Factors affecting examination success at A-level

Carmen L. Vidal Rodeiro and John F. Bell Research Division

Introduction

Previous research has shown that background information about students (such as gender or ethnicity) is an important predictor of attainment (e.g. Gray *et al*. 1990, Haque and Bell 2001, Bell 2003, OECD 2004 or Raffe *et al*. 2006). This previous research has also provided evidence of links between socio-economic characteristics of students and their educational attainment, for example, measures of socio-economic status, parents' educational background, family structure and income have been shown to be important predictors of attainment at secondary level. Such factors have also been found to be strongly related to measures of prior attainment at entry to school.

In this research we are going to use information from different databases in order to investigate the contribution of students' attainment at GCSE, family background, schooling and neighbourhood to their success in GCE A-levels. We will focus on the students' performance in GCE A-level in Chemistry.

Data

Data on students' examination results for the cohort of students that were 17 years old in 2004 were used. These data have been combined with the National Pupil Database (NPD) which incorporates ethnic group, first language, free school meals eligibility (FSM) and special education needs (SEN). A description of the NPD data is given in Vidal Rodeiro (2006).

The inclusion of students' previous attainment as an explanatory variable in a model allows the investigation of the effect of background factors on relative levels of attainment. The prior attainment of the students was based on the mean of their GCSE results using the usual points scale (A*=8, A=7, B=6, etc).

School characteristics were derived using data from the awarding bodies' national centre database and the 16+/18+ databases for the entire A-level entry in England in 2004. Schools offering GCE A-level subjects were classified into five categories: comprehensive and secondary modern schools, further education (FE) and tertiary colleges, grammar schools, independent schools and sixth form colleges. In addition, the attainment group of the schools was computed as the mean of the attainment of their students which was based on their A-level points score. To compute this score, all students in the 2004 cohort with at least three A-level results, excluding general studies, were selected. The A-level grades for these students were converted into points using the UCAS old tariff (A=10, B=8, C=6, etc) and the sum of the points of their three best A-levels was computed. Schools were then allocated into five attainment groups.

Table 1 shows the attainment group by school type. Around 83% of the grammar schools and 89% of the independent schools are in the highest attainment group. This compares to the 10% of comprehensive schools or the 17% of sixth form colleges. No FE/Tertiary colleges are in the highest attainment group.

Table 1 : School attainment group by school type (column percentages)

School Attainment Group	*Comprehensive schools*	*Grammar schools*	*Independent schools*	*Sixth form colleges*	*FE/Tertiary colleges*
Group I (Low)	4.2	0.0	0.2	0.4	17.2
Group II	14.4	0.1	0.8	10.5	46.9
Group III	29.5	1.3	2.8	44.3	21.2
Group IV	41.8	15.2	7.7	28.1	14.6
Group V (High)	10.1	83.4	88.6	16.7	0.0

A female ratio per school was computed (number of females taking A-levels in the school over the total number of students in the school; see Malacova, 2006, for details). If the female ratio was 1, the school was considered a 'Girls only' school. If the female ratio was 0, then the school was considered a 'Boys only' school. The rest of the schools were considered coeducational or mixed schools. Sixth forms were also classified into five groups according to their size (based on the number of students in the upper sixth form): less than 30, 30 to 59, 60 to 119, 120 to 239, and more than 240.

Not everything that might have an influence on the students' success in a particular examination is the result of their previous attainment and the school characteristics. Students' motivation and subject preference, for example, might be important too. Further research is being carried out by Cambridge Assessment about subject choice and motivation.

Recent studies have found that neighbourhood-level variables have an important influence on educational attainment (e.g. Ensminger *et al*., 1996, OECD, 2004, Raffe *et al*., 2006). In this research, the characteristics of the neighbourhood in which a school is situated are considered. There is a risk that the address of a school may not reflect its catchment area. For example, a school might be located near the boundaries of a ward thus attracting a large proportion of children from other wards, or a school could have been affected by parental choice. These problems could be removed if it were possible to use the postcodes of the students' home address (instead of the postcodes of the schools), in conjunction with the ward level census data, but these data were not available to us. Despite these limitations, significant correlations can be identified between school examination performance and various indicators derived from the ward level census data.

