School, Neighbourhood, and University: The Geographies of Educational Performance and Progression in England

David Manley · Ron Johnston

Abstract There has been a vast amount of discussion in both the media and academic literature about the effect of increased tuition fees on access to higher education in England, especially in relation to efforts to implement widening participation programmes. During this debate, the geography of access to higher education has taken a back seat despite growing calls to use contextual data in higher education applications to account for at least some of the presumed spatial disadvantage that is experienced by individuals from less affluent backgrounds. Within this context we use recently released educational performance school data to investigate the composition of higher education access, paying specific attention to the geographical location of the schools from which university applications come and controlling for different school types, school catchment composition and the education environment of the students. The data are analysed within a multilevel modelling framework; the differences between regions in England and between schools according to the class composition of their catchment areas form the main findings. These not only resonate with conventional wisdom on university access but also offer a new perspective on patterns of, in effect, educational relative advantage and disadvantage that are clearly embedded within the country's geography.

Keywords *School performance · University access · Multilevel modelling · Neighbourhood · Region*

> … there is much more to do to make use of contextual data universal, ensuring that admissions processes are informed by the growing evidence base that students from less advantaged backgrounds tend to outperform other students with similar A-level grades on their degrees.
>
> (Social Mobility & Child Poverty Commission 2013, 15).

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There has been a substantial debate in the United Kingdom over the last two decades, and especially in England, regarding university entrance criteria. The majority of students are made offers of places on degree programmes on the basis of their expected performance in the A-Level examinations, sat in most cases after 13 years of education; acceptances are then based on achieved performance relative to the offer. In general, the better the students' performance the greater their prospects of gaining admission to the so-called 'elite universities' with the highest entry criteria. While that performance is taken as a good indicator of potential for success in a degree pro-gramme, it has been argued that some students are advantaged over others in their preparation for those examinations and thus the likelihood that they will fully realise their potential; those who are disadvantaged are less likely to gain a place at an 'elite university' and reap the cultural and economic rewards of studying for a degree there.

These arguments have been instrumental, along with issues of raising awareness and ensuring the retention of students from disadvantaged backgrounds, in the development of 'widening participation' (WP) programmes, now in operation at virtually every university in the country and a virtual requirement if they wish to charge fees above the 'normal' maximum of £6,000 per annum. (There is a substantial literature on the nature and impact of the WP programmes over the last two decades: for a review, see Gorard et al., 2006, and, more generally, Macdonald and Stratta, 2001, and Croxford and Raffe, 2013.) Universities can charge up to £9,000 if they can convince the Office for Fair Access (OFFA) that they have provisions for encouraging applications from students from disadvantaged backgrounds, for taking students' personal and other characteristics that suggest educational disadvantage into account when making offers of places, and for providing financial and other support for students from such backgrounds (on which see OFFA's most recent annual report: OFFA/HEFCE, 2013). A range of sources of disadvantage has been suggested: some relate to the individuals' own circumstances (such as disability); some relate to their family and cultural backgrounds (such as their ethnicity and their household's social class: Anders, 2012– and whilst clearly very important we use aggregate data below and thus do not provide an extensive literature overview of that aspect here); some to their local context (such as the neighbourhoods where they live); and others to the characteristics of the school that they attend (see for instance: Archer et al., 2003; Chowdry et al., 2010). Analyses have suggested that all of these factors may be relevant as influences on how well a student performs at both A-level and on a university degree programme: analysis of perfor-mance at one of the 'elite universities' shows that students whose backgrounds include one or more of these characteristics perform better in their degree courses than their contemporaries from more advantaged backgrounds who obtained similar grades at A-level (Hoare and Johnston, 2011).[1] More generally, Harrison (2013) demonstrates that it is possible to account for around 80 % of the variation in university applications through simple linear regression modelling using a small range of socio-economic data from the Annual Population Survey, key educational statistics (such as free school meals, GCSE passes and ethnicity) and deprivation to predict the Local Authority application to university rate.

