

POST-SECONDARY SCHOOL TYPE AND ACADEMIC ACHIEVEMENT*

by

ELENA MESCHI

University Ca' Foscari, Venice

ANNA VIGNOLES

University of Cambridge

and

ROBERT CASSEN

London School of Economics

The Further Education (FE) sector has been the Cinderella of English education, attracting less research, despite the large number of students who attend FE colleges. We ask whether the post-16 institution attended by the pupil, i.e. FE college or school-based provision, influences pupils' final achievement and whether the gain in pupil achievement at A level is greater in FE colleges as compared with school-based provision. Allowing for the fact that FE colleges admit more disadvantaged pupils, those who attend an FE college do marginally less well at A level. Sixth form colleges have significantly higher value-added, particularly for higher achieving pupils.

1 INTRODUCTION

England has historically had a stratified education system, with a clear demarcation between the academic and vocational routes through education post-16. At age 16, when compulsory schooling ends in England, students have a choice of different institutions in which to continue their studies. Specifically students can opt to stay in a school and study in what is known as the 'sixth form', i.e. years 12 and 13 of the school system. Most of these students will be studying national Advanced Level examinations (known as A levels) that are generally taken at age 17/18 and are the major qualification for entry to university. Alternatively after the age of 16 students can attend a separate sixth form college: these colleges cater for 16- to 18-year-olds who are largely taking A levels. Yet another alternative is a Further Education (FE) college. FE colleges cater to a broader range of students of all ages, offering both academic and vocational post-compulsory (post-16) education. In this paper we consider the relative progress made by students pursuing the academic route (A levels) in these different types of post-16 institution, with a particular emphasis on the progress made by students in FE colleges.

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Our interest in the effectiveness of FE colleges in particular stems from the fact that the FE sector has always been somewhat the Cinderella of English education, attracting relatively less research (with notable exceptions, see Tymms, 1992; Belfield and Thomas, 2000; Martinez, 2002). This is despite the large number of students who attend FE colleges—some 603,400 16- to 18-year-olds in 2011¹—and substantial expenditure. Funding for FE as a whole was £6.1 billion in 2007/8, up from £3.1 billion 10 years before.² Rising post-16 participation in full-time education (FTE), from 50 per cent of the cohort in the late 1980s to 85 per cent in 2011,³ has further increased the importance of FE in the English education system as it has expanded substantially to meet rising demand.

Our analysis uses data from the Longitudinal Study of Young People in England (LSYPE). The LSYPE is a survey of about 15,000 young people born in England between 1 September 1989 and 31 August 1990. They were aged 13 and 14 (attending year 9) in 2003/4 (first wave) and have been followed up on an annual basis. In our data around 30 per cent of those who remain in FTE post-16 undertake their study within an FE college, and of this group, 48 per cent take A levels. It is this subset of FE students that we focus on in this paper. Our data are longitudinal so we are able to control for prior achievement (test scores achieved in national examinations taken at age 16 called General Certificates of Secondary Education or GCSEs) and indeed other characteristics that precede entry into the post-16 institution.

To model the achievement of students in different types of post-16 institution we need to take account as best we can of the selection process that determines which type of post-16 institution a pupil enrolls in. Our modelling suggests that students who attend FE colleges differ from those who choose the other types of post-16 institution. For example, in our data, even when we condition on those students taking A levels, on average students attending FE colleges have lower (age 16) GCSE test scores. Our approach to address this selection bias is to condition on a set of rich controls. However, we cannot necessarily take account of all the factors that might influence post-16 institution selection. In the absence of any kind of natural experiment or suitable instrument to take account of unobservable selection bias, we cannot definitively establish a causal relationship between attending an FE college

¹Department for Education (2012), *Participation in education, training and employment by 16–18 year olds in England*, SFR 18/2010, Table B13. FE colleges of course also train significant numbers of adults post-18, who are not considered in the present paper.

²Her Majesty's Government (2009), *New Opportunities: Fair Chances for the Future*, White Paper CM7533.

³Department for Education SFR 18/2012, *Participation in education, training and employment by 16–18 year olds in England*, Table 5. For the earlier period see SFR 13/1999, *Participation in education, training and employment by 16–18 year olds in England*, 1988–98.

and pupil achievement. This is an issue we return to when discussing our empirical strategy.

This paper makes a clear contribution to the literature by providing evidence on the value-added by different types of post-16 institution on pupil achievement. Existing evidence on the effectiveness of FE colleges is limited (Tymms, 1992; Morris *et al.*, 1999; Owen and Fletcher, 2005; Stanton and Fletcher, 2005, 2006; Schagen *et al.*, 2006). The paper is also relevant to the large literature on the determinants of educational achievement and particularly the factors influencing the achievement and final outcomes of lower achieving students (McIntosh, 2006; Cassen and Kingdon, 2007).

