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THE CORRELATION BETWEEN A LEVEL GRADES AND DEGREE RESULTS IN ENGLAND AND WALES

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ABSTRACT

"A" (Advanced) Level grades are used as part of the selection procedure for entry to university study in England. This article reports on an analysis of the correlation between A level grades and degree results using data on graduates in 1979.

The Correlation Between A-Levels and Degree Results

1. The usual minimum entry requirement for English and Welsh students wishing to enter degree-level courses is the achievement of passes in at least two subjects at the Advanced Level of the General Certificate of Education (A-levels). In practice, competition for places ensures that many applicants are offered places only on the condition that they obtain grades well above the minimum pass level, which is a grade "E": it would not, for example, be unusual to find someone being offered a place on the condition that he/she obtained, say, three passes of at least grade "C". There has been a substantial amount of comment over the last year or so about the fact that several universities have raised their entry requirements in terms of A-level grades in response to a rise in student demand relative to the supply of places. Attention has been focused on the old question about the suitability of A-level grades as a criterion for entry to higher education and frequent reference has been made to the alleged absence or weakness of correlation between A-level grades and degree results. This is a topic which has been the subject of many studies in the past and a forthcoming paper by Tarsh (1983) reviews some of the most important findings. As that paper

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makes clear, however, much of the previous work was done some time ago, a great deal having happened in the meantime, and some of the work has been based on rather small samples. The purpose of this article is to present some results based on more recent data on all university graduates, and to look not just at the overall correlation but also at differences between different subject areas and between students of different age.

Data

2. The data used for the analysis covered 1979 graduates from universities in Great Britain, broken down by degree class, age, and A-level points score, the latter being measured on the conventional Universities Central Council on Admissions (UCCA) scale (A = 5, B = 4, with the best three counting.) This breakdown was available for each of the nine main subject groups (listed in Table I) as well as a few individual subjects. The data was supplied by the Universities Statistical Record to whom I am most grateful. The data did not cover failures or dropouts; nor was it available for the non-university sector. In addition graduates with undivided second class honours, as well as those with pass or ordinary or unclassified degrees, were excluded from the analysis because of the difficulty of placing them in strict ranking order.

3. It must be stressed from the outset that we are in no sense attempting any overall explanation of achievement by university students. We are focusing just on the narrower question of the extent to which degree results are correlated with A-level results. We are, however, not ideally placed even to pursue this rather limited aim. The nature of the data (especially the well-known weakness of the points system for aggregating A-level results, the fact that both measures are ordinal rather than cardinal, and the very small number of degree classes distinguished) means that statistical analysis must be carried out with some caution. While it is possible to use data of this kind to establish the probable existence of a non-random relationship, there is no sure way of measuring the strength of that relationship with any precision.

4. With these qualifications in mind we decided to apply three different tests to see what kind of pattern emerged. The tests used were:

a) Correlation Analysis

This has the advantages that it is familiar and that the statistic r-squared can be interpreted as measuring the proportion of variation in one variable which is associated with variation in the other. It is not, however, ideal for dealing with grouped data and has the further disadvantage that it requires the "5-4-3-2-1" approach to A-levels, with its obvious weaknesses, to be extended to degree classes. (In this exercise, we took a first as 4, an upper second as 3, a lower second as 2, and a third as 1.) It also assumes that the association is linear.

b) Analysis of Variance

This also provides a measure of the proportion of variation "explained" and has an advantage over correlation analysis in that it does not require arithmetic values to be given to degree classes; nor does it assume a linear relationship. It does, however, suffer from the corresponding weakness that it takes account of differences between degree classes (in terms of average A-level scores) but ignores their direction. This does not matter as long as the differences are, in fact, "sensible," which they are in most of the cases examined here.

c) Cramer's Statistic

This is a test based on the measure "chi-squared," which is often used as a test of association on data of this kind. In theory it has an advantage over both the preceding measures in that it does not require either A-level or degree results to be given arithmetic values, though, in practice, this advantage is reduced by the fact that we do not have the A-level data grouped by actual results (i.e., AAA, BBC, etc.) but only the overall "points" score, which assumes, for example, that AAC = ABB. One disadvantage of Cramer's statistic is that, while the values calculated are theoretically comparable, hence allowing comparison of the *relative* strength of association as between subjects, there is no obvious interpretation which can be put on their absolute values. They are not, therefore, comparable with the other measures and do not purport to measure the proportion of variation explained. There is also a danger in using the chi-squared statistic where the expected number of observations in some cells is very small, as it is for some of the smaller subjects groups (education, agriculture, and architecture). Finally, as with analysis of variance, the measure takes no account of whether any apparent association is "sensible."

