 shows what happens when we use the model to reduce the school performance for each student by a small amount, keeping all other characteristics the same. Based on the existing assumptions, we would expect the average HE achievement to increase.

43.   Consider, for example, males with 10 A-level points. Table 3 shows that the average increase in HE achievement per decrease in school performance is '3 points increase in HE achievement' per 'one grade decrease in school performance'. So the effect of decreasing the school performance of these students approximates to what to expect if we were to

increase their A-level points by 3. What is more, all (100 per cent) of these students are expected to increase their HE achievement with decreasing school performance.

44.   However, the model shows that decreasing school performance does not always lead to an expected increase in HE achievement. Consider females with 26 A-level points. The effect of decreasing their school performance is to decrease their average expected HE achievement. We indicate that there is an expected decrease, rather than an increase, with the negative sign. The size of this decrease in expected HE achievement is equivalent to one A-level point. This average figure is a net value consisting of 6 per cent of these students who would be expected to have an increase in HE achievement and 94 per cent who would be expected to have a decrease.

45.   Table 3 shows that the school performance effect on HE achievement is very different for males and females. For female students, it is either negative – that is, it is the opposite of what has previously been assumed – or it is very small. For male students there are mostly positive school performance effects for students with less than 24 A-level points.

46.   The proposals to use school performance data was made with respect to 'selecting' rather than 'recruiting' courses and higher education institutions[12]. The difficulty is that these courses will tend to be dealing with applicants at the higher A-level end of the range, which is just where the school performance effect is ambiguous.

Output from models: type of school

47.   The effect of type of school seems to be more straightforward than the effect of school performance. On all measures of performance independent schools have the most pronounced effect; that is, keeping everything else constant, a student from an independent school will be expected to be the lowest performer at HE. Students from LEA and grant maintained schools do best, with those from FECs slightly behind. Table 4 shows the difference in expected HE achievement between students from independent and LEA schools for different groups of students.

Table 4: School type effect – A-level point equivalent for increased chance of getting upper second or better for LEA students compared to otherwise similar independent school student

Individual student A-level points	Mean difference in HE achievement (Percentage of students increasing achievement)			
	Males		Females	
Low (5-8)	3.2	(100%)	3.0	(100%)
10	3.2	(100%)	3.0	(100%)
12	3.1	(100%)	2.9	(100%)
14	3.1	(100%)	2.9	(100%)
16	3.1	(100%)	2.8	(100%)
18	3.1	(100%)	2.8	(100%)
20	3.0	(100%)	2.8	(100%)
22	3.0	(100%)	2.8	(100%)
24	3.0	(100%)	2.8	(100%)
26	3.0	(100%)	2.7	(100%)
28	3.0	(100%)	2.7	(100%)
30	2.9	(100%)	2.6	(100%)

Note to Table 4

Only LEA school students were selected from the whole data set and then their school type was changed to independent. In all cases the expected HE achievement decreases on making this change. The size of these decreases was calculated as follows. On changing the school type from LEA to independent, the A-level points were also increased, so that the expected HE achievement remained unchanged.

48.   Table 4 shows that students from LEA schools have higher average HE achievement than students from independent schools, all other things being equal. This school type effect is lower for females, and for students with higher A-level points.

49.   The school type effect shown in Table 4 is somewhat artificial, since the performance between independent and other school types is so different. In considering what would happen were each student to have attended a different school type, we are, in some cases, extrapolating to combinations of conditions that do not exist. Table 5 shows the difference in expected HE achievement between students from independent and LEA schools for different groups of students as in Table 4, but simultaneously changes the school performance to make the comparisons more realistic.

Table 5: School type effect with simultaneous change in school performance

Individual student A-level points	Mean increase in HE achievement (Percentage of students increasing achievement)			
	Males		Females	
Low (5-8)	5.3	(99%)	3.0	100%)
10	4.7	(99%)	2.8	(100%)
12	4.3	(99%)	2.6	(100%)
14	3.9	(100%)	2.4	(100%)
16	3.6	(100%)	2.2	(100%)
18	3.3	(100%)	2.0	(100%)
20	2.9	(100%)	1.9	(100%)
22	2.6	(100%)	1.8	(100%)
24	2.4	(100%)	1.6	(100%)
26	2.1	(100%)	1.5	(99%)
28	1.9	(100%)	1.3	(98%)
30	1.6	(100%)	1.2	(94%)

Note to Table 5

Only LEA students were selected from the whole data set and then their school type was changed to independent. The students' LEA school performance was also modified to a randomly selected independent school performance. The corresponding increase in A-level points was calculated to achieve the same HE achievement as described for Table 4. This process was repeated for 50 simulations and the mean results are reported. Further details are at Annex C.