A brief description of the relevant literature is presented in Section 2 before we discuss our empirical strategy in Section 3. Section 4 describes the data and the model specification, while Section 5 reports some descriptive statistics. In Section 6 results are presented from (a) a model of post-16 institution choice and (b) a model of pupil achievement. Finally, Section 7 provides a discussion of our findings and some conclusions.

2 LITERATURE

The existing UK literature has mainly focused on the determinants of the decision to remain in FTE at 16, irrespective of the type of post-16 institution chosen (see Clark *et al.*, 2005, for a review). Most studies that have used rich individual level survey data have found that the key factor determining post-16 participation is not family background and socio-economic status but prior achievement at GCSE (Micklewright, 1989; Andrews and Bradley, 1997; Rice, 1999; Clark, 2002, 2011; Dickerson and Jones, 2004). That is not to say family background is unimportant. For example Micklewright (1989), using the National Child Development Study (NCDS), found an important role for parental education and social class even after controlling for prior achievement and ability. However, prior achievement dominates as an explanation of the staying on decision (see, for example, Andrews and Bradley, 1997).

While this body of research has not generally focused on the impact of post-16 institutions on pupil achievement, some studies have found important institution (school) effects on the staying-on decision (e.g. Andrews and Bradley, 1997; Rice, 1999). Thus institutional characteristics can matter according to existing literature, at least in determining whether students remain in FTE post-16. Here we assess whether institution type matters for pupil achievement post-16.

As has been said, the UK literature on the impact of post-16 institution on pupil achievement is very limited (Morris *et al.*, 1999; Belfield and Thomas, 2000; Martinez, 2002; Owen and Fletcher, 2005; Schagen *et al.*,

2006). Of particular note is the study by Schagen *et al.* (2006) which assessed the impact of patterns of post-16 institutions available on both post-16 participation and learner attainment. This work used administrative education data to map the types of post-16 institution available by area and found no relationship between the types of post-16 institution available and student participation in post-16 FTE and pupil attainment. However, this research relied on administrative data only which have relatively limited information about pupils' characteristics.

The consensus from this literature is that the performance of FE colleges is not dissimilar to that of schools. We determine whether this result holds when using richer data, allowing for factors that influence sorting into different post-16 institutions, and taking into account that the value-added at A level will vary according to the subjects taken (students generally select up to three to five different subjects at A level). FE colleges offer a different mix of subjects as compared with schools and this might affect their value-added if some subjects are 'easier' than others (Stanton and Fletcher, 2006).

3 EMPIRICAL STRATEGY

We start by modelling the determinants of institution choice, in order to help us understand the selection into different types of post-16 institution and thus to incorporate these factors into our model of pupil achievement.

We model the pupil's choice of post-16 institution using a multinomial logit. We define $m = 3$ institution choices (FE colleges, schools and sixth form colleges), and set FE colleges as the reference category. Denoting $P(y_i = m)$ as the probability that the choice m ($= 2, 3$) is taken by pupil i with characteristics \mathbf{X}_i and who has attended a secondary school with characteristics S_i , then the multinomial logit regression model can be written as

$$\ln \frac{P(y_i = m)}{P(y_i = 1)} = \alpha_m + \mathbf{X}_i \boldsymbol{\beta}_m + \mathbf{S}_i \boldsymbol{\gamma}_m \quad (1)$$

where \mathbf{X} is a rich vector of pupil-level characteristics and family background factors that are likely to affect choice of institution and \mathbf{S} is a vector of characteristics of the secondary school attended. As mentioned above, we restrict the sample to those who stay in FTE and study for A level qualifications. Rather than reporting the maximum likelihood estimates of $\boldsymbol{\beta}_m$ and $\boldsymbol{\gamma}_m$, in our result tables, we report the marginal effects of the regressors.

Ideally we would also want to control for local area effects, recognizing that the type of institutions available locally is likely to influence pupils' choices. The model is not identified when neighbourhood (Local Authority (LA)) fixed effects are specified. We did find some evidence that local area

effects are a significant determinant of institution choice post-16. Specifically, we estimated a probit model with a binary dependent variable, taking a value of 1 if the pupil enrolled in an FE college and zero if the pupil opted for either a school sixth form *or* a sixth form college (results available on request). With this model we were able to include LA fixed effects and they were jointly significant. Inclusion of LA fixed effects reduced the significance of some of the school characteristics though otherwise the results from the model were qualitatively quite similar to the multinomial logit results presented.