Results

5. Table I shows, for each subject group, the average A-level points scored by graduates of each degree class. Table II looks at this the other way round (which is more meaningful from our viewpoint) and shows how the proportions achieving good degree results vary according to A-level entrance qualifications. The results of the statistical tests are presented in Table III. The conclusions which may be drawn are:

a) All the results are statistically significant. There are, therefore, no grounds for asserting that there is no association between A-level and degree results, whether overall or in any subject group.

b) The strength of association is invariably small. It seems that the proportion of variation in degree classes associated with A-level scores at this level of aggregation is never much above 10% and, for some subject groups, is considerably less than this.

TABLE I

Average A-Level Points by Degree Class by Subject Group

Subject group	First class	Upper second	Lower second	Third/ fourth	All*
1. Education	10.7	8.8	7.0	6.2	7.7
2. Medicine, etc.	12.5	10.6	9.6	8.6	10.2
3. Engineering, technology	12.0	10.1	8.5	8.1	9.3
4. Agriculture/vet sci.	11.6	8.3	7.3	6.5	7.7
5. Science	12.3	9.9	8.5	8.0	9.3
6. Social studies	12.1	10.1	9.0	8.5	9.5
7. Architecture/other prof.	11.2	10.5	9.8	9.3	10.0
8. Languages	12.6	11.0	9.5	8.5	10.2
9. Other arts	11.8	10.2	8.7	8.4	9.4
All	12.2	10.2	8.9	8.2	9.5

* The Table excludes those with undivided second class or pass/ordinary degrees as well as those whose main entry qualification was not the GCE.

TABLE II

Percentage of Graduates* Obtaining First or Upper Second Class Degrees

Subject group	No of graduates	A-Level points				
		0–4	5–8	9–11	12–15	All
Education	318	16.4	29.8	40.2	73.3	37.7
Medicine, etc.	1,324	18.9	37.4	43.2	61.9	47.0
Engineering	5,218	22.3	27.2	38.6	61.8	40.3
Agriculture/vet science	650	31.9	30.7	45.1	68.7	39.4
Science	10,283	23.9	31.0	43.7	63.7	43.5
Social studies	12,184	27.3	28.6	36.0	53.8	38.2
Architecture/other prof. studies	486	50.0**	24.6	33.5	48.7	36.0
Languages	6,485	25.9	28.4	38.1	60.7	43.7
Other arts	4,135	29.8	33.8	46.2	64.7	46.4
All	41,083	25.1	29.9	39.9	60.0	41.8

* Excluding those with pass or ordinary or undivided second class degrees and those whose main entry qualification was not the GCE.

** Based on 10 or less observations.

TABLE III

Measures of Association Between A-Level and Degree Results

Subject group	Correlation analysis (r-squared)	Analysis of variance (w-squared)	Cramer's statistic
1. Education	0.117 (2)	0.114 (3)	0.352 (1)
2. Medicine, etc.	0.091 (5)	0.094 (5)	0.247 (4)
3. Engineering and technology	0.115 (3)	0.126 (2)	0.233 (6)
4. Agriculture, etc.	0.080 (6)	0.093 (6)	0.285 (2)
5. Science	0.124 (1)	0.141 (1)	0.266 (3)
6. Social studies	0.058 (8)	0.063 (8)	0.198 (9)
7. Architecture, etc.	0.028 (9)	0.029 (9)	0.230 (7)
8. Languages	0.102 (4)	0.105 (4)	0.239 (5)
9. Other arts	0.076 (7)	0.082 (7)	0.203 (8)
All	0.095	0.101	0.230

Notes: 1) Rankings are shown in brackets.
2) All figures in this table are "statistically significant" at 5%. This means that there is a probability of less than 5% that the observed values would occur if there were no true association between the two variables.

c) Even this weak correlation still gives rise to some quite striking differences in performance. For example, Table II shows that in science subjects 64% of those with 12 points (3 Bs) or better gained a first or upper second compared with 44% of all A-level passers and only 24% of those with 4 points (2 Ds) or less.

d) The ranking of different subjects in terms of strength of association is reasonably consistent though Cramer's statistic gives a picture which is rather different from that produced by the other two measures. Overall, the relationship appears strongest in science, education and engineering, followed by languages and medicine, with agriculture (except on Cramer's statistic), other arts, social studies and architecture bringing up the rear.