Data about electoral wards in England were obtained from the Neighbourhood Statistics Service managed by the Office of National Statistics and it was matched to the postcodes of the schools. In this research we focus on the following factors: parental unemployment, parental qualifications, car ownership, density of population (proxy for rural/urban areas), lone parent status, ethnicity and deprivation index.

Methods

A multilevel modelling technique was used. Multilevel models allow for the clustering of individuals within schools and they do not violate the assumption of independence of observations that traditional ordinary least squares analysis commits when analysing hierarchical data. For example, individual students are grouped into schools; students in the same school may have more in common than with students in other schools. Multilevel models take account of this hierarchical structure of the data and produce more accurate predictions.

The modelling process was conceived as a two-level model in which students (level 1) were nested in schools (level 2). The explanatory variables (prior attainment, gender, school characteristics, etc.) were entered into the fixed part of the model. The outcome measure is the attainment at the completion of the A-level stage.

The models were fitted using the programme MLwiN (Rasbash *et al*., 2005). They were run for various combinations of students and school characteristics and background and socio-economic factors.

Results

The total number of students obtaining an A-level in Chemistry in 2004 was 27,867. More than 50% of these students obtained at least grade B. 32% of these students obtained grade A. Only 5% failed to obtain at least grade E. Table 2 shows the number and percentage of students per school type and school gender that obtained an A-level in Chemistry and Table 3 shows the grade distribution by type of school.

Table 2 : Number of A-level Chemistry students by school type and school gender

		Number of students	*Percentage of students*
School Type	Comprehensive	10722	38.5
	Grammar	3773	13.5
	Independent	6349	22.3
	Sixth Form	1635	5.9
	FE/Tertiary	885	3.2
School Gender	Boys	2180	7.8
	Girls	3478	12.5
	Coeducational	17921	64.3

Percentages shown in Table 3 are column percentages. Among all the students that obtained grade A in their Chemistry A-level, around 42% studied in an independent school, 20% in a grammar school, 6% in a sixth form college and 31% in a comprehensive school. From this table, it is possible to see that there are differences in the performance of students by type of school but do they disappear when we adjust for other factors, such as students' attainment?

We first studied students' characteristics. Secondly, additional models were fitted for various combinations of school characteristics. Finally, characteristics of the neighbourhood where the schools were located were introduced.

In the following we will report the results obtained when only students obtaining grade A and at least grade E were considered.

Table 3 : A-level Chemistry grade distribution by type of school (% from each school type obtaining each grade)

School Type	*Grade*					
	A	*B*	*C*	*D*	*E*	*U*
Comprehensive	31.4	44.9	53.7	62.5	66.0	72.4
FE/Tertiary College	0.8	1.6	2.3	2.9	3.2	4.4
Grammar	19.6	18.3	15.2	12.3	11.4	8.8
Independent	42.5	27.8	20.5	14.6	11.7	6.6
Sixth Form College	5.7	7.4	8.3	7.7	7.7	7.8

Grade A

For these analyses, the dependent variable takes the value 1 if the student obtained grade A and 0 otherwise.

The results of a first model which included the gender of the student, the prior attainment (in all the analyses the mean GCSE was centred on its mean value of 6.77) and their interaction are reported in Table 4. If b is the logistic regression coefficient for a particular variable (estimate), then exp(b) is the odds ratio. The odds ratio for each independent variable gives the relative amount by which the odds of obtaining a grade A increase (O.R. greater than 1) or decrease (O.R. less then 1) when the value of the independent variable is increased by one unit.

For example, the variable 'male' is coded as 0 (=female) and 1 (=male) and the odds ratio for this variable is 2.2. This means that the odds of males obtaining grade A are 2.2 times higher than the odds of females.