We then condition on covariates from this choice model in our model of pupil achievement below:

$$Alevel_i = \alpha_0 + \vartheta GCSE_i + \mathbf{I}_i\phi + \mathbf{X}_i\beta + \mathbf{S}_i\gamma + \mathbf{L}_i\lambda + \varepsilon_i \quad (2)$$

The dependent variable '*Alevel*' is the pupil's total A level point score, described in detail in the next section. The model is estimated using ordinary least squares and robust standard errors are provided. The model is a value-added specification and hence controls for prior achievement ('*GCSE*') by including the pupil's total GCSE point score. The variables of interest are a vector of dummy variables (\mathbf{I}) describing the post-16 institution type (sixth form in schools; sixth form colleges; FE colleges—the omitted category). The two parameters of interest are contained in ϕ which indicate the average association between each post-16 institution type and pupils' value-added from GCSE to A level. \mathbf{X} , \mathbf{S} and \mathbf{L} are vectors of pupil characteristics, school characteristics and neighbourhood (Local Authority) fixed effects respectively. ε_i is the usual error term.

Even after accounting for prior achievement, differences in value-added across different types of institution may be due to unobserved student heterogeneity and selection bias. As has been said, our strategy is to include as rich a set of controls as possible, acknowledging there may still be unobserved factors that influence both choice of institution and subsequent achievement. We were unable to find a credible candidate instrumental variable in our data to overcome this problem. One obvious possible candidate for an instrument is the distance between the student's home and the nearest FE college or school, whereby students may be more likely to enrol in the particular type of institution they live nearest to. Unfortunately in our data while we potentially could have constructed measures of the distance between the student's home and their current school (subject to confidentiality issues), we could not do this for FE colleges due to lack of data. Specifically, we lack information on the location of the campus of the FE college attended by the student. Since FE colleges are often large and span numerous sites across a city, knowing the name of the FE college that the pupil enrolled in is insufficient to identify where they are actually studying in relation to their home. This means we are unable to identify the proportion of students that simply attend their nearest institution, whether

that is a school or an FE college. This is one issue where better data would potentially improve the research.

4 DATA AND VARIABLES

We use data from wave 4 of the LSYPE to determine post-16 institution, which refers to the academic year 2006/7, when the young person is aged 16 or 17 and has already made the decision as to whether to stay in FTE and if they do stay on, their choice of institution. We use data from earlier waves for our covariates and we link in administrative data on prior achievement (Key Stage 2 (age 11) test scores and GCSE test scores) and outcomes (A level test scores). There has been attrition from the sample between wave 1 and wave 4. The original sample of 10,648 is reduced to 8147 pupils in FTE at wave 4 and we have information on 5151 pupils who continue post-16. However, not all of these students are taking A levels. When we restrict the sample to those studying A levels and no missing data on their GCSE score, the sample is reduced to 3810, with 453 pupils in FE colleges. This attrition is correlated with prior achievement, as measured by key stage 2 (age 11) test scores and parental education level. Specifically, the mean KS2 score for those always in the sample is 27.44 compared with 26.03 for those who are lost by attrition. The difference of 1.41 points is statistically significant.

Since the analysis in this paper is focused on high achievers, i.e. those staying on in post compulsory schooling to study A levels, attrition may not be such a concern for this group. However, we are nonetheless mindful that our sample over-represents high achieving pupils.

LSYPE adopted a two-stage sampling procedure. Schools (in the state sector only) were primary sampling units and deprived schools were over-sampled by a factor of 1.5. The second stage sampled the pupils within schools and major minority ethnic groups were over-sampled. We account for the sampling procedure, using LSYPE sample weights for all our analyses.

The LSYPE is a very rich source of information on pupils' personal characteristics, attitudes, experiences, behaviour, expectations and aspirations as well as on family background, household composition and parents' characteristics and aspirations. We also matched observations in LSYPE with the National Pupil Database (NPD) that provides information on pupils' records in standard national tests (Key stage tests), to the Pupil Level Annual School Census (PLASC) that contains a number of pupil-level background characteristics and to the LEA and School Information Service (LEASIS) that contains school level characteristics. The richness of these linked survey-administrative data is critical to our strategy to minimize selection bias arising from choice of post-16 institution by controlling for as many observed sources of selection as possible.

To further control for unobserved heterogeneity we condition on students taking A levels (rather than other qualifications). Ninety-four per cent of pupils who enrol in schools post-16 study for A levels (also known as A2) and AS levels (academic qualifications taken at age 16/17 and the first part of an A level). The figure for sixth form colleges is similar (90 per cent). Only 43 per cent of those enrolled in FE colleges study A level, A2 or AS level courses.

The dependent variable for the model of institution choice is an unordered categorical variable indicating whether or not the individual attended a Further Education College, a sixth form or a sixth form college in wave 4 of LSYPE. The base case therefore consists of individuals attending an FE college.

In our model of pupil achievement our key dependent variable is a standardized A level point score obtained from the Key Stage 5 NPD cumulative file, i.e. the total number of points acquired via attaining A levels at key stage 5. This variable is measured in Qualifications Curriculum Agency (QCA) points and has a standard deviation of 259.

Our variables of interest in this model are a mutually exclusive set of dummy variables indicating the type of institution attended post-16 (school; FE college (base case); sixth form college). We do not include characteristics of the post-16 institution in the model and hence these institution dummy variables capture the unconditional differences in achievement between institution types.

