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Are Grammar schools beneficial and do they improve social mobility?

New evidence from analysing determinants of degree performance

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Abstract: This paper analyses the key determinants of degree performance for students at UK universities, and by using degree results as a proxy for a student's underlying ability we can draw conclusions about the effectiveness of different school types, whilst accounting for differences in the distributions of underlying abilities at different school types. The paper also investigates whether those from lower social classes gain more benefit from attending Grammar schools, to ascertain whether or not Grammar schools can be of significant benefit to social mobility in the UK.

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I. Introduction

Ever since the Labour government issued Circular 10/65 calling for Grammar schools to be phased out, the fate of selective education in the UK has been a key battleground between political parties. Although Labour and the Conservatives have recently distanced themselves from the debate, the issue is still debated by politicians, with a manifesto pledge of The UK Independence Party for the 2010 general election being the creation of new Grammar schools[1]. One of the key arguments for maintaining or increasing numbers of selective schools is their record of delivering impressive exam results and their corresponding high places in school league tables; it is also argued that they have a beneficial impact on social mobility for working class children. This paper will examine whether these arguments hold true, by assessing whether there is a significant benefit for students attending Grammar Schools, and also determining if there is a benefit for students from lower social classes to investigate the second argument. Due to costs of organising the 11+ selective test, and the potential negative impact on students who do not gain a place at Grammar school, the continued operation of Grammar schools can be viewed as a misallocation of resources if they do not improve social mobility or attainment levels.

Social mobility in the UK has been found to have fallen since 1970 by Blanden, Gregg & Machin (2005). The figures show that for two comparable boys born in 1958, a doubling of parental income means the wealthier boy would earn on average 17.5% more at age 30, and this figure had increased to 25% for the cohort of children born in 1970. A former chief inspector of schools, Chris Woodhead, has stated that Grammar schools "*have contributed more to social mobility than any other institution this country has known*". However, the empirical evidence is mixed as to

[1] http://www.ukip.org/media/pdf/UKIPMiniman2010web.pdf

whether these changes can be attributed to the phasing out of Grammar schools from 1965, though since this phasing out has stalled in recent decades, changes in social mobility have become less severe.

To examine the Grammar school debate, examining exam results is not sufficient, as different school types may have differing distributions in the underlying abilities of their students, particularly selective schools.

A further motivation for the paper arises from its function as an analysis of the determinants of degree performance. Although this has been examined extensively by Smith & Naylor (2005) the data used in this paper extends over a longer time period and contains other variables, and so the paper may give weight to the controversial suggestion that universities, particularly Oxford and Cambridge, should admit a higher proportion of students from Comprehensive schools.

The paper determines the relative performance of Grammar schools, Independent schools and Sixth-Form colleges, compared with Comprehensive schools. The unique element of the paper is that it uses degree performance, when controlled for other factors, as an indicator of a student's natural ability. By regressing degree performance on a student's school type, A-level results and many control variables, we can determine if school type is a significant determinant of degree performance. For two otherwise identically observable students, we would expect the student who attended a better performing school to have lower attainment when at university, and this theory is supported by empirical evidence from Smith & Naylor (2005). In this way we can isolate a student's underlying ability and determine the true effects of their schooling. Smith & Naylor found that the coefficient for Independent schools for a similar regression was negative, and concluded that *"if we compare two pupils—one from each school type—with equal A-level scores, we must*

infer that the pupil from the LEA school is of greater ability". Therefore, we can test the coefficients of different school types for statistical significance, to determine if they affect A-level attainment. This investigation also enables us to examine the rationality of parents paying for extra tuition to help their children pass the 11+ exam. If we find no evidence of academic benefits of Grammar schools, and no differences in the variances of the results of Grammar and Comprehensive schools, then this would appear to be irrational, although given the more impressive performance of Grammar schools in league tables this is perhaps understandable, and can be explained in terms of information imperfection.