50. Table 5 shows that even when we change school performance along with school type so that we have a more realistic comparison, the HE achievement of students from LEA schools is consistently higher than for students from independent schools.

51. Annex C tabulates school type effects using the four other measures of HE achievement (as listed in paragraph 20). All show a lower expected HE achievement for students from independent schools using a like-for-like comparison. The size of the effect varies between the equivalent to one and four A-level points.

School performance and school type: conclusions from modelling

52. School performance and school type effects appear to be distinct: that is, the performance effects cannot be entirely explained by the type, neither can type be explained by performance. However when we take into account other factors, school performance effects are inconsistent. In some circumstances a student from a lower performing school will be expected to have lower HE achievement, all other things being equal. It seems that much of the apparent school performance effect shown in Figure 2 can be attributed to other factors.

53. By contrast, the school type effect holds up when we take into account other factors, and the direction of the effect is consistent. Students from relatively disadvantaged LEA

schools are always expected to have higher average HE achievement than those from independent schools, all other things being equal. The low achievement of students from independent schools, all other things being equal, cannot be explained by the school performance of independent schools, or other factors associated with HE achievement. We see this effect even when we change school performance along with school type, reflecting the differing performance profiles of the different types. The school type effect is shown to be reduced for students with high A-level points, as is suggested by Figure 3.

Testing the conclusions from modelling

54.   The conclusions from the modelling we undertook are different from our initial expectations, which were informed by reports of the use by some institutions of school performance in identifying applicants who would achieve more than might be expected from their A-levels[1]. We expected the school performance effect to be much larger, and we thought that it was at least possible that the effect of school type could be accounted for by differing levels of school performance.

55.   Given the unexpected nature of these findings, we thought it was important to test them further. There were two aspects of the data that could, potentially, have distorted our findings. The first is the confounding of school performance and school type measures. Independent schools tend to have higher performance than state schools and FECs, and no state schools and FECs have an average performance greater than or equal to 8.0 A-level points (a B grade average) on our school performance scale. The second difficulty is that we cannot assume that our measure of HE achievement is standardised across HEIs, and students from independent schools tend to be over-represented in certain HEIs.

56.   With these potential difficulties in mind, we carried of the following further analyses:

   a.   Extending the descriptive statistics.

   b.   Modelling without high-performing independent schools.

   c.   Modelling with artificial data where there is no independent school type effect.

   d.   Multi-level modelling in which prior education achievement and school factors are treated as random rather than fixed effects.

   e.   Modelling using weighted data so that independent school students are re-distributed across institutions.

Approaches 'a' to 'd' explored the possible effects of confounding school performance and type, and approaches 'd' and 'e' assessed the possible impact of difference in measures of HE achievement at different HEIs.

Confounding of school performance and school type effects

Extending the descriptive statistics

57.   The plot shown in Figure 2 of HE achievement by A-level points can be drawn for sub-groups of students. As we would expect from our modelling, the differences between students from the different groups of schools disappears for female students. For male students the difference disappears when we plot HE achievement separately for each school type. At this level of disaggregation, there is, as expected, a considerable amount of random scatter, but, overall, all these plots are consistent with the results of the modelling. (See Annex C, Figures R1-R6 for these disaggregated plots.)

Modelling without high performing independent schools

58.   All schools with a performance greater than or equal to 8.0 average points per A-level entry are independent, so at the top end of the performance range, performance and type are completely confounded. We re-ran the models excluding all students from independent schools with more than 6.0 average points, and then with more than 5.0 average points. In this rather crude way we ensured that there was a good overlap between school type and school performance. There was no reduction in the independent school effect with these alternative models. (Details at Annex C.)

Modelling with artificial data where there is no independent school type effect

59.   A data set was created which had the attributes of the real data except that school type and HE achievement were independent. The model based on this fabricated data set did not show a significant school type effect. This implies that the school type effect found using the real data was not due to the association between school type and school performance. (Details at Annex C.)

Multi-level modelling in which prior education achievement and school factors are treated as random rather than fixed effects

60.   A series of multi-level models that allowed different effects on HE achievement between HEIs for prior educational achievement, school performance and school type were examined. Correctly modelling the multi-level structure of the data and the variation in effects between HEIs increases the possibility that the schooling effects are correctly identified and are not due to variation that has not been taken into account. (Details at Annex C.)