The purpose of the first stage analysis of choice of institution is to identify factors influencing the young person's choice of institution post-16 that may also influence their achievement at A level. We therefore include in our value-added model the same set of covariates as for the model of institution choice.

Controls include gender, ethnicity, an indicator of Special Educational Needs (SEN), English as an Additional Language (EAL), and whether or not the person is in receipt of Free School Meals (FSM).

We use an indicator for each pupil's eligibility for FSM to proxy family poverty status (Hobbs and Vignoles, 2009) and a variable reflecting parental socio-economic status, namely the NS-SEC (National Statistics Socio-Economic Classification) occupationally based classification. Parental education is included using two dummy variables indicating whether the father or the mother has a degree.

We include two prior achievement measures taken from age 16. The first is a synthetic continuous standardized score, based on a capped average GCSE point score that takes into account the pupil's eight highest grades. Fifty-eight points were awarded for an A*, 52 for an A, 46 for a B, 40 for a C, 34 for a D, 28 for an E, 22 for an F and 16 for a G. The score has mean 0 and standard deviation 1 within the LSYPE total sample in wave 3. The second measure is a dummy indicating whether the pupil achieved at least five GCSEs with grades A*–C, to see whether there are discontinuities at this

threshold. For robustness, we also investigated whether there was any non-linear relationship between prior achievement at GCSE and achievement at A level and found none.

We include variables describing pupils' attitudes towards school in year 11 and their parents' expectations. Parental expectations are measured by a dummy variable indicating whether the parent expected the pupil to stay on in FTE measured when the pupil was in year 9. Including these attitudinal variables is intended to account for what would otherwise be unobserved pupil heterogeneity. We also include a variable measuring the number of hours (if any) the pupil worked during the school term to control for different preferences and opportunities in the labour market.

We control for measures of school disadvantage (the school percentage of students eligible for FSM; the school percentage of students belonging to an ethnic minority group), school type (whether the school attended has a sixth form school or not; whether the school is a single-sex school and dummies for different types of pre-16 schools), school level outcomes (percentage of pupils achieving at least five GCSEs with grades A* to C) and resource inputs (pupil–teacher ratio; school size). We also attempt to control for peer group effects by including a variable measuring the percentage of pupils staying on in FTE at the school attended in year 11.⁴

Lastly, as discussed earlier, in the achievement model we include Local Authority fixed effects to account for neighbourhood characteristics and differences in post-16 institutions available in different local authorities.

5 DESCRIPTIVE STATISTICS

Three quarters (76 per cent) of the cohort remain in FTE after the end of compulsory schooling (Table 1) and around half of those who do so attend a secondary school. Around 15 per cent attend a sixth form college, while around 30 per cent are enrolled in an FE college (this includes students studying A level and those taking alternative qualifications). National statistics from 2007 suggest that 79 per cent of 16-year-olds were enrolled in FTE. Among these 46.8 per cent were in schools, 13.9 per cent in sixth form colleges and 39.2 per cent in General FE, tertiary and specialist colleges (Department for Education). Differences between our sample and the national statistics are likely to arise due to attrition of lower achieving students in the LSYPE sample as discussed earlier.

⁴Using PLASC and ILR (Individualized Learner Record) we are able to follow the whole population of pupils in state schools after the end of compulsory education and to determine their choices at age 16. Therefore for each school (and LA) we calculate the proportion of pupils in FTE at age 17 as a fraction of the school (LA) whole population in school at age 16 (i.e. in the last year of compulsory schooling).

TABLE 1
MAIN ACTIVITY AT AGE 16

	<i>Whole sample</i>		<i>Only pupils in FTE and taking A level route</i>	
	<i>Freq.</i>	<i>Per cent</i>	<i>Freq.</i>	<i>Per cent</i>
FT education	8162	76.65	—	—
<i>Of which^a</i>				
<i>Schools</i>	4020	49.34	2611	68.53
<i>Sixth form college</i>	1227	15.06	746	19.58
<i>General FE/tertiary college</i>	2409	29.57	453	11.89
<i>Other</i>	491	6.03		
Full-time paid work	736	6.91	—	—
Part college part employer	172	1.62	—	—
Apprenticeship	557	5.23	—	—
Something else	1021	9.59	—	—
Total	10648	100	3810	100

^aOut of the 8162 pupils that are recorded as being enrolled in FTE, we have information on post-16 institution only for 8147. There are 15 pupils who declared themselves to be in FTE but did not provide any information on their post-16 institution.