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[1] This finding has been sustained by internal research reports on other universities that have been obtained by a journalist under Freedom of Information legislation: see http://www.guardian.co.uk/education/ 2013/jun/16/ accesstouniversity-private-schools (accessed 17 June 2013)

Despite all of the debate over the desirability of–if not need for–widening participation programmes, there is a relative paucity of strong evidence to sustain some of the claims, and the policies on which they are now being based. With regard to a university applicant's school background, for example, it is generally argued that some schools are better able to prepare their students both for the A-level examinations (and so get better grades accordingly) and in writing their university application forms, because they are better resourced (both financially and in the quality of their teaching staff). This argument is often polarised as between schools in the independent and state sectors (see Mangan et al., 2013). Many of the former are among the better-resourced and, as a result, get better average A-level results for their students. Their proponents argue that A-level performance should be the predominant (if not the sole) determinant of entry to a university (see for instance Coleman and Bekhradnia, 2011), whereas their opponents claim that there should be some positive discrimination favouring students from less well-resourced schools, who perform less well in the examinations but potentially could benefit just as much (if not more) from a degree programme at an 'elite university' as their contemporaries who studied at independent schools (see for instance Department for Education and Employment 2000; Chowdry et al., 2010). Indeed, there is also substantial evidence that students from state schools outperform their independently schooled counterparts in degree attainments once at university (Smith and Naylor 2001, 2005).

Beyond that continuing debate, there are also concerns that within the state sector there are substantial variations in the ability of schools to prepare students for university entrance. There are 164 selective secondary schools in England (approximately 5% of the total), entry to which is based on an assessment of their academic potential after six years of primary education (the 11+ examination). Because these institutions are dominated by students with high academic potential, it is argued, the intellectual and other resources available there improve the chances of all who attend them. Most state secondary (high) schools in England are not academically selective, however, but they vary considerably in the backgrounds of the pupils they admit, reflecting in most cases the nature of their local catchment areas. Schools that draw their students from areas where social disadvantage is common (reflecting their residents' social class and other characteristics) will have very different social milieux from those serving more advantaged areas (Singleton, 2010a). In the former, there may be less family support for students in their educational activities and lower aspirations: the schools' culture may not be oriented towards preparing students for university entrance, there may be few positive role models from within the school, and many students with the potential to benefit from a degree programme may not have that sufficiently identified or encouraged (see Butler et al., 2007).[2] Many students may leave some schools at the minimum age (16), two years before A-level examinations are normally taken: with only a small (sixth-form) cohort, a school may not be able to provide the specialist teaching necessary to develop their students' potential–and hence their ability to compete for places at 'elite universities' (Brooks, 2002; Boliver, 2013). And not all schools offer a sixth-form education leading to A-levels, in part because of this size factor. Some local authorities cluster those aged 16 and over into a small number of Sixth Form Colleges, and many direct students into either Tertiary or Further Education Colleges where those studying for A-levels may be in a minority only, working

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[2] This argument is promoted in the report of the Social Mobility & Child Poverty Commission (2013).

alongside students on a wide range of programmes aimed at other qualifications and career opportunities (Boliver and Swift, 2011).

In part, therefore, we argue that educational disadvantage reflects the country's social geography: because most schools and other institutions providing post-16 education in the state sector draw mainly on their local populations some are better able than others, either through prior knowledge of the University system or other educational capital advantages, to prepare their students for A-level success and admission to an 'elite university'. Furthermore, that micro-geography is set within a wider spatial matrix. A recent report focusing on the university destinations of Welsh students (Murphy, 2013) not only suggested that they were less likely to get offers from two major 'elite universities' (Oxford and Cambridge) than their English counterparts, but also that there were considerable regional variations across England in the number of Oxbridge offers made; in general, students from south-east England were more likely to get an Oxbridge offer than those living in the industrial cities of northern England. A similar argument was advanced by the *Guardian* (2013) newspaper using data demonstrating that the vast majority of places at Oxbridge were taken by students from the South East of England, implying that those universities discriminate against applicants from other regions.[3] This regional variation may simply reflect variations in A-level performance at the school level, but it may well be that in some regions there is a greater propensity to direct students towards Oxbridge (and other 'elite universities') than elsewhere, independent of such attainment.