Variation in HE achievement measure

61.   It has been pointed out that we cannot be certain that the measure of HE achievement is standard throughout the sector[13]. If it is more difficult to graduate from the most selective universities, and if it is also more difficult to gain a 'good' degree, then this could create an apparent school type effect. This is because the most selective institutions tend to have a higher proportion of students from independent schools, even after taking into account

subject mix and entry qualifications[14]. If students from independent schools are concentrated in the most selective institutions, and it is more difficult to get a good degree at these institutions, then students from independent schools will appear to have a lower HE achievement. (Note that a difference in difficulty in gaining a good degree could be due to a difference in standards, or in the effectiveness in teaching, or some other factor. For the purposes of this discussion it makes no difference.)

62.   In our model of HE achievement, we have a term 'average A-level points of institution' and the direction of this factor is variable. All other things being equal, the expected HE achievement for students attending institutions with higher average A-level points is dependent on the student's characteristics, in particular with regard to their degree course. These results are not entirely consistent with the suggestion that it is harder to get a good degree from more selective institutions, but there is some indication that this may be a feature in parts of the HE system.

63.   The fact that the model includes a term for the average A-level points of an institution means that it is unlikely that the variation in HEI standards could explain our findings, though we still thought it prudent to carry out further tests.

Multi-level modelling in which prior educational achievement and school factors are treated as random rather than fixed effects

64.   These models allow for the fact that HE achievement and schooling effects can vary between HEIs and are more flexible than more commonly used modelling techniques. The results of this modelling showed that the variation in the effect of these factors does not account for the schooling effects we have noted. (Details in Annex C.)

Modelling using weighted data so that independent school students are re-distributed across institutions

65.   To further test the hypothesis that variation in HEI standards could be causing the schooling effects seen, we weighted each observation so that the weighted numbers of students from independent and state schools were the same as the sector average for any given institution, and for various other factors, like A-level points. The results from modelling this weighted data showed no significant differences in the school type factors, and we conclude that any unaccounted for differences in HE achievement between HEIs due to this 'varying difficulty factor' is insufficient to take account of the school type effect.

Variation in schooling effects for different sub-groups of students

<u>Do the findings apply to all institutions, including the most selective?</u>

66.   Studies at the University of Bristol[15], and at other institutions, have led some to conclude that there is no difference between the achievement of students from independent and state schools. Is it the case that the school type effect that we have reported does not apply to some institutions? In some cases such conclusions seem to be the result of making

a simple comparison between degree outcomes of students from state and independent schools, without taking into account other factors, most importantly the entry qualifications. The average A-level points of students from state schools will be expected to be lower than for independent schools students at highly selective HEIs, even in the absence of any formal or informal policy of making discounted offers, simply because the proportion of students from state schools is lower for higher A-level grades. Where such conditions apply, equal achievement between students from state and independent schools would be consistent with the observed 'independent school effect', because the state school students have lower average grades[16].

67.   In addition to the complications of ensuring comparisons are made on a like-for-like basis, studies undertaken at the HEI level will often be difficult because the size of the expected chance year-on-year variation will be similar to the differences in HE achievement expected from school type effects. (These problems would be even more acute for investigations carried out at the departmental level.) It would often be necessary to pool data from several cohorts in order to assemble enough data to investigate these effects.

68.   These difficulties also apply to this study when we ask the question, do these findings apply to all institutions? With data from just one cohort, we cannot answer that with certainty. (We cannot even tabulate full results for individual institutions without breaching data protection principles.)

69.   Tables 4 and 5 show that the school type effect is smaller for students with high A-level grades, so we would expect the most highly selective institutions to have a smaller independent school effect. It is also these highly selective institutions where admissions tutors are looking for additional criteria to decide between large numbers of very well qualified applicants and where the issue of discounted offers is most relevant.

70.   To get closer to the individual institution level, without creating severe distortion in the data as a result of the small numbers involved, we grouped the institutions according to the average A-level points of students they accepted in our cohort. Details of all five groups are at Annex C, but here we only consider three groups – those institutions with significant numbers of students at the highest grades, that is those with 28 or 30 points. Table 6 sets out the key statistics for these groups.

