

# Grade surprise and choice at 16

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## **Abstract**

This paper argues that an important influence on boys' decisions to stay on into post-compulsory education is the attainment of maths grades that differ from expected.

**Keywords:** Bivariate probit; post-compulsory education; choice under uncertainty

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## 1. Introduction

Standard education investment models attributable to Becker (1962) and Heckman (1976) view the individual as maximising discounted lifetime income streams through education choice. Individuals calculate the reward for different education pathways and choose the pathway that maximises utility. Since Willis and Rosen (1979) and Henderson *et al.* (1978) discussed the issues of education, self-selection and peer groups, many studies have presented investigations into the influences of various forces on enhancing education participation. Motivations for participation in post-compulsory education vary by gender, and Webber and Walton (2006) show that peer groups are stronger for males. Many studies focus on the UK youth labour market (e.g. Pissarides, 1981; Rice, 1987; Micklewright, 1989) and Feinstein and Symons (1999) and McIntosh (2001) are not alone when they find that the most important variable explaining the decision to stay on into post-compulsory education is prior educational attainment. The purpose of this paper is to identify whether the attainment of higher (or lower) grades than expected affects the decision to stay on into post-compulsory education for boys.

## 2. Data

Data are drawn from the Bradford Youth Cohort Study<sup>1</sup> that were collected at the school level by the Policy Research Institute (at Leeds Metropolitan University). At the centre of the work is an administered questionnaire that was distributed in class time with students completing them under teacher supervision and corresponds to a student cohort who were

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<sup>1</sup> The study collected no measure of parental educational or financial background. We attempt to control for these effects by including two variables that capture the income levels and inequality within the student's 4-digit postcode residential area.

going to complete their compulsory school in 1998.<sup>2</sup> The students were asked to respond to a subsequent questionnaire which was distributed one year later after they had completed their compulsory education.<sup>3</sup>

Two sets of variables are at the centre of this empirical study. The first set corresponds to intentions and realisations of the decision to stay on into post-compulsory education. These data are summarised in Figure 1; the accompanying Chi<sup>2</sup> statistic indicates that there is a statistically significant relationship between these intentions and realisations.

The second important set of variables corresponds to ability. The data set includes the expected and realised grades for maths and English language. Students were informed of the grade that they should expect to receive, which was based on their results of mock exams, but they did not have to write this grade on the questionnaire if they believed that they would get a different final grade. Grades are measured on an ordered scale from “A” (=7) to “G” (=1), and “U” (=0). The differences between the expected and actual grades are grades surprises; if a student expected grade “C” but actually received grade “B” then the error would be +1. Grade surprises are summarised in Table 1. Overall there appears to be limited systematic bias in grade surprises, as shown in Table 2, although of note is the 3:1 ratio of negative to positive grade surprise for maths.

### **3. Results**

Table 3 presents the results of a bivariate probit estimation with clustering at the school level where the dependent variables are whether the students intends to stay on and whether the

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<sup>2</sup> More recent data are not available for variables that are at the core of this study. Although changes have occurred in the UK post-compulsory education market over the last decade (see Thomas and Webber, 2009, for a brief review) the data set remains one of the most detailed and useful for this study.

<sup>3</sup> Students who were in post-compulsory education were interviewed in class, while those who left education were sent the questionnaire by post. There was attrition in the response rate for the second questionnaire, with those who left education being less likely to return completed questionnaires, suggesting a possible bias towards those in education.

student did actually stay on. Included as explanatory variables are ethnicity dummies, two residential area income measures (one capturing the average income level and the other capturing the extent of inequality within the residential area) and a variable capturing the peer group effect, which is constructed as the rate of staying on into post-compulsory education of other students in the school. Also included are dichotic variables capturing whether the student felt advice from particular sources (parents, teachers, careers) is important in forming their decision and whether they had work experience.

The results confirm *a priori* expectations as greater staying on rates of peers results in a greater likelihood of the student staying on, higher incomes encourage (and/or facilitate) the realisation of the staying on decision, and greater proportions of the student's local residents on low incomes encourage students to stay on into post-compulsory education.

Higher expected grades enhance the intention and realisation of the decision to stay on; this effect is much larger for maths than for English. Coefficients for grade surprise indicate that doing better (worse) than expected enhances (reduces) the likelihood that the student decides to stay on.<sup>4</sup> Two columns of marginal effects presented in Table 4 relate to when the student intended to stay on and when the student intended to leave respectively. Across all expected grades and almost without exception, positive (negative) grade surprise enhances (reduces) the likelihood that the student will stay on and these marginal effects are substantially larger for those who intended to leave relative to those who intended to stay on.

Policy geared towards increasing the proportion of students who stay on into post-compulsory education should not be blind to grade surprise. Students who do better than expected may be more easily coerced into staying on as they may feel that they are better academically than they originally thought. Students who do worse than they expect may need

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<sup>4</sup> Similar grade surprise variables were examined earlier for English language but were not identified as being statistically significant. Further research could identify why students appear to take maths more seriously than English as an indicator of ability. One suggestion is that understanding maths requires sequential learning, which may be less important for other subjects such as English language.

to be reminded that their result could have been due to abnormally poor performance by them on the day of the exam and may not necessarily mean that they would also do poorly in exams at the post-compulsory level.