TABLE 2
ENROLMENT IN DIFFERENT TYPES OF INSTITUTION AT AGE 17 BY PUPILS' ACHIEVEMENT AT GCSE

	<i>Schools</i>	<i>Sixth form colleges</i>	<i>FE colleges</i>	<i>Other</i>
<i>By quintiles of GCSE score (1st quint: bottom score; 5th: top score)</i>				
1	22.26	4.58	57.85	15.31
2	29.29	10.83	49.89	9.99
3	50.85	14.76	29.34	5.04
4	61.07	16.77	18.25	3.9
5	70.16	15.7	11.04	3.1
<i>Total</i>	<i>50.16</i>	<i>13.34</i>	<i>29.88</i>	<i>6.61</i>
<i>Sample restricted to A level students</i>				
<i>By quintiles of GCSE score (1st quint: bottom score; 5th: top score)</i>				
1	62.86	20.69	16.45	
2	65.93	20.55	13.52	
3	67.98	19.62	12.4	
4	73.04	16.94	10.03	
5	71.23	19.73	9.04	
<i>Total</i>	<i>68.19</i>	<i>19.51</i>	<i>12.31</i>	

Note: Row percentages.

The type of institution the student is enrolled in at age 17 varies by prior achievement (Table 2). Seventy per cent of those in the top quintile of GCSE scores enrol in schools and only 11 per cent in FE, while 60 per cent of those in the bottom quintile of GCSE scores enrol in FE colleges and only 22 per cent enrol in schools. Pupils in school sixth forms and sixth form colleges have similar characteristics and achievement at GCSE.

As has been said, we condition on the more homogeneous group of pupils who are studying A levels (bottom panel of Table 2).⁵ For this sample we observe a much weaker relationship between choice of institution and GCSE achievement though it remains true that higher achieving pupils are less likely to enrol in FE.

Our sample size of students in FE is 453 individuals. This is too small for some subgroup analyses.

6 RESULTS

6.1 Choice of Institution

Table 3 shows the results from our choice model (equation (1) above). It is estimated using a multinomial logit and the table presents marginal effects. Table 3 shows the relationship between the covariates and the choice of attending a further education college versus a school or sixth form college, conditional on having decided to stay in FTE post-16 *and* to study for A levels. Where there are missing data on a covariate a binary indicator that the data are missing is included in the model.

The results in Table 3 clearly indicate that most pupil and family characteristics are not significant in the model, including parental socio-economic classification (though pupils eligible for FSM are less likely to choose a school sixth form). Most pupil characteristics are therefore not significant determinants of post-16 institution choice *for those taking A levels*. Prior achievement at age 16 (GCSEs) is significant however, with higher achieving pupils being more likely to enrol in a school sixth form than in an FE college (or indeed a sixth form college). Note that in models which include students not studying for A levels (not presented), both prior achievement *and* family background are highly correlated with post-16 institution choice. Students from more disadvantaged backgrounds and with lower achievement are significantly more likely to choose to enrol in FE colleges but they tend not to study for A levels when they do.

Returning to Table 3, which focuses only on A level students, pupils with a more positive attitude towards their schooling during year 9 are significantly more likely to opt for a school sixth form or sixth form college post-16. Those pupils whose parents wish them to remain in FTE post-16 are more likely to attend a sixth form college. Thus in general higher achieving more engaged students are less likely to enrol in FE colleges. Since the attitudes of the pupil and their parents are associated with choice of post-16 institution and are also likely to influence achievement, it is essential that the achievement model controls for these factors.

⁵The proportion of pupils taking A level is not homogeneous across institutions. In fact, while 87 per cent and 83 per cent of pupils in schools and in sixth form colleges respectively study for A levels, among pupils in FE colleges this percentage is only 38 per cent.

TABLE 3
 THE DETERMINANTS OF THE DECISION TO ENROL IN AN FE COLLEGE VERSUS A SCHOOL SIXTH
 FORM OR SIXTH FORM COLLEGE (CONDITIONING ON PUPILS STUDYING FOR
 A LEVELS)—MULTINOMIAL LOGIT

	(1) <i>Marginal effects Schools</i>	(2) <i>Marginal effects Sixth form college</i>
Pupil characteristics		
Female	-0.157 (0.159)	-0.187 (0.147)
FSM	-1.207*** (0.413)	-0.277 (0.327)
SEN	0.149 (0.512)	0.046 (0.376)
Other white	-1.366** (0.542)	-0.363 (0.513)
Bangladeshi	-0.086 (0.599)	-0.624 (0.497)
Caribbean	-0.812* (0.453)	-0.353 (0.429)
Chinese	-0.368 (1.369)	-0.705 (1.005)
Indian	0.108 (0.528)	0.178 (0.434)
Pakistani	1.197** (0.550)	0.735 (0.456)
African	-0.020 (0.591)	0.693 (0.508)
Mixed	-0.193 (0.354)	-0.173 (0.294)
Other	-1.124 (0.742)	-0.625 (0.663)
EAL	-0.074 (0.457)	-0.685* (0.388)
KS4 (std scores)	0.419*** (0.150)	0.025 (0.143)
5 GSCE A*-C	-0.098 (0.277)	0.073 (0.281)
SEC 2	-0.046 (0.234)	0.046 (0.221)
SEC 3	-0.359 (0.355)	-0.098 (0.339)
SEC 4	0.155 (0.337)	-0.331 (0.344)
SEC 5	-0.135 (0.349)	0.154 (0.303)
SEC 6	0.001 (0.350)	-0.053 (0.328)
SEC 7	-0.024 (0.354)	0.182 (0.360)
Not currently working	0.153 (0.428)	0.394 (0.347)
Father with degree	-0.124 (0.232)	-0.345 (0.218)
Mother with degree	-0.143 (0.220)	0.259 (0.210)