6. The above analysis was carried out for all students. One possibility which seemed worth exploring was that there were systematic differences between young and mature students (which would, in themselves, be of interest) and that these were distorting the analysis. Some of the analysis was, therefore, repeated using student numbers disaggregated by age. The results of this analysis are presented in Table IV. The main conclusions to be drawn from it are:

a) Mature entrants have lower GCE entrance qualifications in all subject groups, the average gap being about 2 points, (roughly BCC as against CCD equivalent). It is possible, however, that mature students are more

TABLE IV

Relationship Between Degree and A-Level Results: Young and Mature Students

Subject group	Average A-Level points		Percentage obtaining firsts or upper seconds		Correlation (r-squared)	
	Young	Mature	Young	Mature	Young	Mature
1. Education	7.8	7.2	37.0	42.2	0.131	0.045*
2. Medicine, etc.	10.3	9.4	49.4	30.1	0.106	0.006*
3. Engineering and technology	9.4	8.1	41.8	30.5	0.118	0.068
4. Agriculture/veterinary science	7.8	7.2	39.9	33.3	0.092	0.003*
5. Science	9.4	7.3	44.4	31.5	0.129	0.032
6. Social studies	9.7	7.4	37.6	43.7	0.069	0.032
7. Architecture, etc.	10.3	8.7	36.5	34.0	0.045	0.008*
8. Languages	10.4	8.5	43.1	48.7	0.122	0.059
9. Other arts	9.7	7.5	46.3	47.6	0.088	0.060
All	9.7	7.7	42.0	39.8	0.104	0.043

Notes: (1) "Young" = under 24 at end of year of graduation.
(2) Analysis excludes those with undivided seconds, passes, ordinary and unclassified degrees, and those whose main entry qualification was not the GCE.

* Not statistically significant.

likely to have additional qualifications not taken into account in this analysis.

b) These lower entrance qualifications are not always reflected in inferior degree results. Indeed, it is worth noting that in social studies, other arts, and languages, all of which exhibit wider than average gaps in A-level results, the mature students actually seem to do slightly better. Relatively speaking, mature students fare worst in science, engineering, and medicine (possibly because the effects of recent study outweigh any compensating advantages of maturity in these fields).

c) The correlation between A-level results and degree class is invariably much poorer for mature students than for young students. Although the correlation coefficient is always positive and, in the overall analysis, statistically significant, the correlations observed for education, medicine, agriculture and architecture are not significant. In other subjects the correlations were significant but low, with a maximum r-squared of 0.068 for engineering.

d) It is clear that the presence of mature students has not substantially

TABLE V

A-Levels and Degree Results in Selected Subjects

Subject	Average A-Level points					Measures of association		
	First class	Upper second	Lower second	Third	All*	r-squared	w-squared	Cramer's statistic
Civil engineering	11.7	10.0	8.6	8.6	9.3	0.077	0.090	0.240
Electrical engineering	12.3	10.8	9.0	8.0	9.7	0.166	0.167	0.271
Biology	11.1	9.3	7.6	6.7	8.4	0.143	0.145	0.265
Mathematics	13.0	11.1	10.2	9.2	10.6	0.133	0.136	0.271
Chemistry	12.4	9.8	8.1	7.3	9.1	0.192	0.204	0.318
Law	13.5	12.0	11.0	10.2	11.4	0.085	0.086	0.239
Sociology	10.2	9.0	7.9	6.8	8.3	0.055	0.052	0.234
English	12.3	11.2	10.1	9.2	10.6	0.065	0.064	0.201
French	12.5	11.5	10.0	8.4	10.5	0.132	0.130	N/A

* Excluding those with undivided second class or pass/ordinary degrees and those whose main entry qualification was not the GCE.

distorted the earlier results. The correlations observed for young students only are certainly higher than those for all students but not dramatically so. The maximum r-squared observed is still only 0.131, and the rankings have changed only a little with education replacing science at the top and languages moving into third place above engineering.

7. Another potential weakness of the main analysis is that it was carried out for broad subject groups, some of which include many different subjects, often with widely different entry standards. We, therefore, also analysed data for a few individual subjects to assess whether there was any sign of distortion due to the level of aggregation. The results of this are presented in Table V. It is clear from this that there are considerable differences in the strength of association as between different subjects within the broader groupings and ideally, therefore, any further work should operate at this finer level of disaggregation.

One particular point of interest is that the correlation is much higher for French than for English: this could have some relevance to the possible interpretations offered below. The general ranking, however, seems consistent with the above, i.e., science and engineering subjects ahead of arts and social studies (though the low correlation for civil engineering is an exception here). It is also worthy of note that the correlations for the science subjects and electrical engineering are all higher than those for the subject group to which they belong. In the case of chemistry we have a subject where the proportion of explained variance is about 20%.