Table 6: Groups of HEIs with students with high A-level grades

Institution group	Number of institutions	Number of students	A-level points			
			Mean	Median	% with 28 points	% with 30 points
1(Highest)	4	4,351	29.0	30.0	18%	70%
2(2nd Highest)	12	14,463	25.2	26.0	19%	21%
3(3rd Highest)	23	21,975	21.7	22.0	9%	6%

71.   These three groups of institutions together take 96 per cent of all the 30 A-level point students, and 92 per cent of the 28 point cohort. Is there a school type effect for these groups of institutions, for these students? In Table 7 we show the proportions of the cohort getting an upper second or better.

Table 7: Proportions of students with 28 A-level points getting an upper second or better by institution group and schools type (proportions expected by model are in parentheses)

Institution group	School type				Difference between LEA and independent
	LEA	FEC	Grant maintained	Independent	
1	79% (81%)	72% (79%)	66% (78%)	73% (77%)	6% (4%)
2	81% (80%)	80% (78%)	79% (78%)	75% (76%)	6% (4%)
3	83% (81%)	84% (79%)	82% (79%)	80% (78%)	3% (3%)

72.   The results for institution groups 2 and 3 follow the pattern expected by the model quite closely. The rankings of HE achievement by school type all follow the order expected from the model, that is: LEA, FEC, grant maintained followed by independent. Group 1, the most selective group of institutions, however, is anomalous in two respects. Firstly, we notice that all students do less well than we would expect from the model. Overall, 73 per cent of the students with 28 A-level points get an upper second or better, compared with an expected 78 per cent. Also, though the difference between the LEA and independent school students is as we would expect, both FEC and grant maintained students do not do as well as students from independent schools, which is not what we would expect from the model. As we mentioned previously, both FEC and grant maintained are rather heterogeneous classes of schools and colleges, and it is possible that the actual character of the school and colleges covered under these headings are quite different for the most selective institutions in Group 1. However, the pattern shown for Group 1 does not apply to all the institutions in that group, and the numbers of students from FECs and grant maintained schools are such that this could be a one-off chance result.

73.   Table 8 reproduces the figures in Table 7 for students with 30 A-level points.

Table 8: Proportions of students with 30 A-level points getting an upper second or better by institution group and school type (proportions expected by model are in parentheses)

Institution group	School type				Difference between LEA and independent
	LEA	FEC	Grant maintained	Independent	
1	89% (84%)	85% (81%)	85% (82%)	86% (81%)	3% (3%)
2	89% (84%)	88% (81%)	85% (82%)	85% (81%)	4% (2%)
3	91% (85%)	89% (83%)	89% (83%)	86% (83%)	4% (2%)

74.   For institutions in Groups 2 and 3, the students from independent schools do least well, while for the institutions in Group 1, the students from FECs and grant maintained schools have the lowest average HE achievement. In these respects, the pattern for students with 30 points is similar to that for students with 28 points. Again, the anomalous position of students from FECs and grant maintained schools does not apply to all the Group 1 institutions, and it is not clear whether there is an underlying difference or whether this is a chance result.

75.   In some other respects the pattern for the 30 point students is different from that for 28 point students. Firstly, the students in all these groups do better than is expected from the model. Secondly, we find that the students from the most selective institutions in Group 1 do about as well as the other groups, unlike Group 1 28 point students. Overall 86 per cent of students from Group 1 gain an upper second or better, compared to 87 per cent in Groups 2 and 3.

76.   The truncation of A-level points at 30 provides an explanation for these results. The truncation means that there will be a significant range in the A-level performance among the students who are assigned to 30 points. We would expect the most selective institutions to have a higher proportion of 'good 30 point' students. We describe their A-levels as 'AAA plus', by which we men that they have four or more grade 'A's, or in some other way distinguish themselves from the average entrant with 30 points. It may also be the case that the students with 28 points at Group 1 institutions were also stronger applicants than 28 point students at the other groups, but all these students must have three best A-levels of grades 'A', 'A' and 'B'. The range of pre-HE achievement will therefore be much less than for the 30 point students. This could also explain why Group 1 30 point students do about as well as 30 point students in Groups 2 and 3, while 28 point students do significantly worse, assuming that, for some reason, getting a good degree is slightly more difficult at Group 1 institutions. Put a different way, we can understand the large gap between 28 and 30 point students at Group 1 institutions compared to Groups 2 and 3 in terms of the average relative strength of the 30 points in the three groups. This explanation is summarised in Table 9.