TABLE 3 (Continued)

	(1) <i>Marginal effects Schools</i>	(2) <i>Marginal effects Sixth form college</i>
School attitude (Y9)	0.055*** (0.013)	0.033*** (0.012)
No hours worked	0.006 (0.023)	-0.028 (0.022)
Parent wants pupil to stay in fulltime education	0.346 (0.300)	0.606** (0.286)
School characteristics		
School has sixth form	0.377 (0.293)	-0.087 (0.389)
% staying in FTE	0.089*** (0.007)	-0.032*** (0.009)
% achieving 5 GSCE A–C	-0.040*** (0.008)	0.016** (0.007)
% FSM	-0.017 (0.014)	0.004 (0.011)
City technology college	11.330*** (0.402)	14.208*** (0.607)
Foundation	0.285 (0.246)	0.575** (0.245)
Voluntary aided	0.425 (0.266)	0.622** (0.259)
Voluntary controlled	0.724 (0.548)	0.501 (0.483)
School size	0.000 (0.000)	0.002*** (0.000)
Pupil–teacher ratio	-0.064 (0.046)	-0.028 (0.046)
% non-white British	-0.496 (0.498)	0.631 (0.458)
Single sex	-0.306 (0.302)	0.428* (0.251)

Notes: Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Reference categories: Male; Ethnicity = White; SEC = Higher Managerial and Professional.

Legend: SEC 2 = low managerial & professional occupations; SEC 3 = intermediate occupations; SEC 4 = small employers and own account workers; SEC 5 = lower supervisory and technical occupations; SEC 6 = semi-routine occupations; SEC 7 = routine occupations. Where there is missing data in the control variables we use missing data dummy variables in order to keep the maximum sample size possible.

Some characteristics of a child's pre-16 school are highly correlated with their choice of post-16 institution. For instance, pupils are more likely to choose a school sixth form if they are (at age 15/16) in a school with a higher proportion of children staying on in FTE past age 16, i.e. a higher achieving and more advantaged school. They are more likely to choose a sixth form college if they attend a larger school or a single-sex one. Again this suggests the model of achievement must control for such factors.

These results suggest that to a large extent it is the prior achievement of the pupil and the characteristics of individuals' schools (and potentially their neighbourhoods/local authorities) that influence their choice of whether to attend an FE college to study for their A levels.

TABLE 4
THE DETERMINANTS OF TOTAL A LEVEL POINT SCORE—A VALUE-ADDED MODEL

	(1)	(2)	(3)	(4)	(5)
Sixth form colleges	0.647*** (0.076)	0.500*** (0.065)	0.503*** (0.063)	0.476*** (0.063)	0.390*** (0.058)
Schools	0.550*** (0.064)	0.339*** (0.056)	0.214*** (0.061)	0.172*** (0.061)	0.160*** (0.056)
KS4 (std scores)		1.187*** (0.058)	0.862*** (0.062)	0.855*** (0.062)	0.560*** (0.057)
KS4 squared		-0.158*** (0.026)	-0.063** (0.026)	-0.061** (0.026)	-0.018 (0.024)
% poor GCSE (less than 5 GCSE A-C)				-0.005*** (0.001)	-0.004*** (0.001)
A level subject : Physical science					0.503*** (0.032)
A level subject: Math					0.444*** (0.034)
A level subject: Computer & Engineering					0.216*** (0.050)
A level subject: Business & Economics					0.327*** (0.034)
A level subject: Social Science					0.393*** (0.027)
A level subject: Foreign Languages					0.508*** (0.048)
A level subject: English					0.499*** (0.028)
Prior achievement	-	v	v	v	v
Pupil characteristics	-	-	v	v	v
School characteristics	-	-	v	v	v
<i>LA dummies (140 in regression)</i>	v 3.01***	v 3.35***	v 2.82***	v 2.79***	v 2.63***
<i>F test of joint significance</i>					
Observations	3810	3810	3810	3810	3810
R-squared	0.113	0.345	0.414	0.417	0.522

Notes: Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The reference (omitted) category for *institution types* is *FE colleges*. Where there is missing data in the control variables we use missing data dummy variables in order to keep the maximum sample size possible.