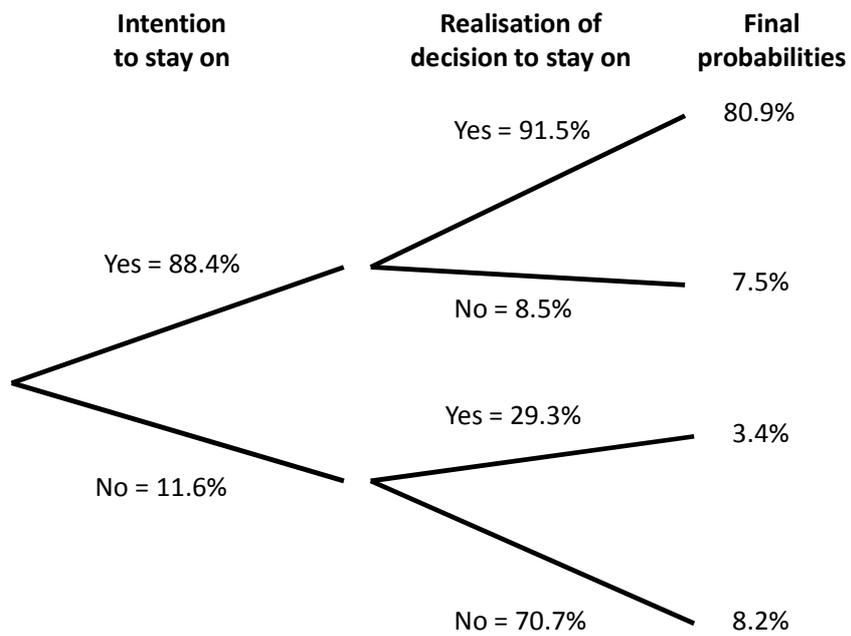
#### **4. Conclusion**

The results presented above suggest that achieving a maths grade that is better than expected can significantly enhance the likelihood that a male student stays on into post-compulsory education at the age of 16. The influence of grade surprise on this education decision is greater for students who intended to leave than for students to intended to stay on.

#### **References**

- Becker, GS (1993) *Human capital: A theoretical and empirical analysis with special reference to education* (3<sup>rd</sup> edition), University of Chicago Press, Chicago.
- Feinstein, L and Symons, J (1999) “Attainment in secondary school”, *Oxford Economic Papers* **51**(2), 300–21
- Heckman, JJ (1976) “A lifecycle model of earnings, learning and consumption”, *Journal of Political Economy* **84**(4), s11–44
- Henderson, V, Mieszkowski, P and Sauvageau, Y (1978) “Peer group effects and educational production functions”, *Journal of Public Economics* **10**(1), 97–106
- McIntosh, S (2001) “The demand for post-compulsory education in four European countries”, *Education Economics* **9**(1), 69-90
- Micklewright, J (1989) “Choice at sixteen”, *Economica* **56**, 25–40.
- Pissarides, CA (1981) “Staying-on at school in England and Wales”, *Economica* **48**(192), 345–63
- Rice, P. (1987) “The demand for post-compulsory education in the UK and the effects of educational maintenance allowances”, *Economica* **48**, 465–76
- Thomas, W and Webber, DJ (2009) “Choice at 16: school, parental and peer group effects”, *Research in post-compulsory education* **14**(2), 119-141
- Webber, DJ and Walton, F (2006) “Gender specific peer groups and choice at sixteen”, *Research in Post-compulsory Education* **11**(1), 65-84
- Willis, RJ, and Rosen, S (1979) “Education and self-selection”, *Journal of Political Economy* **87**, 7-36

**Figure 1: Probability tree**



Notes: Pearson  $\chi^2(1) = 155.470$  ( $P < 0.000$ )

**Table 1: Descriptive statistics for grade surprise**

	Maths surprise	English surprise
Mean	-0.306	-0.139
St. Dev	0.785	0.778
Skewness	-0.075	0.246
Kurtosis	3.717	4.553

**Table 2: English and Maths surprises (%)**

		English surprise							
		-3	-2	-1	0	1	2	3	Total
Maths surprise	-3	<b>0</b>	0.21	0	0	0	0	0	0.21
	-2	0	<b>0.84</b>	2.73	2.31	0.21	0	0	6.08
	-1	0.21	0.21	<b>11.32</b>	15.09	3.14	0.21	0	30.19
	0	0	0.84	10.48	<b>31.87</b>	7.97	0.63	0.42	<b>52.20</b>
	1	0	0.63	1.26	5.87	<b>2.52</b>	0.21	0	10.48
	2	0	0	0.21	0	0.21	<b>0</b>	0.21	0.63
	3	0	0	0	0	0.21	0	<b>0</b>	0.21
	Total	0.21	2.73	26.00	<b>55.14</b>	14.26	1.05	0.63	100

Pearson  $\chi^2(36) = 148.051$  ( $P < 0.000$ )