II. Literature Review

Although there have been numerous attempts to determine the academic benefits of Grammar schools no general consensus has been reached. Atkinson, Gregg and McConnel (2007) conducted one of the most comprehensive studies in the UK, looking at both selective and non-selective LEAs. They examine the impact on students who attend selective schools, and on those who do not gain a place at a selective school. The paper finds evidence that attainment is not higher in selective LEAs than those without selective schools. The paper does find that in selective LEAs students from selective schools do significantly better than national averages, and those who do not gain a place at selective schools have somewhat lower attainment. This is attributed to the higher incidence of weaker pupils at the non-grammar schools and points to there being no academic benefits to a Grammar school education. The paper also finds that children eligible for free school meals attending selective schools do exceptionally well, indicating potential benefits to social mobility from Grammar schools, though the paper also states that a relatively low proportion of such children

achieve places in Grammar schools, perhaps due to a lack of funding for 11+ tuition. This investigation aims to examine this point further since it is possible that those children from poorer backgrounds that are sufficiently intelligent to pass the 11+ without extra tuition have an underlying ability such that they would have returned exceptional results at any type of school, as Atkinson et al do not account for potential differences in students' natural ability.

Manning & Pischke (2006) examined the impact selective education has on test score patterns for LEAs, and found that there was no significant difference in the test scores for 16 year olds between selective and non-selective LEAs. This paper enforces the idea that Grammar schools have no impact on academic attainment. However, there are many papers which dispute this view, with Galindo-Rueda & Vignoles (2004) finding significant improvements for the most able 20% of students. Interestingly Hanushek & Woessman (2005) found that selective education could actually reduce average performance. However, this paper examines the impact of selective education in different countries and it is likely that the conclusions might not be relevant for the UK since education systems vary from country to country.

Jesson (2000) conducts a study of the value added of different school types. The study finds that Grammar schools are not superior to comprehensive ones. However, value added approaches can lack accuracy[2], and the regression based approach of this paper can add further weight to this evidence, since regression allows us to control for more factors.

Brunello & Checchi (2006) examine the relationship between school tracking or selection and family background. The paper finds that the correlation between the two increases where tracking starts earlier or is increased. This points to a

[2] Only nine factors are controlled for, source: http://www.nationalstrategiescpd.org.uk/public_content/esp/resource_bank/resource_032.html

reduction in social mobility arising from selective systems. However, this is most likely due to poorer children not having access to tuition to pass selection exams, and there is no evidence that a given child would have their own social mobility reduced by attending a selective school.

As a result of the regressions run, this paper also examines the determinants of degree performance in the UK. This is relevant since there have been recent calls by politicians for universities to take a greater proportion of their students from state schools. Recent literature from Smith & Naylor (2005) finds school type to be a significant determinant of degree performance, with those from state schools found to do significantly better at university than those from Independent schools. Unfortunately the paper makes no mention of Grammar schools. The paper suggests that universities could adopt positive discrimination by asking for better exam results from those attending Independent schools, although the paper does not endorse this view. Smith & Naylor also found that social class was largely not a significant determinant of degree performance.

In light of the above literature, this paper aims to contribute to the literature in three ways:

I. Determine, by attempting to control for a student's underlying ability, whether higher attainment at Grammar schools than Comprehensives can be attributed solely to differences in underlying abilities of the students, or is in some part due to schooling benefits.

II. Determine if those from poorer backgrounds benefit from attending a Grammar school as opposed to a Comprehensive school. If they do not, it is unlikely Grammar schools have a positive impact on social mobility.

III. Determine whether calls for universities to take a higher proportion of students from Comprehensive schools are justified in terms of their likely subsequent performance at university.

III. Data & Methodology

The data used in this paper is from the Universities' Statistical Record (USR), which has data on every student studying at UK institutions for every year from 1972 to 1993. The data was compiled by the Universities Central Council on Admissions (UCCA) and consequently data for years after 1993 does not form part of the data set since the Higher Education Statistics Agency (HESA) became responsible for higher education information after this point.

The University student record comprises five broad categories of data for each student. The Personal section includes date of birth, gender, marital status and parental occupation. The History section has data on A-level results and previous school. The Results section has more specific data on A-level subjects and performance. The Annual section includes data on University attended, subject studied, course type and sources of finance. The Leaving section has data on degree class and qualification type. The data contains a wide range of variables and so can be considered comprehensive, though the lack of more recent data is a weakness of this source. Furthermore, Betts & Morell (1999) find race to be a significant factor in the US, and this variable is not part of the USR. It is possible that other relevant variables may be missing from the data set, though all variables found to be significant in the investigation of Smith & Naylor (2005) are present, as are some additional variables

such as the dummy variables for the student attending a Grammar school, and obtaining an A in A-level maths.

This paper uses student record data for each student graduating from a UK University from 1986 to 1992 as the variables in these cohorts are consistent. Only those studying full-time are included and medical students are excluded since their degrees are often not classified in the standard manner. When analysing this data set Smith & Naylor (2005) point to a potential inaccuracy of data for school types where the student left school several years prior to commencing university, and for this reason only those below the age of 25 at the time of graduation are considered. We also only consider those students who took A-levels, since this ensures that all students are directly comparable.