6.2 Pupil Achievement

Here we report the results of our A level value-added achievement model (equation (2)). Table 4 estimates the determinants of a pupil's total A level point score, conditioning on: post-16 participation by the student, the student taking A levels and prior achievement at age 16 (GCSE). Only the key parameters of interest are presented. Where there are missing data on a covariate a binary indicator that the data are missing is included in the model.

In the first column we present the mean gap in achievement between FE colleges and other types of post-16 institution, with no additional controls. This is for comparison purposes since it provides an estimate of the

raw difference in pupil achievement between schools, sixth form colleges and FE colleges, when we do not allow for selection into these different types of institution. In column (2) we include measures of prior achievement, namely total age-16 (GCSE) test score and GCSE test score squared. This enables us to measure the value-added by FE colleges, compared with other types of post-16 institution. In column (3) we include all the variables from Table 3 as potential determinants of institution choice, and indeed of achievement.

Peer effects in the post-16 institution are potentially important too. Pupils in FE colleges may do better or worse because of the type of peers that they encounter in these institutions rather than the quality of the institutions themselves. In column (4) we allow for post-16 institution peer effects using peer measures derived from the LSYPE survey itself: we include the percentage of pupils with fewer than five A*-C GCSE grades and the percentage of pupils with GCSE scores below the national median. Only the former is statistically significant and hence it is presented in Table 4.

In our final specification in column (5), we include the A level subjects taken by students, to allow for differences in value-added arising from pupils taking different subjects (with differing degrees of difficulty) in different types of institutions. In particular, we include dummy variables for each set of broad A level subjects (physical sciences, mathematics, computing and engineering, business and economics, social sciences, foreign languages and English).

In column (1) of Table 4 we see that on average students in sixth form colleges and school sixth forms have considerably higher achievement at A level than those in FE colleges. The achievement advantage over students in FE colleges is 0.65 of a standard deviation for those in sixth form colleges and 0.55 of a standard deviation for those in a school sixth form. Controlling for pupil prior achievement does however reduce these differences across institutions substantially (column (2)). Students in sixth form colleges achieve 0.50 of a standard deviation more on average than FE college students, and those in schools 0.34 more, once we allow for prior achievement. Controlling for a range of pupil and school characteristics to allow for factors influencing institution choice (column (3)), does reduce the magnitude of the coefficient on the school sixth form variable (though not on sixth form college variable). This implies that students who enrol in school sixth forms do have different personal and pre-16 school characteristics that explain some of their apparently greater progress at A level. Including a measure of post-16 institution peer effects again reduces the magnitude of the differences across institution types. Lastly, in column (5) we allow for A level subjects and this has a major impact on the coefficient on the sixth form college variable, reducing the magnitude of the coefficient so that pupils in sixth form colleges achieve 0.39 of a standard deviation more than those in FE colleges, while pupils in school sixth forms achieve 0.16 more. The reduction in the magnitude of the coef-

ficients, as the model allows for pupil and school characteristics, peer effects and A level subjects, illustrates the selection bias arising if we do not control for other factors that are correlated with choice of institution.

Our results indicate that pupils in FE colleges do achieve less at A level. The magnitudes of the coefficients are such that those in sixth form colleges have an advantage over FE college students which equates to 101 QCA points, on the basis that one standard deviation of the dependent variable equates to 259 points. Those in school sixth forms have an advantage of 41 QCA points.

Our model controls for a wide range of pupil and school factors. However, we have already acknowledged that it is still possible that pupils sort into post-16 institutions on the basis of *unobservable* factors. This source of bias cannot be eliminated with our methodological approach.

We also investigated various interactions to determine whether the observed lower achievement of pupils in FE colleges varies by type of student. Table 5 reports the achievement advantage of pupils in school sixth forms and sixth form colleges over those in FE colleges by gender (columns 1 and 2), parental education level (columns 3 and 4) and level of prior GCCSE achievement (columns 5 and 6). Although it would have been of interest, we were unable to estimate the model separately for students taking different A level subjects due to sample size limitations.

The results from Table 5 indicate that the achievement advantage observed in Table 4 for those in sixth form colleges is of a similar order of magnitude for both females and males. As sample sizes get smaller however, the standard errors get larger and while the coefficients suggest that males may do relatively better than females in school sixth forms, these gender differences are not statistically significant. Further, the coefficient on the school sixth form variable, though similar in magnitude to that in the final specification in Table 4, becomes statistically insignificantly different from zero when the sample is split by gender.

Table 5 does suggest, however, that sixth form colleges only add more value for more disadvantaged pupils. Pupils whose parents do not have a degree do 0.43 of a standard deviation better in a sixth form college as compared with those in an FE college. Equally pupils whose parents are not graduates also do better in school sixth forms as compared with those in an FE college (by 0.19 of a standard deviation). This might imply that institution choice is more critical for more disadvantaged pupils who on average will have less parental support for their education.