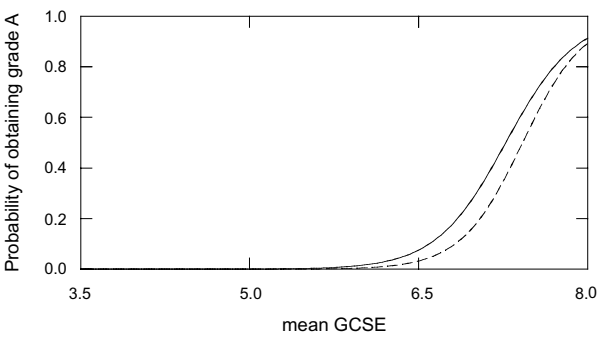
Table 4 : Individual characteristics I[1]

	Estimate	*Standard Error*	*Odds Ratio*
Constant	-1.914	0.044	
Male	**0.806**	0.053	**2.2**
Mean GCSE	**3.234**	0.066	**25.4**
Male*Mean GCSE	**-0.435**	0.087	**0.6**
School-level variance	**0.406**	0.037	

[1]. Estimates in bold indicate statistical significance at 0.05 level.

Figure 1 shows the predicted probability of obtaining grade A by mean GCSE generated by the estimates in Table 4. Although, on average, male students are less likely to obtain a grade A for any given value of mean GCSE, the difference is smaller for the most able male students. There are two difficulties with interpreting these data. First, relative progress is being considered and the sex difference can be related to the mean GCSE performance or to the A-level performance or to both. Second, there are

Figure 1 : Predicted probability of obtaining grade A by mean GCSE (solid line for females and dashed line for males)



selection effects, for example, it is possible that the motivation of students differs between groups.

There was a large number of students who had their ethnic group and other personal data missing (e.g. PLASC data does not include results from some independent schools or non-maintained special schools). In order to study the effect of the ethnicity we used a reduced data set (15,613 students, 56% of the original data), where data about ethnicity, first language, free school meals eligibility and special education needs were available.

Substantial differences appeared between ethnic groups (Table 5). Of course, these differences could be the result of other variables that have not been included in the model but vary by ethnic group. Additionally, some of the ethnic groups are very broad and if they were split the results could differ. After controlling for students' attainment, the results show that in comparison to the 'white' group, Bangladeshi, African, Chinese or Indian students have a higher probability of obtaining grade A.

Table 5 : Individual characteristics II

	Estimate	*Standard Error*	*Odds Ratio*
Bangladeshi	**0.438**	0.142	**1.5**
African	**0.570**	0.194	**1.8**
Caribbean	-0.230	0.517	0.8
Chinese	**0.447**	0.185	**1.6**
Indian	**0.678**	0.110	**2.0**
Mixed	**0.609**	0.162	**1.8**
Other ethnic group	**0.435**	0.132	**1.5**
Language – not English	-0.084	0.100	0.9
FSM	-0.292	0.170	0.7
SEN	0.178	0.444	1.2

Next, school type, school gender, school attainment and school size were included in the model as sets of dummy variables. Comprehensive, coeducational, attainment group 1 and size 1 schools were assigned the baseline. Since prior attainment was significant as an individual factor of examination success, it was also included. Results for this model are displayed in Table 6.

The odds of obtaining grade A for a student attending a grammar school are 0.9 times the odds of a student attending a comprehensive school (although this effect is not significant). However, if the student attends a sixth form college or a FE/Tertiary college, the odds of obtaining grade A are 1.8 and 1.5, respectively. Therefore, students attending sixth form or FE/Tertiary colleges have a positive advantage in their A-level Chemistry outcome.

Separate models were fitted to find out the effects of the school type when the school attainment group is not considered. In that case, the effects of grammar and independent schools on attainment in A-level Chemistry are positive and significant. There is, however, no evidence that independent schools do better on average than other types of schools once prior attainment has been taken into account.