The data on parental occupation is detailed enough to construct dummy variables for nine social classes, details of which can be found in the appendix. This is important to the investigation, since it is possible motivation for study could vary by social class. There are two hypotheses regarding how social class may affect degree performance:

Hypothesis I: *students of a higher social class will receive more parental pressure to replicate academic achievements of parents, and more resources to study, and so will be more motivated or able to perform well at university*

Hypothesis II: *students of higher social classes may have more alternative options available to them should they perform poorly at university, and so have reduced incentives to perform well, compared to their peers from lower social classes*

Whichever of the above hypotheses has the greatest affect, they will show up in social class coefficients to prevent bias of school coefficients, since school attended will also be correlated with social class.

In addition to the USR data set, a separate regression will be run using recent data from Durham University[3], to ensure that conclusions drawn from this research are still relevant today. The data set comprises data for a cohort of students graduating after 2005[4] from Durham University, and although the sample size is relatively small at 3,104 it is beneficial to the investigation nonetheless.

Table 1 – USR Summary Statistics

Variable	Mean	Standard Deviation
Sex (Male)	0.5663	0.4956
Age	21.703	1.1694
Married	0.0055	0.0743
Social Class I[5]	0.2143	0.4103
Social Class II	0.4375	0.4961
Social Class III	0.1092	0.3120
Social Class IV	0.0993	0.2991
Social Class V	0.0599	0.2372
Social Class VI	0.0091	0.0951
Social Class VII	0.0122	0.1097
Social Class VIII	0.0333	0.1794
Social Class IX	0.0252	0.1567
Grammar	0.1451	0.3522
Independent	0.2679	0.4429
Comprehensive	0.4268	0.4946
Sixth-Form College	0.1083	0.3107
Other	0.0180	0.1330
A-level score[6]	17.331	7.2288
A-level Maths	0.4678	0.4990
A in A-level Maths	0.1360	0.3428
Good Degree[7]	0.4478	0.4973
N=376,959		

[3] I am grateful to the Records department at Durham University for providing with me with the data
[4] In order to ensure student anonymity, the exact year of the cohort is unknown
[5] See appendix for social class labels
[6] For best 3 A-levels, where and A gives 10 points, B gives 8 points, C 6 points, D 4 points and E 2 points
[7] A 1st class or Upper 2nd class degree

Table 2 – 'Good' Degree probabilities and A-level scores by school type

School type	Observations	Good Degree	A-level scores	Std. Dev
Grammar	54695	0.4474998	16.88516	7.096228
Independent	100991	0.4507035	18.45823	7.338105
Comprehensive	160869	0.4582051	17.05099	7.086182
Sixth-Form College	40817	0.4385918	17.68932	7.054655
Other	6788	0.4148497	13.19476	7.314914
Unknown	12799	0.3423705	14.91507	7.319205

Table 1 shows summary statistics for key variables in the USR data set. For reasons of space dummy variables for different subjects and universities are omitted. Interestingly there are more males than females in the data set, with males accounting for 57%. 65% of students are categorised in the top two social classes and 14.5% of the students attended a Grammar school compared with a much larger proportion of 43% attending a Comprehensive. 44.7% of students obtained a 2:1 or 1st class degree and Figure 1 in the appendix shows a more detailed breakdown of the proportions of each degree classification.

Table 2 shows some basic comparisons between different school types. We can see that the percentage of students obtaining a 2:1 or 1st class degree is similar for all school types other than where a student has attended a school which was not classified, which is considerably lower. Figure 2 in the appendix shows a more detailed breakdown of degree classification for students from each school type. This shows little variation between the school types, although the proportion of first class degrees is lower for those students from Sixth-Form colleges.

Table 2 also shows the average A-level scores out of 30 which is quite similar for Grammar schools and Comprehensives, at 16.9 and 17.1 respectively, although Independent schools perform better at 18.5, though these averages would alter significantly if students who did not attend universities were also included. We can see that schools are similar in terms of degree performance, but different in terms

of A-level results, which demonstrates the need to control for underlying abilities when analysing schools, rather than simply examining exam results.

Figure 3 in the appendix shows a detailed breakdown of degree classifications by social class. Although there are no vast differences between the classes, there is a trend for a higher proportion of first class degrees as social class increases. Furthermore, there is a trend increase in the proportion of third class degrees as social class falls.