The final columns of Table 5 indicate that the achievement premium is greater in both sixth form colleges and school sixth forms for pupils who have higher ability (measured by whether their age 11 Key Stage 2 test scores were above the median for the sample). Note however that Table 5 does suggest that lower ability pupils in sixth form colleges also do better than similar pupils in FE colleges.

TABLE 5
THE DETERMINANTS OF TOTAL A LEVEL POINT SCORE—HETEROGENEOUS IMPACTS

	<i>By gender</i>		<i>By family background</i>		<i>By previous ability</i>	
	<i>Females</i> (1)	<i>Males</i> (2)	<i>At least one parent with a degree</i> (3)	<i>No parent with a degree</i> (4)	<i>Above the median of (age 11) KS2 scores</i> (5)	<i>Below the median of (age 11) KS2 scores</i> (6)
Sixth form colleges	0.377*** (0.076)	0.390*** (0.097)	0.136 (0.123)	0.433*** (0.068)	0.484*** (0.091)	0.265*** (0.080)
Schools	0.099 (0.071)	0.242** (0.100)	-0.024 (0.121)	0.188*** (0.066)	0.241*** (0.090)	0.080 (0.076)
Observations	2107	1671	1116	2662	1828	1842
R-squared	0.513	0.588	0.584	0.494	0.484	0.456

Notes: Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The reference (omitted) category for *institution types* is *FE colleges*. Where there is missing data in the control variables we use missing data dummy variables in order to keep the maximum sample size possible.

7 DISCUSSION AND CONCLUSIONS

Our analysis of the value-added at A level by different post-16 institution types suggests that those who attend an FE college do less well at A level as compared with those in school sixth forms. Pupils in sixth form colleges do better at A level than those in both school sixth forms and FE colleges. This result holds even allowing for pupils' prior achievement, attitudes, school characteristics and local authority fixed effects. Similar pupils taking A levels in FE colleges achieve approximately 41 fewer QCA points at A level as compared with pupils doing A levels in school sixth forms, while pupils in sixth form colleges achieve around 101 more points. These differences in A level achievement across post-16 institution type are modest in magnitude, given that an E grade in one A level is worth 150 QCA points, but nonetheless represent around 1–3 A level grades which is of course not inconsequential.

Our work has several caveats. First, there is attrition in LSYPE and lower achieving students are more likely to vanish from the sample. This problem is less relevant to our higher achieving sample who obtained A levels but nonetheless it is possible there is some bias from attrition of low achieving students. Further, despite the richness of our models, our results may still reflect the fact that those who attend FE colleges are more educationally disadvantaged in ways that we are unable to account for in our model.

Our model suggests that FE colleges add less value than schools and sixth forms at A level, which begs the crucial question, *why?* A number of possible reasons present themselves.

First, FE colleges are resourced at a lower level. The Learning and Skills Development Agency found that in 2003/4 funding in school sixth forms was on average around 13 per cent higher than in FE colleges and sixth form colleges. The gap has reduced somewhat since that time: it stood at 9 per cent in 2008 (KPMG LLP, 2008). However, there remains a significant differential in per capita funding levels across different post-16 institutions. Recent data from the Association of Colleges suggest that the average funding per student in FE colleges for 16- to 18-year-olds (including non-A level students) was approximately £4631 in 2010 as compared with £5650 for school sixth forms (Association of Colleges, 2010). Given these differences in the level of resourcing in FE as compared with schools, one might have expected the former to add less value.

Second, FE teachers are paid less than school teachers, are less qualified and may arguably be of lower quality as a result (Walker *et al.*, 2010). There is robust evidence that teacher quality is an important determinant of pupil achievement and hence any gap in teacher quality may well be part of the explanation for differences in value-added in FE colleges as compared with schools (Hanushek and Rivkin, 2006).

Third, we may be measuring a peer effect that is not controlled for by the peer measures included in our model. Certainly inclusion of the peer

measures that we do have in the model led to a significant reduction in the magnitude of the achievement advantage of school sixth forms and sixth form colleges. Perhaps inclusion of better peer measures might further reduce the apparent advantage of these institution types over FE colleges. Of course we do need to acknowledge that parents may not be concerned whether the lower value-added by FE colleges is attributable to teacher quality or peer effects. However, from an accountability perspective this distinction is crucially important and our work cannot, unfortunately, shed much light on which explanation is most likely.

It is also important to acknowledge that FE colleges have a far wider remit and range of activities as compared with a school sixth form or sixth form college. For a start, FE colleges cater for a wider range of students and A level students are only a minority of the students in FE. A wider assessment of the role of FE colleges is needed, particularly as we expect that the imminent increase in the education and training participation age to 18 in England is likely to result in more young people enrolling in FE. It is crucial that we recognize that FE colleges have a harder job to do, working with harder-to-reach students with a lower level of resources, and we need to monitor carefully the value-added by FE colleges in A level and non-A level courses alike.

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