Interpretation

8. The main conclusion of this work, therefore, is that the observed correlation, though variable and generally statistically significant, is always weak. Despite the obvious limitations of the data and techniques described earlier this is probably a fair conclusion and is in line with previous findings. It is, nevertheless, somewhat surprising at first sight and has been contrasted with the much higher correlations observed at earlier stages of education in, for example, Entwistle and Wilson (1977). Some explanation is required and it is suggested that the underlying reasons may be grouped into three types:

a) There are real differences in performance – this is sure to be an important factor, not so much because abilities change, as because motivation and attitudes often change considerably between school and university. This is particularly important in view of the change in learning methods – involving greater freedom for the student – which occurs at this stage. It is also the case that, for many people, especially those studying the subjects with the weakest correlation, the subject matter being studied will differ considerably from their A-level experience. Finally under this head there will be the

influence of factors common to all levels of education, such as health and other problems which undoubtedly have an influence in some cases.
b) The exams are poor measures of achievement – it is undoubtedly the case that A-level standards can vary by board, year of exam, subject of entry and by marker; an analysis reported in Statistical Bulletin 8/81 (DES, 1981) suggests that A-level results are also affected by school type and size of sixth form. It is also true that classes of degree are not comparable by subject or by university, and Nevin's (1972) article, "How not to get a first," makes some interesting observations on this. Indeed it might well be argued that the inaccuracy was likely to be greater in the measurement of degree results than for A-levels since the latter are subject to more thorough efforts to ensure consistency across the country. This question of the *relative* accuracy of the two exams is important because it would be unfortunate if the value of A-levels as an entry criterion were written down because of something attributable to the lack of consistency in assessment for degrees. But, to the extent that either or both exam results are inaccurate measures of performance then any true underlying correlation of performance will be obscured. In this context it is significant that scientific subjects and languages score among the highest correlations since these are areas where assessment may be regarded as generally more objective and standardised. (This may partly account for the higher correlation in French as compared with English, though the greater "linearity" in French, i.e., progression from what has been learnt earlier, will also be important here.)
c) The "sample" is not representative – this is more speculative but it is true that we are observing a much higher proportion of those with good A-levels than of those with poor A-levels (particularly in subjects such as veterinary science and law); and it may well be true that we are observing, on average, the most able section of those with poor A-levels. This may be so for a variety of reasons (e.g., the fact that they were accepted in the first place suggests that, at least in some cases, their A-level grades were not thought to be a true indication of their ability), but the net result would be that the observed correlation was less than it would be if all those with two A-levels went on to take degrees and we had data on all their results. This suggests that the observed correlations might be higher if the analysis could be extended to cover all sectors of HE, and also the failures and dropouts as well as those achieving degrees.

Further Work

9. A number of possibilities for further work seem worthy of consideration:
a) A similar analysis for the non-university sector (though aggregated data for this is not yet available).

b) An extension of the analysis to cover failures and dropouts.
c) An attempt to measure the effect of institutional factors. This might, for example, involve further work of the kind already undertaken at some individual institutions, though it should be pointed out that the gains in terms of greater standardisation of the population can be at least partially offset by the limited sample size.
d) The use of finer degree classifications (probably only possible in a small study).
e) Analysis of the sensitivity of degree class to A-level score and the way that this varies over the range of A-level scores. It would, for example, be significant if the effect appeared to be stronger at the top than at the bottom (where grades are most critical for entry) or vice versa.
f) Analysis of the extent to which the relationship varies according to measures of resource input such as class size or unit cost. The purpose of this would be to investigate whether there was any evidence of an attempt by institutions to compensate for relatively poor entrance qualifications by means of more intensive teaching.
g) Further analysis of the extent to which the *number* of A-levels and grades in particular subjects (especially where there is a change between school and university) have an influence which is independent of the aggregate points score.

Conclusion

10. The analysis presented in this article has suggested that the correlation between A-level and degree results is generally statistically significant but relatively weak. The overall relationship conceals some significant differences between subjects with scientific subjects generally scoring above arts and social studies, and languages falling in between. It also conceals the fact that for mature students the relationship is particularly weak.

11. The article goes on to put forward a number of possible explanations, one of the most important points here being the relative accuracy of degree classification and A-level score. Certain areas for further work were suggested in order to explore these possibilities and to overcome some of the data limitations of the present exercise. It is to be hoped that some of these will be followed up.

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