The method

We assume that a student's observable ability where they leave school, their A-level results, is determined by both natural ability and their schooling (Smith & Naylor 2005). Degree performance will be regressed on school types and many control variables including A-level scores and age, with dummy variables to control for gender, social class derived from parental backgrounds, having maths A-level, university attended, subject studied having a scholarship[8] and marital status. Since the data is from seven cohorts, dummy variables for each cohort are also included to control for grade inflation, although the coefficients are relatively stable over time. The total sample size is 376,959. To measure the effect of different school types they are included in the regression as dummy variables, with Comprehensive schools omitted as the default case.

The dependent variable is the dummy variable 'Good Degree' which equals one if the student obtained a 1st class or 2:1 degree. An ordered probit regression is used to estimate the probability that a 'good' degree is obtained.

[8] Found to be insignificant and so not included in final regression

Regression Specification:

$$Pr(Y_{1i}=1 \mid \beta_{1i},\beta_{2i},\beta_{3i},\beta_{4i},\beta_{5i},X'\beta_{6i},Z_i)=\Phi(\alpha + \beta_1 Grammar_i + \beta_2 Independant_i + \beta_3 Sixth\text{-}Form\ College_i + \beta_4 Other_i + \beta_5 A\text{-}level\ score_i + X'\beta_{6i} + Z_i\Omega)$$

Where *X'* denotes all control variables

Applying the above theory that for two otherwise identically observable students, the student who attended a better school would on average have lower attainment when at university, we infer that a negative coefficient on $\beta_1 Grammar$ indicates schooling effects are greater for Grammar schools than Comprehensives. ***Regression 1*** will contain all observations, and ***Regression 2*** estimates the above regression for only those of the lowest social classes, with parental occupations categorised as "professional", "Intermediate" or "Skilled – non-manual" as well as those with unknown parental occupations excluded from the data set. ***Regression 3*** will accomplish the same objectives as *Regression 1* but will use more recent data from Durham University.

IV. Empirical Results & Analysis

The results of *Regression 1* are shown in Table 3 (below). The coefficient for attending Grammar school is small at -0.024 but this is significant at the 1% significance level. This coefficient is negative and so under the methodology described above this indicates a small attainment benefit to attending a Grammar school compared to a Comprehensive ceteris paribus. The marginal effect of attending a Grammar school is -0.009 which means an average student from a Grammar school is 0.9 percentage points less likely to obtain a 'good' degree than an otherwise

identical one that attended a Comprehensive school. These findings provide evidence in support of Grammar schools providing academic benefits to their students.

Table 3 - *Regression 1*

Variable[9]	**Coefficient**	**Marginal Effect**	**Marginal Effect x100**[10]
Male	-.1231945***	-.049	-4.9
Age	.0524870***	.021	2.1
Married	-.1688352***	-.066	-6.6
Social Class II	.0164916***	.007	0.7
Social Class III	.0278855***	.011	1.1
Social Class IV	-.0075817	-.003	-0.3
Social Class V	-.0265806**	-.010	-1.0
Social Class VI	-.0396258*	-.016	-1.6
Social Class VII	-.0335720	-.013	-1.3
Social Class VIII	-.0444496***	-.018	-1.8
Social Class IX	-.1829724***	-.071	-7.1
Grammar	-.0235591***	-.009	-0.9
Independent	-.0989830***	-.039	-3.9
Sixth-Form	-.0682703***	-.027	-2.7
Other	.0976796***	.039	3.9
A-level score	.0453500***	.018	1.8
A-level maths	-.1219413***	-.048	-4.8
A in maths	.0913605***	.036	3.6
3 A's	.0245563**	.010	1.0
N = 376,959	Pseudo R^2 = 0.06		

Significance levels: *** 1% **5% *10%

The coefficients of the school types 'Independent' and 'Sixth-Form College' are also negative, indicating that they have a positive impact on attainment. These coefficients for 'Independent' and 'Sixth-Form College' are statistically significant, and are much larger than the coefficient for Grammar schools, which would indicate a greater benefit to attending an Independent school or Sixth-Form college. Attending an Independent school gives a 3.9 percentage point reduction in the probability of a student obtaining a 'good' degree, and this figure is 2.7 for Sixth-Form colleges. These findings are consistent with Smith & Naylor (2005) who found that attending

[9] Regression also included dummy variables for all universities, subjects and cohort year, not shown here for reasons of space

[10] Evaluated at the mean value

Independent school gives a marginal effect of -0.065 for males, -0.054 for females, on the probability of obtaining a ‘good’ degree.