Likelihood-ratio  $\chi^2(36) = 70.237$  ( $P = 0.001$ )

Cramér's  $V = 0.227$

Goodman and Kruskal's gamma = 0.361 (Asymptotic Standard Error = 0.063)

Kendall's tau-b = 0.2293 (Asymptotic Standard Error = 0.041)

McNemar-Bowker = 32.89,  $df = 14$  ( $P = 0.003$ )

Stewart-Maxwell's test for marginal homogeneity = 15.96,  $df = 6$  ( $P = 0.014$ )

**Table 3: Coefficients estimates**

	Intention to stay on into post-compulsory education		Actual participating in post-compulsory education	
Constant	-7.769	(3.205)**	-8.835	(3.101)***
Caribbean	0.348	(0.272)	0.391	(0.244)
Indian	0.106	(0.523)	0.422	(0.505)
Other	0.172	(0.370)	0.861	(0.444)*
White	<i>Control variable</i>			
Average income in residential area postcode	0.119	(0.106)	0.194	(0.091)**
Proportion of residents in postcode area with income less than £10,000 per annum	0.048	(0.045)	0.073	(0.042)*
Peer group effect	2.392	(0.911)***	2.071	(0.693)***
Parents advice is important	-0.064	(0.141)	-0.082	(0.143)
Teachers advice is important	0.541	(0.193)***	0.311	(0.212)
Careers advice is important	-0.289	(0.223)	-0.254	(0.172)
Work experience	0.210	(0.186)	0.063	(0.211)
Expected maths result	0.454	(0.101)**	0.263	(0.093)***
Expected English language result	0.153	(0.085)***	0.138	(0.075)*
Maths surprise +ve 'B'			5.332	(0.683)***
Maths surprise +ve 'C'			0.054	(0.286)
Maths surprise +ve 'D'			0.637	(0.236)***
Maths surprise +ve 'E'			0.442	(0.399)
Maths surprise +ve 'F'			5.009	(0.691)***
Maths surprise +ve 'G'			5.199	(0.713)***
Maths surprise +ve 'U'			2.656	(0.367)***
Maths surprise -ve 'A'			-5.511	(0.284)***
Maths surprise -ve 'B'			-0.233	(0.119)**
Maths surprise -ve 'C'			-0.287	(0.131)**
Maths surprise -ve 'D'			-0.561	(0.239)**
Maths surprise -ve 'E'			0.129	(0.324)
<i>n</i>	477			
Log pseudo likelihood	-252.817			
rho	0.806 (0.061)			

Notes: Standard errors are in parentheses; \*\*\*, \*\* and \* represent statistical confidence at the 1%, 5% and 10% levels. Rho suggests strong positive correlation between regressions ( $\chi^2(1)=40.809, p<0.000$ ).

**Table 4: Marginal effects**

	Participating in post-compulsory education given the student intended to <i>stay on</i>		Participating in post-compulsory education given the student intended to <i>leave</i>	
Caribbean	0.009	(0.007)	0.083	(0.134)
Indian	0.011	(0.006)*	0.172	(0.089)*
Other	0.015	(0.005)***	0.300	(0.094)***
White	<i>Control variable</i>			
Average income in residential postcode	0.006	(0.003)**	0.063	(0.039)
Proportion of residents in postcode with income less than £10,000pa	0.002	(0.001)*	0.023	(0.016)
Peer group effect	0.046	(0.037)	0.245	(0.446)
Parents advice	-0.002	(0.005)	-0.021	(0.069)
Teachers advice	0.003	(0.008)	-0.033	(0.107)
Careers advice	-0.006	(0.007)	-0.032	(0.088)
Work experience	-0.002	(0.008)	-0.043	(0.098)
Expected maths result	0.003	(0.004)	-0.026	(0.051)
Expected English language result	0.003	(0.003)	0.019	(0.037)
Mathsurprise +ve @ grade 'B'	0.022	(0.006)***	0.447	(0.066)***
Mathsurprise +ve @ grade 'C'	0.002	(0.011)	0.030	(0.155)
Mathsurprise +ve @ grade 'D'	0.029	(0.012)**	0.354	(0.138)**
Mathsurprise +ve @ grade 'E'	0.011	(0.005)**	0.203	(0.142)
Mathsurprise +ve @ grade 'F'	0.228	(0.064)***	2.781	(0.265)***
Mathsurprise +ve @ grade 'G'	0.014	(0.004)***	0.363	(0.064)***
Mathsurprise +ve @ grade 'U'	0.121	(0.033)***	1.475	(0.129)***
Mathsurprise -ve @ grade 'A'	-0.251	(0.049)***	-3.060	(0.471)***
Mathsurprise -ve @ grade 'B'	-0.011	(0.006)*	-0.129	(0.062)**
Mathsurprise -ve @ grade 'C'	-0.013	(0.006)**	-0.159	(0.085)*
Mathsurprise -ve @ grade 'D'	-0.026	(0.012)**	-0.311	(0.143)**
Mathsurprise -ve @ grade 'E'	0.006	(0.015)	0.071	(0.179)