Evaluating these arguments has not been straightforward because of the absence of data that allow a rigorous evaluation of hypotheses. One of the areas that has been under-studied–despite many claims that school performance needs to be contextualized by examining the socio-economic characteristics of their catchment areas–is the geography of progression to higher education within the state sector. A number of studies have deployed census data in a variety of ways to achieve such characterisation (e.g. Fotheringham et al., 2001; Pearce, 2000; Gibson and Asthana, 1998, 2000; Higgs et al., 1997; Herbert and Thomas, 1998) but almost all have only examined students' performance during the compulsory school years and few–a major exception is Singleton (2010a, 2010b)–have looked at A-level outcomes and progression to higher education. These invariably show that the nature of a school's (imputed) catchment area is closely related to its students' attainments. What is unclear and where we add substantially to the discussion is through an investigation to determine if Singleton's finding applies to the later years of education as well.[4] In this paper, we deploy two recently-released Government datasets relating to English schools to explore–within the constraints of what has been provided–some of the arguments regarding inter-school differences and, by combining those data with material derived from the 2011 Census of Population, in particular the nature of their catchment areas and, hence, their probable social mix. Our analyses in part replicate previous studies–notably with respect to school type–with regard to student A-level performance and entry into higher education but these form the necessary baseline for the original components of the work

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[3] See the response to this by the University of Oxford's Director of Admissions: http://www.guardian.co.uk/education/2013/jun/16/accesstouniversity-private-schools (accessed 17 June 2013)

[4] Another geographical study has shown that the distance potential students live from universities does not influence whether they apply for degree places but does influence which institutions they apply to (Gibbons and Vignoles, 2012).

reported here, that focuses on geographical variations at two spatial scales (each school's immediate neighbourhood and its regional setting) in student performance and progression.

The data

The Department for Education has recently released two valuable datasets for this task: one gives details for all relevant state schools and colleges regarding their students' performance at A-level in 2012 (there are no comparable data for independent–'public'–schools); the other provides information on how many of those students were admitted to degree programmes in 2012, and at which types of Higher Education institution. The former dataset also gives details about the individual schools' and colleges' characteristics.[5]

A-levels (General Certificate of Education Advanced Level) are studied over a two-year period by full-time students and in two parts, one in each year respectively. The first part is known as an AS-Level and can be an exit qualification. However, it is more commonly combined with a second part, the A2–Level, to form an A-Level qualification. There are over 60 subjects available for A-Level study ranging from traditional ones such as English Language and English Literature to Media Studies or Sports Science. Performance has traditionally been graded from A to E with A being the highest grade achievable, though an A* grade has recently been added: for certain purposes grades are aggregated using a standard points allocation, and this is deployed in some of the analyses here. After exploration of the data, and a number of preliminary analyses, we have selected three variables to represent student's A-level performance at the school level:

- The average point score per student per A-level examination taken;
- The proportion of students who obtained three or more passes at grades A-E; and
- The proportion of students who obtained three passes at grades AAB or better.

The first of these is a general measure of a school's average student 'quality'; the second is a measure of the number who would be eligible for admission to a degree programme at any higher education institution; and the third is an indicator of the number who have the minimum qualification for many degree programmes at most of the 'elite universities'.

In addition, we included a fourth variable:

- The number of students in a school taking A-level examinations that year.

The larger that group, the greater the likelihood that the school/college could provide specialist teaching resources and other materials necessary for many A-level courses.

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[5] The datasets were accessed at http://www.education.gov.uk/schools/performance/metadata.html and https://www.gov.uk/government/publications/destinations-of-key-stage-4-and-key-stage-5-pupils-academic-year-2009-to-2010.

(We excluded all institutions with less than 20 students in this group, on the grounds that proportional data are less reliable with such small numbers, and are more likely to vary substantially from year to year.)[6]

The dataset also contains a number of school characteristic indicators which have been deployed in the analyses:

- Type of institution[7] (Selective School; Modern School; Comprehensive School; Sixth Form College; Further Education College; Tertiary College
- Denomination (No religious affiliation; Church of England; Roman Catholic; Christian)
- Gender (Mixed; Boys only; Girls only)

A number of categories were excluded from the above list. Most comprised only few institutions (such as the small numbers of Jewish, Muslim and Sikh schools and a number of other specialist institutions–such as agricultural colleges). Some were excluded because preliminary analyses indicated no significant relationships with the performance and university admission indicators (such as whether those schools with religious foundations were voluntary controlled or voluntary aided); and some overlapped with other categories (such as academies with modern and comprehensive schools) and preliminary analyses produced no significant findings if they were deployed.