The negative coefficients for Sixth-Form colleges, Grammar and Independent schools indicate that university admissions departments looking to maximise the percentage of students obtaining good degrees should take a higher proportion of students from Comprehensive schools compared to these three alternative school types. Otherwise identical males have a 4.9 percentage point lower chance of obtaining a ‘good’ degree compared to females, and this is another factor which admissions departments could account for if looking to maximise their proportion of ‘good’ degrees.

A student’s A-level score is a key indicator of university performance with a one point increase in A-level score from the mean of 17.33 associated with a 1.8 percentage point increased chance of obtaining a ‘good’ degree. A non-linear effect of A-level performance was also detected, with the positive coefficient of obtaining 3 A’s at A-level significant at the 5% significance level. However, there is one unexpected pattern in the results. The coefficient for taking A-level maths is negative at -0.12, and although the variable for getting an A in maths is positive, this is smaller at 0.09, and this indicates that from two otherwise identical students one that has studied maths will have a lower probability of obtaining a ‘good’ degree. This is unexpected since a maths A-level is commonly regarded as being indicative of high ability. One possible explanation of this would be that in fact admissions tutors give too much credit to a potential student with A-level maths and so a student with a lower underlying ability can gain a place at university.

The coefficients for many of the social classes are significant. Compared to those in the top social class, those in the second and third social classes have a

significantly higher probability of obtaining a 'good' degree. However, the coefficients for the fourth social class and below are all negative, and all but two of these categories are statistically significant. This can be explained in terms of the two hypotheses mentioned above. If both *Hypothesis I* and *Hypothesis II* operate simultaneously, *hypothesis I* describes why coefficients for higher social classes become positive, as those of higher social classes receive more parental pressure, encouragement and resources to perform well at university. However, for the students of the very highest social class the effect of *hypothesis II* has a greater impact, with these students having a reduced incentive to perform well at university since they will have a greater number of options available to them than those from lower social classes should they perform poorly.

Table 4 - *Regression 2*

Variable	**Coefficient**	**Marginal Effect**	**Marginal Effect x100**
Male	-.1353380***	-.053	-5.3
Age	.1038795***	.041	4.1
Married	-.1399857**	-.054	-5.4
Social Class IV[11]	.0348814	.014	1.4
Social Class V	.0137923	.005	0.5
Social Class VII	.0023290	.001	0.1
Social Class IX	-.1472641***	-.057	5.7
Grammar	-.0207432	-.008	-0.8
Independent	-.0894492***	-.035	-3.5
Sixth-Form	-.1093909***	-.042	-4.2
Other	.0413992	.016	1.6
A-level score	.0465646***	.018	1.8
A-level maths	-.1047878***	-.041	-4.1
A in maths	.1069622***	.042	4.2
3 A's	.0272666	.011	1.1
N = 66,250	Pseudo R^2 = 0.0502		

Significance levels: *** 1% **5% *10%

Table 4 shows the results of *Regression 2*. This regression contains only those from social class IV and below and so the sample size has reduced to 66,250.

[11] Social Class VI is now the default case.

We can see that the results are very similar to *Regression 1*. However, the coefficient for Grammar schools has risen slightly from -0.0236 to -0.0207, and is now statistically insignificant. The interpretation of this is that for the lowest social classes there is no significant educational benefit to attending a Grammar school. This is an unexpected result, since when the whole data set is considered there is evidence that Grammar schools provide a significant benefit. This result indicates that it is unlikely that Grammar schools have a positive effect on social mobility since they provide no significant educational benefits to those of lower social classes. A possible explanation for this would be that there is a psychological impact on students from lower social classes that attend Grammar schools. Perhaps passing the 11+ test and gaining a place at Grammar school may cause the student not to work as hard, or there is on average less parental encouragement. Of course there are many other possible explanations and these would need to be tested extensively before firm conclusions can be drawn. However, this does not detract from this paper's finding that Grammar schools provide no significant benefit to those of lower social classes. It must also be noted that there is no evidence that Grammar schools perform worse than Comprehensive schools, the results show that there is no significant difference between the two.