After controlling for students' prior attainment, the school attainment group plays an important role in the success of a student taking Chemistry A-level. The higher the attainment of the school, the larger the odds of getting grade A. This supports the results found by Rutter *et al*. (1979) who reported that when students of similar prior attainment at the point of entry attending schools with differing proportions of more able students, those attending the schools with the higher percentages of more able students did better in their examinations.

Table 6 : School characteristics

	Estimate	*Standard Error*	*Odds Ratio*
Constant	-2.848	0.341	
Grammar	-0.118	0.094	0.9
Sixth Form	**0.586**	0.120	**1.8**
Independent	0.111	0.097	1.1
FE/Tertiary College	**0.414**	0.149	**1.5**
Boys school	0.134	0.091	1.1
Girls school	**-0.400**	0.077	**0.7**
Attainment 2	**0.837**	0.269	**2.3**
Attainment 3	**0.892**	0.261	**2.4**
Attainment 4	**1.109**	0.259	**3.0**
Attainment 5	**1.475**	0.265	**4.4**
Size 2	0.259	0.238	1.3
Size 3	0.221	0.224	1.3
Size 4	0.213	0.228	1.2
Size 5	0.112	0.238	1.1
Mean GCSE	**2.842**	0.044	**17.2**
School-level variance	**0.348**	0.035	

Attending a single sex school has different effects on success. The odds of obtaining grade A for a student attending a 'Boys' school are 1.1 the odds of a student attending a coeducational centre. However, the odds of obtaining grade A for a student attending a 'Girls' school are 0.7 the odds of a student attending a coeducational centre. This last result could be due to a school selection and/or motivation effect: highly motivated girls who wanted to study Chemistry might have decided to attend a mixed sixth form because of the traditional belief that 'Boys schools' were better at science subjects (many 'Boys schools' have mixed sixth forms).

The size of the school does not seem to be associated with the students' success in Chemistry A-level.

Although many of the effects of the individual and school characteristics can be understood and interpreted by observing the coefficients in previous tables, it is always useful to consider a plot of these effects (Figure 2). Any variable whose line intersects with the vertical zero axis can be regarded as not significant (at the 5% level) and the length of the line gives an indication of the relative size of the group, for example, the number of Caribbean students is low. Positive values imply a positive relationship with the outcome; negative values imply that the probability of obtaining grade A in Chemistry at A-level decreases with higher values of the background variable. From this figure, we can see at a glance which variables are strongly related to the probability of obtaining grade A, both positively and negatively, and which ones seem to have much less definite relationships, even if they are statistically significant.

The variable that has the largest positive effect on obtaining grade A in Chemistry A-level is the prior attainment at GCSE. The average performance of the students in a centre (school attainment) is also a significant predictor of individual success at A-level. The effects of centre type are small in comparison, in particular the effects of attending a grammar or an independent school.

Based on this graph, although the prior attainment has the highest impact on the probability of obtaining grade A at A-level, other factors such as school characteristics explain a substantial proportion of the

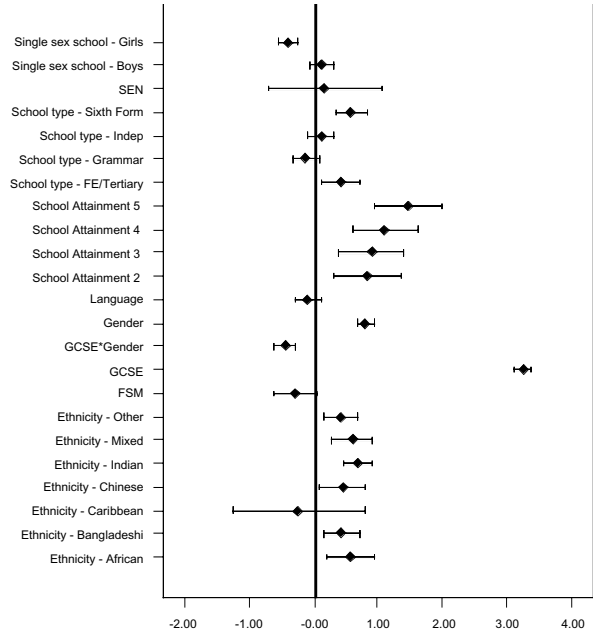


Figure 2 : Effects of the individual and school characteristics (grade A)