School catchments are no longer clearly defined in many parts of England and as a result determining the social composition of a school is not a straight-forward task especially when attempting to isolate one part of the schooling process. We prefer the neighbourhood from which individuals are likely to be drawn as much education policy related to university access, and widening participation in particular, is focused on neighbourhood characteristics. For instance, the Participation of Local Areas (POLAR and POLAR2, POLAR3 updates) classification produced by HEFCE is used to identify areas of low participation in higher education for the targeting of preferential admissions and resources for widening participation (see HEFCE, 2005). It is sensible, then, that we adopt a similar spatial frame as policy makers so that our analysis can demonstrate the utility (or otherwise) of the neighbourhood as a means to address inequalities in higher education. The postcode for each institution was provided in the database, and with this we were able to place it–using look-up tables produced by the Office of National Statistics–in one of the Middle Level Super Output Areas (MSOAs) designed for the 2011 census. These MSOAs have an average population of 7,362. We acknowledge that the MSOAs are far from being precise representations of an institution's catchment area–and indeed many undoubtedly draw students from much wider areas. Nevertheless a substantial proportion of an institution's students are very likely to

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[6] It is possible to obtain further indicators of the school's nature from other data sets–such as the proportion of its students who qualify for free school meals (frequently used as a measure of socio–economic disadvantage), the proportion for whom English is not the first language, and the proportion registered with special educational needs. However, for schools these apply to the whole school and not just the sixth form–the component (often relatively small) involved in study for A-levels–and they are not relevant for other types of institutions included here where students take A-level courses. Similarly, data on the school staff are available but the same constraints apply; we use the number of students taking A-levels as a surrogate measure of the number of teaching staff associated with A-level teaching.

[7] Modern schools are those that admit students who have not gained access to selective schools in areas where that option is available, and thus have on average lower ability students; comprehensive schools–like sixth form colleges–admit students of all abilities.

be drawn from its immediate neighbourhood, so that area's characteristics provide a reasonable, and the best available, approximation of the types of household from which its students are drawn. Importantly, the breadth of data from the census means that it is possible to capture many social and economic dimensions of the local population which are not available from other school-based data sources.

Eighteen variables representing aspects of an area's socio-economic and demographic characteristics widely used in analyses of neighbourhood milieux were selected for analysis, for all of England's MSOAs, and a principal components factor analysis undertaken to identify the main dimensions of differentiation. Three substantial components were extracted and subjected to a direct oblimin rotation. The resulting factor loadings are shown in Table 1. Each, by a series of loadings exceeding 0.70, provides a clear dimension of local areal differentiation. The first distinguishes, by its positive loadings, areas with large Black and/or Asian, non-UK born and relatively young populations, living in high density (urban) areas. The second categorises areas according to the social class of their occupants: areas at the positive pole of the continuum have relatively large percentages of their working populations in routine occupations, as well as relatively large unemployed populations, and households living in socially-rented homes: at the other extreme are areas with relatively large numbers of people with degrees or similar qualifications. Finally, the third factor also identifies–at its positive pole–high density (undoubtedly urban) areas with singe-person households living in privately-rented accommodation–relatively large percentages of which are flats. These areas also have large student populations but, unlike those picked out by the first factor, few Black or Asian residents. For each of the schools in the database, we derived the factor score for its local MSOA on each of those three dimensions, and used these to categorise their catchment areas.

The data source also locates schools in regions, using a breakdown into 25 areas of England's nine standard regions used for much statistical reporting: they are listed, with the names used by the Department for Education, in the Appendix to this paper. If, as the recent Welsh analysis suggests, there are variations across the country in the take-up of places at different types of tertiary-level institution, incorporating this 25-region classification into the analysis should allow an assessment of any additional differences across regions above and beyond the differences by schools (as indicated by the typologies introduced above) and their immediate catchment areas (indicated by the three sets of factor scores).