Table 5 in the appendix shows the results for *Regression 3* using the data from Durham University. This is intended to be identical to *Regression 1* aside from the use of different data. The vast majority of students in this data set obtain a 2:1 class degree, with 1,877 out of 3,104 students achieving a 2:1 and a further 592 obtaining a 1st the incidence of students not obtaining a 'good' degree is very low. As a result the sample size was not great enough to run a separate regression for students from the lowest social classes.

The results shown in Table 5 show that for otherwise identical students at Durham those who have attended Independent School are 4.7 percentage points less likely to obtain a ‘good’ degree. This figure is 4.9 for those students from a Sixth-Form college. This is consistent with the evidence from the USR that there is significant academic benefit to attending these school types. However, the coefficient for Grammar schools is now positive, which contrasts with the findings from the USR, although the coefficient is not statistically significant at the 10% significance level. This would indicate that there is no significant difference between attending a Grammar school or a Comprehensive, and since this data is more recent it could be interpreted as evidence that the performance of Comprehensive schools has matched Grammar schools in recent years.

One important limitation of this study is that it only examines the impact of the different schooling types for those students who attend university, which will mean that the impact of these schools for students who either did not want to go to university or those who were not offered a place is not measured. This means that schooling effects for weaker students are not assessed, and these may differ for different school types, particularly Independent schools, where smaller class sizes could be more beneficial to weaker students. However, since the majority of Grammar school students go on to university, the paper still serves as an appropriate measure for the effectiveness of Grammar schools. It must also be noted that there will be considerable variation between individual schools, the paper conducts a general examination of different schooling types.

A possible source of bias to the investigation would be if the school type attended was having an additional impact on degree performance. For example, students at school type ‘A’, may pick up educational methods at school which enable

them to perform better in their university studies relative to those from school type ‘B’. If this was the case then the coefficient for school type ‘A’ will have a positive bias, since the student is now more likely to obtain a ‘good’ degree. Since we would assume that Independent schools and Grammar schools are more likely to be school type ‘A’ this indicates a possible positive bias in the coefficients. Since these coefficients are negative, this means they are less likely to be statistically significant. Despite this possible bias, both coefficients are significant in *Regression 1*, and so any bias is unlikely to compromise the integrity of the study. It possible that this is the reason Grammar schools were insignificant in Regression 2. However, if one argued that Comprehensive schools were school type ‘A’ then the opposite is true.

V. Conclusions

Given the larger sample size of the data from the USR it is possible to draw firmer conclusions from *Regression 1* and *Regression 2*. From *Regression 1* we find a small but significant negative relationship between attending Grammar school and degree performance, which indicates ceteris paribus that attending Grammar school will have a positive effect on a student’s A-level results. From *Regression 2* we find that this effect is not present for students from lower social classes, which indicates that Grammar schools do not have a positive impact on social mobility, although we do not evaluate the impact on social mobility for students in selective LEAs who do not gain a place at a Grammar school. More recent data from Durham University in *Regression 3* finds evidence that there is no significant difference between attending Grammar school and Comprehensive school, although the validity of this conclusion could be questioned due to the small sample size. Ideally a more comprehensive data

set comprising data for all universities would be tested when such data become available.

We also find significant academic benefits to attending Independent school and Sixth-Form College from all three regressions. This last finding is significant as it enables the paper to make a policy recommendation for the government to increase numbers of Sixth-Form colleges, since we find evidence that they out-perform both Grammar and Comprehensive schools. However, the data used in this paper is not recent enough to evaluate the impact of the Academies introduced in year 2000, and it would be unwise to make policy recommendations without more recent data, although the recent data from Durham does endorse the findings of Sixth-Form colleges outperforming other state funded institutions.

The analysis of degree performance determinants has also found important results. Females were found to significantly out-perform otherwise identical males. It was also found that obtaining a maths A-level has a negative impact on degree performance, and it was hypothesised that admissions departments give maths too much extra preference when awarding students places at university. Finally social class was also found to be a key determinant of degree performance, with those from social classes II and III performing significantly better than those from the top social class, and those whose parents are out of the workforce performing significantly worse.

It is possible that several relevant variables are missing which could be correlated with school types, such as extra curricular activities, although no previous investigations of degree determinants included such information and it is unlikely to have impacted results significantly. The model itself has a very low pseudo-R^2 which would be expected due to high levels of variation between students. Although, this is

not ideal, and as such we would never be able to perfectly predict a student's degree performance beforehand, the model is successful in identifying the key determinants, and significance of the different schooling types. Robust standard errors were used throughout to improve the stability of the model.