Table 9: A-level points, A-level grades and HE achievement by institution groups

Institution group	A-levels		Difference in average HE achievement (Differences expected from model are in parentheses)	
			30 A-level points - 28 A-level points	
	28 A-level points	30 A-level points	% gaining upper second or better	% gaining first
1	AAB	AAA plus	13% (4%)	20% (11%)
2	AAB	AAA	8% (4%)	14% (12%)
3	AAB	AAA	7% (4%)	15% (11%)

77. Thus, though our model has a factor to take account of the relationship between the difficulty in getting a good degree and the overall selectivity of the institution, it did not take account of these specific 30 point effects. At Annex C we describe a model that includes extra terms to take account of this complication. This further refinement of the model does not weaken our conclusions. Indeed including the extra terms to model the '30 point truncation effect' further reduces the school performance effect, while the school type effect is maintained.

78. Even for the most selective institutions, students from LEA schools do better than students from independent schools, all other things being equal. This result is repeated when we look at other measures of performance, like, for example, the proportion of students gaining a first class honours degree. 35 per cent of LEA students with 30 points from Group 1 institutions gain a first, compared to 31 per cent from independent schools. For students with 28 A-level points, the respective figures are 14 per cent for LEA school students and 10 per cent for independent school students. The school type effect clearly applies for these 28 and 30 point students at these selective institutions as it does for others. The difficulty is that we are unable to calibrate this difference in terms of A-level equivalence. Most students at Group 1 institutions have 30 A-level points and many of them are probably '30 point plus' students. The difference between 28 and 30 points, the only measure available to us, at these institutions is too great to provide a measure of the school type effect. The situation for students from FECs and grant-maintained schools at Group 1 HEIs is less clear. We need both more data and more tightly defined definitions of these schools and colleges to come to a firm view of the school type effects in these circumstances.

How do the schooling effects vary in each subject area?

79. When the whole cohort of students is considered together, we have concluded that there are no consistent school performance effects, but students from independent schools do less well in HE than students from other schools. However an important question to ask is whether these overall effects are seen within subject areas. Disaggregating and analysing the data at a subject area level causes similar problems to disaggregating at an institutional level. The chance year-on-year variation will be similar in size to variation in HE achievement due to specific subject area schooling effects.

80. A series of multi-level models at a subject area level have been examined, which are described more fully in Annex C. For all subject areas, the modelling shows that an LEA schooled student will do better in HE than their independent school counterparts. The size of this effect does vary depending on subject area. LEA students in business studies appear to have the largest advantage over their independent school counterparts, the effect being around 50 per cent larger than seen in the overall data. The weakest effects of attending an LEA school are seen in creative arts, with the effect being around half the size of that seen in the overall data.

81. The effects of school performance are inconsistent across the subject areas. The direction of the effect varied, and in a proportion of subject area is near zero. In agriculture subjects and the languages the school performance effect is negative. This means that in

these subjects the average HE achievement of students from poorly performing schools is lower than the achievement of students from better performing schools.

82.   The subject areas where the strongest school performance effects exist are in subjects allied to medicine and engineering. The performance effect in these subjects is around three times stronger than the effect seen for the overall data.

83.   More detailed results are given in Annex C.

Possible causes of the school effects

84.   It is usually assumed that the cause of a schooling effect is as follows. Students who gain A-levels at relatively disadvantaged schools do not show their full potential through their A-level results. Once in HE, there is a relatively 'level playing field' and the students then achieve more than would be expected from their A-level grades.

85.   Let us examine this explanation in more detail. The A-level results of students at a school or FEC will depend on the selection criteria, which can range from a formal academic test through to the accidental consequences of the school's location, and the 'added value' that the school brings. If the selection takes students with high 'ability', whether we consider this ability to be inherited or gained through earlier experiences, such ability should lead to achievements in HE as well as at A-level. To the extent that the school teaching helps students find an interest in and an understanding of their studies, and develops their study skills, over and above what is needed to 'get the grades' at A-level, the students should do well at HE as well. The 'schooling effect' will therefore only occur if the school provides a temporary 'added value', perhaps through specific exam coaching or cramming. The lessons of this coaching would have to be irrelevant to assessment within HE. Examples of such temporary added value might include accurate advice as to what questions are likely to come up, identification of examination boards, and syllabuses within those boards, where higher grades are more likely, and more active and effective appeals over the grades first awarded.