The destinations data provide a relatively coarse classification of the institutions attended. Data are available only for:

- The percentage of students who proceed to any higher education (HE) provider;
- The percentage of those students going on to HE who attend either Cambridge or Oxford Universities;
- The percentage of those students going on to HE who attend another 'Russell group' University;[8]

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[8] The Russell Group universities then were, in addition to Cambridge and Oxford, Birmingham, Bristol, Cardiff, Edinburgh, Glasgow, Imperial College London, King's College London, Leeds, Liverpool, London School of Economics, Manchester, Newcastle, Nottingham, Queen's Belfast, Sheffield, Southampton, University College London, Warwick.

Table 1 Factor loadings from the analysis of neighbourhood characteristics using 2011 census data for Middle Level Super Output Areas (coefficients of 0.70 or greater are shown in bold)

Factor

Variable	I	II	III
% of residents who are UK-born	**−0.89**	0.07	−0.64
% of residents who are Black	**0.81**	0.16	0.45
% of residents who are Asian	**0.73**	0.05	0.30
% of the population aged 65+	**−0.72**	−0.31	−0.57
Population density	**0.72**	0.12	0.70
% of the population aged 0-4	0.68	0.59	0.15
% of workforce in semi- and routine occupations	−0.17	**0.91**	−0.18
% of households that are lone parent families	0.49	**0.84**	0.17
% of adults who are unemployed	0.49	**0.83**	0.35
% of adults with degree qualifications	0.19	**−0.82**	0.28
% of homes that are socially rented	0.42	**0.70**	0.35
% of dwellings that are terraced	0.22	0.60	0.18
% of dwellings that are flats	0.58	−0.04	**0.88**
% of homes that are privately rented	0.43	−0.08	**0.87**
% of households that are single-person, non-pensioner	0.25	0.20	**0.85**
% households 2 or more cars	−0.53	−0.58	**−0.74**
% of those aged 16+ who are students	0.30	−0.12	0.64
% of workforce employed in manufacturing	−0.48	0.47	−0.40

- The percentage of those students going on to HE who attend another University;
- The percentage of those students going on to HE who study at a non-HE institution which nevertheless offers degree-level qualifications.

Because the number attending Cambridge or Oxford is relatively small, we have combined these with the next category, to give:

- The percentage of those students going on to HE who attend a Russell Group University.

This group–comprising at the time 20 separate institutions–is the best approximation available to an 'elite university', one with high qualifications entry criteria for almost all of their degree programmes.

We have data for 1,473 individual schools and colleges with more than 20 students taking A-levels. These are nested within the 25 regions, and so our analyses were undertaken as ordinary least squares regressions using multi-level models. In all of the results presented below for each analysis we present the results of two models. The null models include the random effects only–i.e. the differences between schools and regions. The full models also incorporate all of the school indicators–those regarding school type are categorical variables so in

each case there is a comparator type against which the impact of the others is assessed; those regarding catchment characteristics are continuous variables (standardised factor scores) with means of 0.0 and standard deviations of 1.0.

Geography educational performance and university entrance

This section evaluating the results of the analyses is in two parts. In the first, we explore whether there are variations across institutional types and places in their students' performance at A-level. The second, using the same independent variables plus those relating to student performance, assesses whether there are variations–particularly between places–in students' access to higher education and different types of higher education institution.

Student performance

Three multi-level regression analyses are reported in Table 2. For each, the first block reports the results of fitting null models which incorporate the random effects only–i.e. the variations across schools and regions; the second block also includes the fixed effects–the school and catchment characteristics. In this–and the other results in later tables–coefficients significant at the 0.05 level or better are in bold; those significant at between 0.05 and 0.10 are in italics.

For all three indicators of school performance–students' average A-level point score; the proportion of students getting three or more A-level passes at A-E; and the proportion getting at least three passes at AAB or better–the null model coefficients show (not surprisingly) highly significant variations across schools. With regard to regional variations, however, there is only one significant coefficient at the 0.05 level or better (and that only marginally so)–for average points score. The implication is that there is little evidence of macro-scale geographical variation in school-level performance at A-level.

This conclusion is repeated in the full-model results; again the only significant variation across regions is in average points score. The residual regional coefficients demonstrate that even in this case most regions do not differ from the others. Only one coefficient–for the North East B (Tyne and Wear and Northumberland) region–stands out as very different from the remainder where, it appears, students perform on average better than expected relative to their contemporaries elsewhere when the impact of all of the fixed effect variations is taken into account. The largest (insignificant) residuals also come from the North East of England and suggest a particular regional effect.