VI. Further Work

The investigation is sufficient to draw basic conclusions regarding the benefits to a student's attainment of attending different school types. However, the method cannot quantify these benefits, and as an extension of the work it would be interesting to examine the rationality of parents sending their children to private schools by comparing expected extra future earnings with school fees, and including degree performance as an instrument for differences in underlying ability.

A further extension of the work would be to take data from schools, so there are more specific data about the student's attainment and other activities at all points through the student's education. If this data could be matched to data for the student at university, a greater degree of the variation could be controlled for and a more firm conclusion could be reached.

Another possible method of investigation could be to identify cases where identical twins have attended different schools. Their subsequent results could be regressed upon environmental factors and their school types, to determine the impact of the different school types.

This paper only considers the impact of schooling on subsequent academic attainment. It would be interesting to determine if other elements to the schools, such as extra curricular activities, result in increases in students' happiness or to their future earnings.

VII. References

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VIII. Appendix

Figure 1 – Distribution of degree classifications

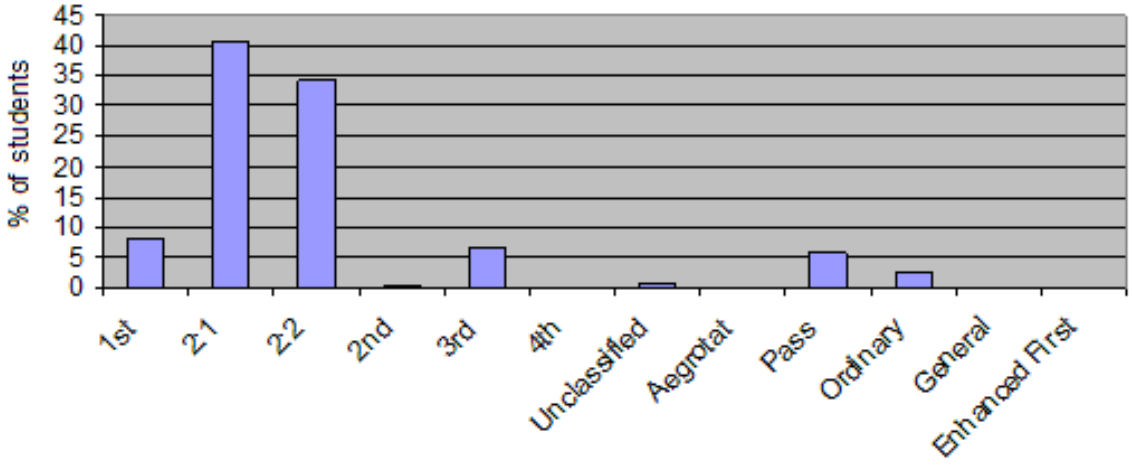


Figure 2 – Proportions of degree classifications for each school type

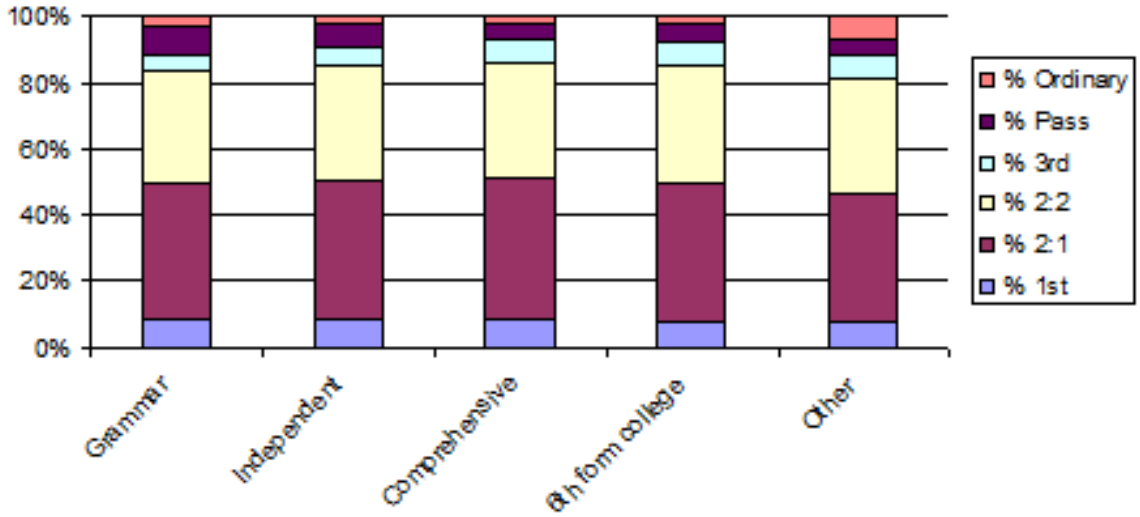
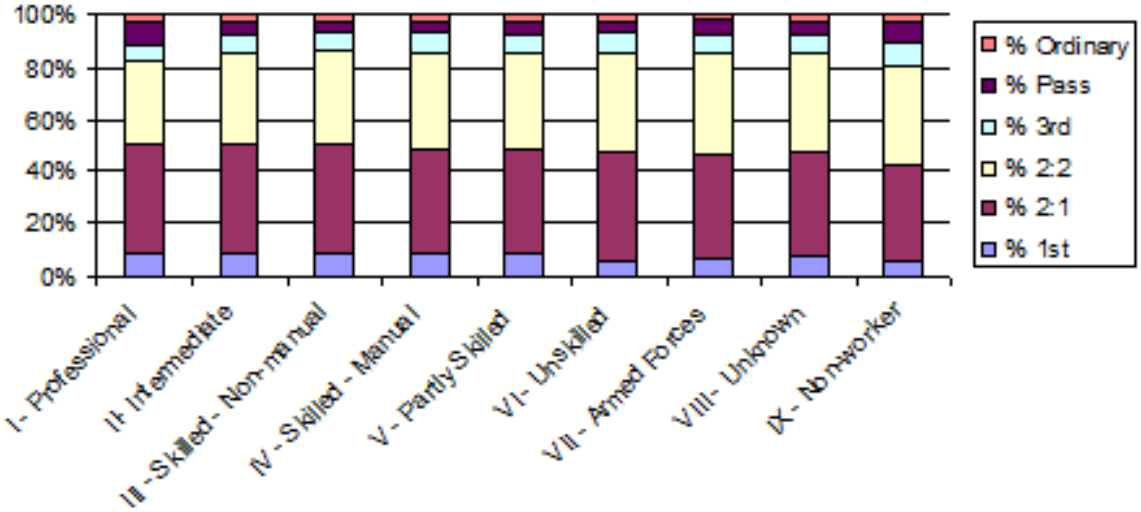