variation in the students' outcomes. For the model in Table 6, the explained proportion of the variance was computed (Snijders and Bosker, 1999) and it has a value of 0.59. The unexplained proportion can be partitioned between school and candidate as 0.05+0.36, which means that 5% of the variation is unexplained variation at the school level and 36% is unexplained variation at student level.

Further models that included socio-economic factors in the form of neighbourhood characteristics were fitted. Their effects, without taking into account prior attainment, are shown in Figure 3.

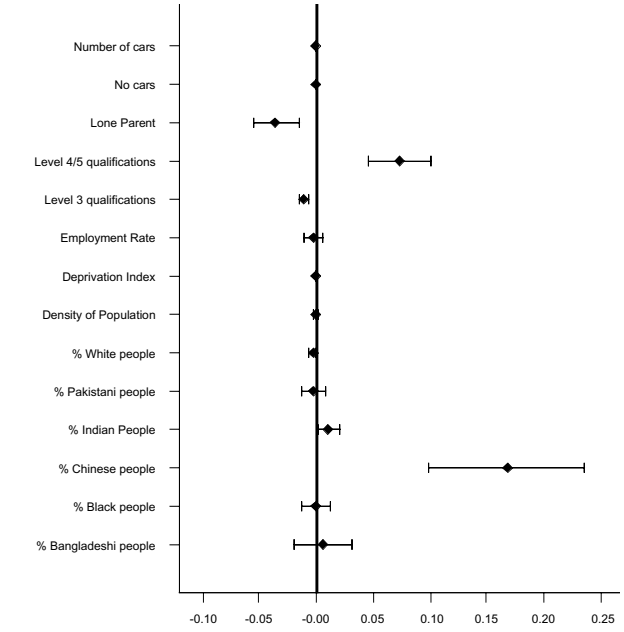


Figure 3 : Effects of the neighbourhood characteristics – no prior attainment (grade A)

The variable that has the largest positive effect on obtaining grade A is being in a neighbourhood with a high percentage of Chinese people. Also, a school situated in a neighbourhood where there is a large percentage of people with at least Level 4/5 qualifications has a positive effect on the students' success in Chemistry A-level. An area with a high number of lone parents with children has an important and significant effect but in this case negative. The impact of these factors is very small in comparison with the effect of the prior attainment or some of the school characteristics (see Figure 2).

Table 7 shows only the significant neighbourhood characteristics after adjusting for prior attainment. Their distributions can be found in Vidal Rodeiro (2006). Prior attainment measures are likely to incorporate deprivation effects that operate during earlier childhood years, and we should therefore be conservative in our estimates of the magnitude of the total effect of deprivation.

Table 7 : Neighbourhood characteristics (prior attainment)

	Estimate	*Standard Error*	*Odds Ratio*
Lone parent	**-0.03506**	0.01034	**0.9**
Level 3 qualifications	**-0.01029**	0.00234	**0.9**
Level 4/5 qualifications	**0.07281**	0.01389	**1.1**
% Chinese people	**0.16751**	0.03504	**1.2**
% Indian people	**0.01102**	0.00487	**1.0**
Deprivation Index	**-0.00039**	0.00018	**0.9**

Grade E

Do the factors (individual, school or neighbourhood characteristics) that have an effect on the probability of obtaining grade A, have an effect on the probability of obtaining other grades? In this section, we repeat the previous analyses but the dependent variable takes the value 1 if the student obtains at least grade E and 0 otherwise.

For at least grade E, gender and mean GCSE are still statistically significant. However, the odds of obtaining at least grade E for a boy are only 1.3 times the odds of a girl obtaining at least grade E compared to the 2.2 for grade A. The effect of prior attainment is, as expected, much lower.