The regional coefficients of the other two analyses indicate homogeneity across virtually the entire country. In that for the proportion getting three or more passes at A-E only one region stands out as slightly different from the other 24: this is for the South East D region (Kent and East Sussex) where it seems that–taking all other variables into account–students there perform somewhat less well than their contemporaries elsewhere. The same region stands out again for the analysis of the proportion getting three passes at AAB; it differs substantially from the rest of the country–as to a lesser extent does one other region (Central London).

Table 2 Results of the multi-level model analyses of school performance (significant coefficients at the 0.05 level or better are shown in bold)

	Average		Proportion with		Proportion with	
Dependent variable	Point Score		Grades A-E		Grades AAB≤	
Null model						
Random Effects						
Constant	202.709	0.731	0.821	0.005	0.063	0.003
Region	**7.532**	**3.723**	0.000	0.000	0.000	0.000
School	**312.145**	**11.610**	**0.022**	**0.001**	**0.006**	**0.000**
−2*loglikelihood	−12635.976		−1409.433		−3253.958	
Full Model						
Random Effects						
Constant	192.28	3.57	0.562	0.029	−0.029	0.020
Region	**6.76**	**3.02**	0.000	0.000	0.000	0.000
School	**212.87**	**7.92**	**0.014**	**0.001**	**0.006**	**0.000**
Fixed Effects						
Number of students	**0.024**	**0.003**	0.000	0.000	0.000	0.000
School type (comparator: Tertiary College)						
Comprehensive	**3.152**	3.396	**0.233**	**0.027**	**0.095**	**0.019**
Selective	**30.765**	**3.622**	**0.378**	**0.029**	**0.339**	**0.020**
Modern	−5.873	4.039	**0.130**	**0.033**	**0.055**	**0.022**
Further Education College	**8.078**	**3.114**	−0.023	0.025	−0.008	0.017
Sixth-Form College	−1.348	3.240	**0.145**	**0.026**	**0.035**	**0.017**
Denomination (comparator: none)						
Church of England	1.337	1.805	0.015	0015	**0.021**	**0.010**
Roman Catholic	**2.808**	**1.307**	**0.046**	**0.011**	0.007	0.007
Christian	**8.683**	**3.187**	0.027	0.026	**0.064**	**0.017**
Gender (comparator: mixed)						
Boys	−1.021	2.186	−0.008	0.018	0.022	0.012
Girls	**6.793**	**1.762**	0.023	0.014	0.013	0.009
Catchment Characteristics						
Ethnicity	0.428	0.527	−0.007	0.004	0.008	0.003
Social Class	**−4.305**	**0.474**	**−0.024**	**0.004**	**−0.025**	**0.003**
Inner City	−0.067	0.468	**−0.008**	**0.004**	0.001	0.003
−2*loglikelihood	−12077.351		−2086.966		−3192.552	

Turning to the fixed effect variables, the coefficients for the number of students suggest that average performance is better at bigger schools, but this is not also reflected in the pass rates.[9] Among school types, not surprisingly selective schools perform very much better than tertiary colleges (the comparator) on all three variables. Modern and comprehensive schools and sixth form colleges also perform better on the

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[9] This difference probably reflects variations in the number of subjects for which students are entered.

two pass rate variables but not on the average point score: in general, selective schools perform significantly better than comprehensive and modern schools, which in turn perform better than sixth form colleges.[10] Roman Catholic schools and those categorised as Christian (i.e. which do not favour one Christian sect over others) perform a little better than those that are non-denominational (holding type constant) and there is slight evidence that students in girls' schools perform better on average than those with mixed populations.

The final set of variables relates to catchment characteristics and indicates some very clear patterns in the geography of educational performance, irrespective of school type. In particular, the three coefficients for the second, social class, factor are all highly significant (ratios between the coefficient and its standard error of 9.1, 6.0 and 8.3 respectively). All three coefficients are negative, indicating that–given that the pattern of factor loadings means that the most working class areas have the highest positive scores (Table 1)–the more middle class the immediate area around the school the better its students' A-level performances. Two other significant coefficients in that block show that students in schools serving areas with relatively high percentages of their populations drawn from those claiming Asian or Black ethnicity tend to get more passes at AAB or better, while those in inner city, predominantly white areas (factor 3) are more likely to get three or more passes at A-E, ceteris paribus.