86.   Given these considerations, perhaps it is not surprising that we do not see a large consistent school performance effect. Most of the characteristics that lead to schools having high performance as measured by high A-level grades will also result in their students being well prepared for HE.

87.   By contrast, the school type effect, as we have seen, does seem to be consistent, with students from independent schools under achieving in HE compared to what might be expected from their A-level results. Using data for the 1992-93 leaving cohort from the pre-1992 universities, Naylor and Smith reported an independent school effect on HE achievement similar in size to what we have found[11]. More recently they devised some ingenious tests to try and understand what is the cause of this effect[17].

88.   Their first hypothesis is equivalent to what we have described as the 'temporary added value' explanation. They use the notion of an 'underlying ability distribution'. A student from

an LEA school who achieved the same A-level results as a student from an independent school was postulated to be 'drawn from a higher point' in this distribution. The second hypothesis proposed that students from independent schools make less effort once they are within HE. Naylor had previously reported that students from independent schools had higher nominal 'occupational earnings' after graduation[18], so it is possible that there is less incentive for them 'to work hard for a good degree'. They rejected this second hypothesis on the grounds that when introduced, an interaction term between independent school type and class of degree is insignificant in their 'occupational earnings' model. In other words, they were unable to find evidence that students from independent schools have a lower financial return from gaining a good degree than students from other types of schools. We think that this still leaves the possibility that students from independent schools do not 'work hard for a good degree' because they believe they do not need to, or because the difference in the marginal advantage of getting a better class of degree is too small to be detected, or for some other reason. For example, it may be that students from independent schools receive allowances such that a fuller social life is available, and this has a detrimental effect on their HE achievement as measured by class of degree[19], though we can imagine that such activities could provide advantages in the labour market.

89.   Naylor and Smith then investigated the variation in the size of the independent school effect for different independent schools and found that, for male students, the effect increased with increasing fees. That is, the higher the fee, the lower the HE achievement compared to similar students from state schools. They considered a second hypothesis based on differential incentives, and rejected it using a test analogous to that described for independent schools as a whole.

90.   Though we are not yet convinced that the fee level is a real determinant of the size of the independent schooling effect, we do agree with the authors that further exploration of school effects may prove to be illuminating. However, before we explore such subtle questions, we need much fuller information on the individual A-level results. It is still possible that our observed schooling effects are a consequence of the way we have summarised A-level results[20].

Summary and conclusions

91.   For the cohort that we have analysed, that is home full-time A-level 18 year-old entrants to degree courses in 1997-98, we found that the school performance effect lacks consistency. That is, under certain conditions, students from poorly performing schools are expected to do less well in HE than similar students from better performing schools. Both the size and direction of the school performance effect can depend on A-level points, the sex of the student, the subject of study in HE, and the measure of HE achievement used.

92.   The analysis of the same cohort showed that students from independent schools appear to do less well than students from other schools and colleges, when compared on a like-for-like basis. For all but those students attending the most highly selective institutions, the size of the effect is equivalent to that which would be associated with one to four A-level points.

93.   Even at the most highly selective institutions, we find a difference in HE achievement between students from independent schools and those from LEA state schools. However, students at these institutions from both FECs and grant maintained schools in aggregate had lower average HE achievement than students from independent schools. This result is not consistent across the institutions within this group, and the numbers are too small to be sure whether this is anything more than a one-off effect. At these most selective institutions, it is not possible to measure the difference in HE achievement in terms of equivalent A-level points, because the majority of the students have 30 A-level points, the maximum recorded value.

94.   We have not yet come to any conclusions as to the cause of these effects.

Further work

95.   We have identified the following aspects of this analysis which could usefully be taken further:

a.   To better reflect the structure of the data in our modelling.

b.   To assess more control variables for inclusion in the model, and, in particular, to see if we need to give a fuller characterisation of A-level results. This depends on further assembling data from a variety of sources.

c.   To extend the analysis beyond the limited group of 18 year-old A-level entrants to first degree courses.

d.   To assemble data for several cohorts, in part to try and see if the picture is changing, but also to be able to combine cohorts to provide sufficient numbers to analyse individual and small groups of institutions.

e.   To look at different attributes of schools, and more refined groupings of school types.

f.   To explore whether schooling effects related to a student's school at age 16, and school performance as measured by GCSE results, are significant.

96.   More generally, there is a growing interest in finding new ways to identify potential in applicants to HEIs. Our experience in assessing schooling effects suggests that an assessment of such techniques is unlikely to be conclusive if based on small scale studies. The models developed here provide a possible framework for systematic studies to find out what works and what does not in identifying potential.