Having a mixed background or being Chinese does not have a significant effect on the probability of obtaining at least grade E. Being Bangladeshi, African, Indian or part of other ethnic groups has a positive significant effect on the outcome and this effect is larger for at least grade E than for grade A.

Another difference between grade A and at least grade E is that for the latter the first language has a significant effect and the odds of obtaining at least grade E for a student with a first language other than English are 0.6 times the odds of a student whose first language is English.

In a following step a model with the school level characteristics plus students' prior attainment was fitted. The odds of obtaining at least grade E for a student attending a particular type of school are very similar to those for grade A. However, only 'attending a FE/Tertiary college' has a significant effect on the outcome. As before, the school attainment group plays an important role in the success of a student taking Chemistry A-level. The higher the attainment of the school, the larger the odds of obtaining at least grade E. The effect of school gender and school size is the same as for grade A.

To summarise, Figure 4 displays the effects of the individual and school type characteristics on the probability of obtaining at least grade E.

Table 8 shows the results obtained when models were fitted with socio-economic factors taken into account. The factor that has the largest positive significant effect on the probability of obtaining at least

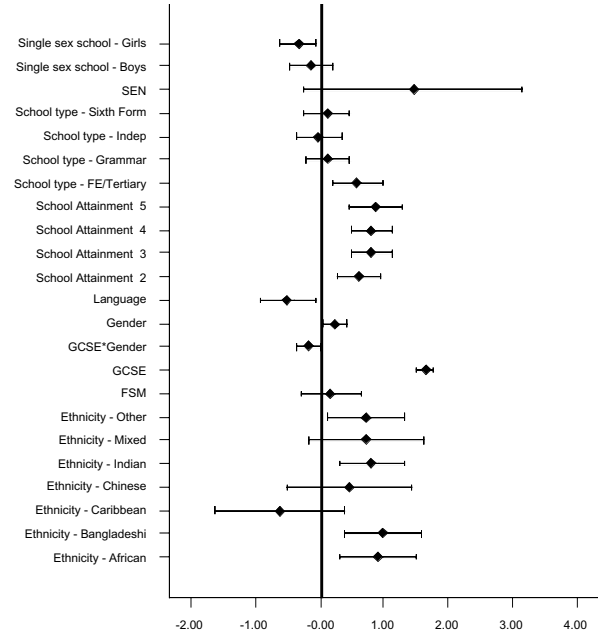


Figure 4 : Effects of the individual and school characteristics (at least grade E)

grade E is the employment rate. As the percentage of employed people in the neighbourhood increases, so the probability of obtaining at least grade E does. Being in a neighbourhood with high percentages of single-parent families has a negative effect on the probability. Another factor that has a negative effect is the percentage of ethnic minorities (Chinese, Indian, Black and Bangladeshi). Being in a neighbourhood with high percentages of white people has a positive effect on attainment.

Table 8 : Neighbourhood characteristics (prior attainment)

	Estimate	*Standard Error*	*Odds Ratio*
Level 3 qualifications	**0.01782**	0.00374	**1.0**
Level 4/5 qualifications	**-0.07089**	0.02276	**0.9**
% Chinese people	**-0.27535**	1.50448	**0.7**
% Black people	**-0.03296**	0.00808	**0.9**
% White people	**0.01170**	0.00257	**1.0**
% Indian people	**-0.01925**	0.00610	**0.9**
% Bangladeshi people	**-0.03499**	0.01311	**0.9**
No cars	**-0.00011**	0.00004	**1.0**
Employment Rate	**0.02433**	0.00608	**1.0**
Population Density	**-0.00794**	0.00134	**0.9**

Conclusions and discussion

The effects of basic explanatory factors (e.g. prior attainment and gender) made statistically significant contributions to the success in A-level Chemistry. Having taken into account prior attainment, several school effects also proved significant, in particular the average performance of the students in a school is a significant predictor of individual success.