Figure 3 – Proportions of degree classifications for each social class



Social Class categories for USR

I. Professional
II. Intermediate
III. Skilled non-manual
IV. Skilled manual
V. Partly Skilled
VI. Unskilled
VII. Armed Forces
VIII. Unknown
IX. Non-worker

Social Class categories for Durham Data

I. Higher managerial and professional occupation
II. Small employers and own account workers
III. Lower managerial and professional occupation
IV. Intermediate occupations
V. Lower supervisory and technical occupations
VI. Semi-routine occupations
VII. Routine occupations
VIII. Not classified

Table 5 - Regression 3 results for Durham University

Variable[12]	**Coefficient**	**Marginal Effect**	**Marginal Effect x100**
Male	-.1904029***	-.048	-4.8
Social Class II	-.0412408	-.010	-1.0
Social Class III	-.2611183***	-.068	-6.8
Social Class IV	-.0821745	-.021	-2.1
Social Class V	.0013011	.000	0.0
Social Class VI	-.1867206	-.050	-5.0
Social Class VII	-.5068113**	-.155	-15.0
Social Class VIII	-.3584382***	-.101	-10.1
Grammar	.0874822	.021	2.1
Independent	-.1857946***	-.047	-4.7
Sixth-Form	-.1856847**	-.049	-4.9
Other	-.0915343	-.024	-2.4
A-level score	.0449050***	.011	1.1
3 A's	.7010836***	.168	16.8
N = 3,104	Pseudo R^2 = 0.1689		

Significance levels: *** 1% **5% *10%

[12] Regression also included dummy variables for all subjects, not shown here for reasons of space

Statistical tests

Regression 1:

H_0 sch_gram = 0

chi2(1) = 10.04
Prob > chi2 = 0.0015

Reject H_0 => Grammar schools have significant impact

Regression 2:

H_0 sch_gram = 0

chi2(1) = 1.52
Prob > chi2 = 0.2182

Do Not Reject H_0 => Grammar schools have no significant impact

Regression 3:

H_0 sch_gram = 0

chi2(1) = 0.51
Prob > chi2 = 0.4759

Do Not Reject H_0 => Grammar schools have no significant impact