Endnotes

1.   Universities UK (2003), 'Fair enough: wider access to university by identifying potential to succeed'.

2.   It is possible to make a case for differential offers even in the absence of clear evidence of a school performance effect on final degree outcome. Many leading universities in the US accept applicants from disadvantaged backgrounds knowing that they are unlikely to graduate with as good a degree as some of the people they have turned down. They take a much longer view of the benefits of higher education, and are looking to select those who they believe will become future leaders in different walks of life.

3.   All results are derived from the home, English domiciled, full-time A-level entrants to three or four year degree courses in 1997-98 at English HEIs aged 18 on 31 August 1997. Entrants studying medicine, veterinary science, dentistry and architecture and entrants with unknown or very low (one to four) A-level points were excluded, as were students who could not be linked back to the schools listed in the DfES schools performance tables. Further details are at Annex A.

4.   There is a large gap in the average HE achievement between men and women using most measures. For example, for our cohort, 45 per cent of men and 56 per cent of women get a first or upper second. The subject taken and other factors can account for only a small part of this difference. The only measure that men do better on is getting a first: 9 per cent compared to 7 per cent for women. These results need to be taken in the context of significantly higher participation rates for women. (See HEFCE 01/62, Figure 3.)

5.   The legal situation in the case of taking the sex of the applicant into account when making an offer is straightforward, because this would contravene the Sex Discrimination Act (1975). Taking account of other factors may have implications with respect to the Human Rights Act, which incorporates the European Convention on Human Rights into English law, but here the interpretation of the law is much less straightforward.

6.   William D (2002), Daily Telegraph, 15 August 2002.

7.   Bekhradnia B and Thompson J (2002), 'Reflection of success', The Guardian, 15 October 2002.

8.   Bekhradnia B and Thompson J (2002), 'Who does best at university?'. Fuller version of Guardian article (7 above) at:

9.   The most relevant measures from the School and College (16-18) performance available are:

   a.   The average A-level point score per candidate (aged 16, 17 or 18 at start of school year) entered for two or more A-levels (or AS equivalent). This can range from 0 (all

candidates fail all the examinations they are entered for) to 30 (all candidates achieve three grade As) or higher

b. The average A-level point score per entry for candidates (aged 16, 17 or 18 at start of school year) entered for one or more A-levels (or AS equivalent). This can range from 0 (failure) to 10 (grade A at A-level).

The candidate measure suffers from being dependent on the number of A-levels taken so that the results for a school could be easily altered by its examination policy (whether it offers four A-levels per candidate, whether it offers retakes). The per entry measure is not affected by the number of A-levels taken but may be affected if there are a large number of candidates being entered for a single A-level. Both measures are for examination entries (rather than results) so that schools who opt to enter more marginal candidates will lower their recorded performance. Both measures also relate to candidates aged 16, 17 or 18 at the start of the 1996-97 academic year (so long as they were on the register at the school or college in January 1997). Again, in both cases the results in modular examinations are included, even if students later declined those results in favour of continuing their studies. Neither measure is ideal for measuring the performance of the school with reference to the particular cohort we are looking at. We have decided to use the average point score per examination entry since it is not directly affected by the number of examinations taken. For details see: www.dfee.gov.uk/performance/16to18_97.htm.

10. HEFCE unpublished analysis, 1996 onwards.

11. Smith J and Naylor R A (2001), 'Determinants of degree performance in UK universities: a statistical analysis of the 1993 student cohort' Oxford Bulletin of Economics and Statistics, 63, 29-60.

12. In 'Fair enough: wider access to university by identifying potential to succeed', Universities UK, 2003, courses were described as 'selecting' where high offers were made, where recruitment is only rarely through Clearing, and where most places are filled at confirmation with applicants who meet their offers. Courses were described as 'recruiting' where most applicants receive a standard offer, which can be well above their predicted grades as well as being above what is finally accepted at confirmation and Clearing.

13. Bell J F (2003), 'Analysing student progress in higher education using cross-classified multilevel logistic models', Fourth International Amsterdam Conference on Multilevel Analysis. Using records for pre-1992 universities for 1993-94 and earlier, John Bell produced models which suggested that the school effect 'is an artefact of the allocation of students to universities' which have a different relationship between degree success and A-level score. In our analysis we have attempted to address the issues he raised.