With regard to the effect of the school type, given a mean GCSE score, the probability of obtaining grade A is slightly higher if the student attended a sixth form college or an FE/Tertiary college than if the student attended a grammar or a comprehensive school. However, if a sixth form has an able entry, that is, has many pupils who did very well in their GCSEs, then, on average, it does not matter which type of school it is. However, these are average effects and there is still considerable variation between individual schools that is large enough to cancel out these effects.

Substantial differences appeared between ethnic groups. The results show that in comparison to the white group, other ethnic groups have significantly higher probability of obtaining grade A but their effects are not significant when modelling the probability of obtaining at least grade E. However, all the differences described might not be attributed entirely to ethnicity. Different ethnic groups have different socio-economic profiles and consequently it is not possible to say categorically whether the differences observed are the result of ethnic differences per se or whether socio-economic or other factors play a part.

By comparing the significant explanatory variables included in the different models, our findings show that when prior attainment data are lacking, other student background and school context information explain the students' success at A-level Chemistry. However, prior attainment has, by far, the largest impact on the success.

All models give very similar percentages of the school and pupil level variance explained, but the one described in Table 6 gives the highest percentages, showing that school characteristics (type, attainment and gender) explain more about the students' performance than the neighbourhood characteristics. The unexplained percentage of the variation in the models fitted in this article is around 42%. The amount of school level variance unexplained is relatively small (around 4–5%) but the unexplained variation at student level is around 36–38%, suggesting that the individual students' characteristics are much more important than the school they attend. Also, the amount of unexplained variation at student level could be due to the fact that other variables that have not been included in the model (e.g. subject preference, motivation) may have an influence on students' success.

A conceptual limitation of all regression techniques is that one can only ascertain relationships, but never be sure about the underlying causal mechanism. Therefore, caution must be taken when interpreting the results of the regression analyses shown in this article. In this research, we found significant relationships between some individual, school or socio-economic characteristics and attainment. However, they may not be the result of a causal relationship.

References

Bell, J.F. (2003). Beyond the school gates: the influence of school neighbourhood on the relative progress of pupils. *Oxford Review of Education*, **29**, 4, 485–502.

Ensminger, M.E., Lankin, R.P. & Jacobson, N. (1996). School leaving: a longitudinal perspective including neighbourhood effects. *Child Development*, **67**, 5, 2400–2416.

Gray J., Jesson, D. & Sime, N. (1990). Estimating differences in examination performance of secondary schools in six LEAs: a multilevel approach to school effectiveness. *Oxford Review of Education*, **16**, 2, 137–158.

Haque, Z. & Bell, J.F. (2001). Evaluating the performances of minority ethnic pupils in secondary schools. *Oxford Review of Education*, **27**, 3, 357–368.

Malacova, E. (2006). Effect of single-sex education on progress in GCSE. *Oxford Review of Education*. In press.

OECD (2004). *Learning for Tomorrow's World. First Results from PISA 2003*. Paris: OECD Publications.

Raffe, D., Croxford, L., Iannelli, C., Shapira, M. & Howieson, C. (2006). *Social-Class Inequalities in Education in England and Scotland*. Special CES Briefing No. 40. Edinburgh: CES.

Rasbash, J., Browne, W., Healy, M., Cameron, B. & Charlton, C. (2005). *MLwiN version 2.02*. London: Institute of Education.

Rutter, M.L., Maugham, B., Mortimore, P., Ousten, J. & Smith, A. (1979). *Fifteen thousand hours*. London: Open Books.

Snijders, T. and Bosker, R (1999). *Multilevel analysis. An introduction to basic and advanced multilevel modeling*. London: Sage Publications.

Vidal Rodeiro, C.L. (2006). *Factors determining examination success at A-level: a study focussed on A-level Chemistry and A-level Business Studies*. Internal Report. Cambridge: Cambridge Assessment.

A-level uptake: 'Crunchier subjects' and the 'Cracker effect'

John F. Bell, Eva Malacova, Carmen L. Vidal Rodeiro Research Division
Mark Shannon New Developments

One of the claims made about A-levels is that students are opting for the allegedly easier subjects at A-level. For example, Boris Johnson stated in the *Observer* (July 9, 2006) that 'This year, as every year for the last two decades, we are seeing a drift away from crunchier subjects such as sciences, maths and languages.' More recently, Cambridge University produced a list of A-level subjects that provide a less effective preparation for their courses, for example, Business Studies, Media Studies, and Physical Education, Sports Studies. On their website (http://www.cam.ac.uk/admissions/undergraduate/requirements/), it is stated 'To be a realistic applicant, Cambridge applicants would be expected to have no more than one of these subjects'[1]. It must be stressed that the term 'less effective preparation' refers to the courses offered by what is a highly selective university – these A-levels can be highly relevant and effective preparations for courses offered by other higher education institutions. It is also worth noting that some subjects not on the list had to struggle to gain acceptance. For example, Tillyard (1958) wrote:

> *... [in 1878] it was unthinkable that English should be recognised as an independent study; it could enter Cambridge only on the warrant of a faint respectability reflected from modern languages.*

Opponents of English could be quite outspoken, for instance, Edward Augustus Freeman, the Regius Professor of Modern History at Oxford, in a broadside published in 1887 in the London *Times* wrote:

> *There are many things fit for a man's personal study, which are not fit for University examinations. One of these is "literature."... [We are told] that it "cultivates the taste, educates the sympathies, enlarges the mind." Excellent results against which no one has a word to say. Only we cannot examine in tastes and sympathies.*

As late as 1965, Robson used the first lecture arranged by the F.R. Leavis Lectureship Trust to argue that English Studies met the conventional criteria for admission to a *studium generale*[2]. Also, in 1887 the congregation of Oxford University voted against an Honour School of Modern European Languages. The Warden of All Souls objected because of 'the depreciation and exclusion of Greek and Latin' and that 'it confused the whole conception of academical studies, and dragged the subjects fit for more advanced years into undergraduate life' (*Times*, 7 November, 1887). However, as Emperor Loathair I (795–855) said 'Tempora mutantur, nos et mutamur in illis'.[3] Whilst it might be possible to idly speculate what a Regius Professor of Media Studies at a 22nd century Cambridge University might make of the current situation, it is probably more informative to consider what exactly is happening with A-levels and determine if the changes are as dramatic as is implied in the media.

In this article we investigate the uptake of A-levels in England. We consider the A-level results for all year 13 students (eighteen-year-olds) in 2001 to 2005 (more detailed analyses for the earlier years can be found in Bell, Malacova and Shannon, 2003, 2005[4]). This period covers the transition to Curriculum 2000 because the new A-levels that were started then were completed in 2002. This reform split A-levels into two. First, a free standing qualification called the Advanced Subsidiary covering the first year of the course was introduced. Secondly, the A-level was obtained by combining results of AS modules with A2 modules. The aim of this reform was that students would study for four or five subjects at AS in the first year of the sixth form and then choose three of them to continue on to A-level. The objective of this reform was to broaden the curriculum and to provide more balance. This is seen as a desirable outcome in many areas of higher education. For example, all medical schools (except Dundee and Edinburgh) encourage potential applicants to take a combination of science and non-science subjects (Clarke, 2005). These medical school policies have implications for the A-level science uptake for the higher attaining candidates. Given that Chemistry is nearly always compulsory and Biology often is, then the effect would be most pronounced in Physics and Mathematics. In general, there are two processes that need to be considered. First, broadening the

1. There are exceptions and it is always advisable to check the Cambridge University website for the precise requirement for a course.
2. A recognised university. Originally an institution recognised by the Holy Roman Empire and whose status was confirmed by Papal Bull. Cambridge was formally acknowledged as one in 1290.
3. For those who have not had a classical education: 'Times are a-changing and we change with them.'
4. The analyses differ from those in this article because they include General Studies A-level.