14. The performance indicators published by the UK funding councils show that the most academically selective institutions tend to have a higher proportion of students from independent schools than would be expected, even taking into account the subject mix and

entry qualifications. See, for example, HEFCE 2002/52 on the HEFCE web-site www.hefce.ac.uk under Publications.

15.   Odell J (2003), 'School Performance and the Likelihood of getting into Bristol', paper presented to the Universities UK 'Fair Enough' conference, 22 January 2003.

16.   We think that a difference in average A-level scores for students from independent and state schools may provide an explanation for the findings reported by Jeff Odell (see 13). A summary measure based on degree class was used to compare graduates of the University of Bristol from state and independent schools. The results did not support the findings of Naylor (see note 11 above) who had found that students from independent schools had lower HE achievement when other factors where taken into account, and it was conjectured that this may have been 'because Bristol tends to recruit from the strongest state schools'. However, crucially, the A-level scores of these graduates were not taken into account. School performance effects were then explored as follows. The 1998 graduates were divided into eight groups, according to the performance of their schools. The mean A-level points of the students from the lowest performing schools were about two A-level points less than for those at the highest performing schools group, yet the mean HE achievement for all the groups was found to be the same. It was therefore concluded that students from less well performing schools have higher HE achievement, given the same individual A-level scores. However, the proportions of independent school students in the different performance groups were not considered, and we might expect the higher performing groups to have a higher proportion of independent school students. We have not been able to assemble data for the cohorts used in the analysis carried out at the University of Bristol, but we have applied exactly the same methods to the 1997-98 entry cohort (as defined in note 3 above) to the University of Bristol. Using the same summary measure based on class of degree, we found that state school students did do better than students from independent schools. We also found that if we divided the graduates of the University of Bristol into eight groups based on school performance, the summary measure based on class of degree was the same for each group, despite the fact that the lowest performing group had an average A-level score about two points lower than the higher performing group. In other words, the results were very similar to those reported for the original analysis at the University of Bristol. However, the same result was also predicted for these graduates when we carried out a simulation based on our model. As expected, the proportions of independent school students were higher in the higher performance groups, and this provides the main explanation as to why the observed result was expected by the model. Thus we have concluded that it is school type, not school performance that is the determining school factor at the University of Bristol, as at other institutions.

17.   Smith J and Naylor R A (2002), 'Schooling effects on subsequent university performance: evidence for the UK university population', University of Warwick, Warwick Economic Research Papers No 657.

18.   See reference in note 11 above and references therein. Note that when the authors refer to 'occupational earnings' they mean the average earnings of those working in particular occupations that the graduates enter. These average earnings are for both

graduates and non-graduates. They are not based on the earnings of the graduates themselves.

19.   The 'social life' alternative to the second hypothesis was originally made rhetorically, to demonstrate the almost limitless number of possible explanations for such effects. Since then, we have leant that research by Professor Clare Callender showed that 95 per cent of students at independent schools agreed that 'some of the best aspects of going to university are meeting new people and the social life', more than any other group, so perhaps there might be something in this hypothesis. See the Universities UK publication, 'Attitudes to debt: School leavers and further education students' attitude to debt and their impact on participation in higher education', 2003.

20.   The Universities' Statistical Record (USR) which predated the HESA returns and was used by Naylor et al, has more details about A-level results. In order to create an equivalent dataset for recent cohorts it will be necessary to link data from UCAS and HESA.

Description of annexes

Annex A – Definitions and data sources Explains what cohort of students is being studied and the data definitions for that cohort.

Annex B – Tabulations of HE achievement and main report tables/figures Contains tabulations of the five measures of student achievement split in a number of ways. It also contains the figures (and related data), and tables from the main report.

Annex C – Modelling of HE achievement *Word document* – Describes the statistical models used in the main report and the methods used to examine the results of these models.

Excel spreadsheet – The spreadsheet contains data on the statistical models and the results derived from them. It contains two types of worksheet:
   a. The worksheets named using the notation C(x) are either figures or tables that appear in the Word document part of Annex C.
   b. Those named using the notation R(x) are referenced in the Word document but appear only in the spreadsheet.

List of abbreviations

DfES	Department for Education and Skills
FEC	Further education college
GMS	Grant maintained schools
HE	Higher education
HEFCE	Higher Education Funding Council for England
HEI	Higher education institution
HESA	Higher Education Statistics Agency
IND	Independent schools
LEA	Local education authority
UCAS	Universities & Colleges Admissions Service