Most of these findings are unremarkable, and fit general appreciations of the pattern of educational performance across English schools and other institutions providing A-level education. The clear additional result, which is very important for the debates over widening participation and educational disadvantage, concerns the geography of that performance. Once the impact of different school type has been taken into account, schools serving more middle-class neighbourhoods tend to get better A-level performances than those serving more disadvantaged areas: educational disadvantage at the individual level (reflected in where you live) is exacerbated by attending local schools in relatively disadvantaged areas.

Entry to higher education

Is that geographical variation also reflected in whether students enter higher education and, if so, what type of institution they gain admission to?.

The first set of regression results in Table 3 shows that in the null model there were highly significant differences by both school and region in the percentage of students proceeding to a higher education qualification; these remained in the full model after the random effects had been included. The two graphs in Fig. 1 illustrate this for regional variations. (In all of the graphs shown here, the triangle indicates the coefficient for the region and the bars its standard error.) The top graph shows a significant range, above and below the (weighted) national average in those percentages across the

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[10] The regression coefficients only show whether there is a significant difference between each type separately and the comparator. The conventional test for whether two coefficients are significantly different from each other is whether their error bands overlap, using 2SEs as the criterion. Thus for the proportion with three or more A-E passes, the coefficient for selective schools is 0.378 +/−0.058 (i.e. 0.320–0.436) whereas that for modern schools is 0.130 +/−0.066 (0.064–0.196); the values clearly do not overlap. With coefficients of 0.130 +/−0.066 and 0.145 +/− 0.052, however, there is substantial overlap between modern schools and sixth-form colleges and so no significant difference between the two.

Table 3 Results of two multi-level model analyses of higher education admissions by school (significant coefficients at the 0.05 level or better are shown in bold)

Per Cent Entering

Dependent Variable	Higher Education		Russell Group University	
Null model				
Random Effects				
Constant	**54.494**	**1.108**	**14.710**	**0.657**
Region	**26.908**	**8.673**	**6.061**	**3.023**
School	**190.505**	**7.080**	**201.954**	**7.515**
−2*loglikelihood	11967.109		11993.126	
Full Model				
Random Effects				
Constant	1.475	4.421	**−61.598**	**3.918**
Region	**22.262**	**6.880**	**14.545**	**4.491**
School	**101.729**	**3.798**	**60.548**	**2.317**
Fixed Effects				
Number of students	**0.011**	**0.002**	**0.006**	**0.002**
Average Points Score	**0.072**	**0.019**	**0.301**	**0.017**
Proportion with three A-E	**23.523**	**2.369**		
Proportion with three AAB			**54.880**	**3.115**
School type (comparator: Tertiary College)				
Comprehensive	**18.882**	**2.422**	**9.496**	**1.942**
Selective	**29.027**	**2.694**	**12.639**	**2.249**
Modern	**14.121**	**2.853**	**6.972**	**2.306**
Further Education College	0.100	2.168	−0.698	1.752
Sixth-Form College	**10.606**	**2.279**	**7.082**	**1.768**
Denomination (comparator: none)				
Church of England	1.018	1.269	0.291	0.982
Roman Catholic	**2.882**	**0.924**	**2.074**	**0.712**
Christian	−0.624	2.217	**10.41**	**1.717**
Gender (comparator: mixed)				
Boys	0.973	1.517	1.966	1.188
Girls	**3.089**	**1.228**	−0.252	0.949
Catchment Characteristics				
Ethnicity	**2.328**	**0.431**	−0.141	0.342
Social Class	*−0.673*	*0.354*	**−1.963**	**0.290**
Inner City	−0.320	0.332	0.192	0.269
−2*loglikelihood	10955.624		9713.073	

25 regions in the null model when the fixed effects have not been incorporated, with five of them falling clearly below the national average. (They are, from left to right, South and West Yorkshire, London West, West Midlands C, North West C and East Midlands A; although five other regions have coefficients whose standard error bars are
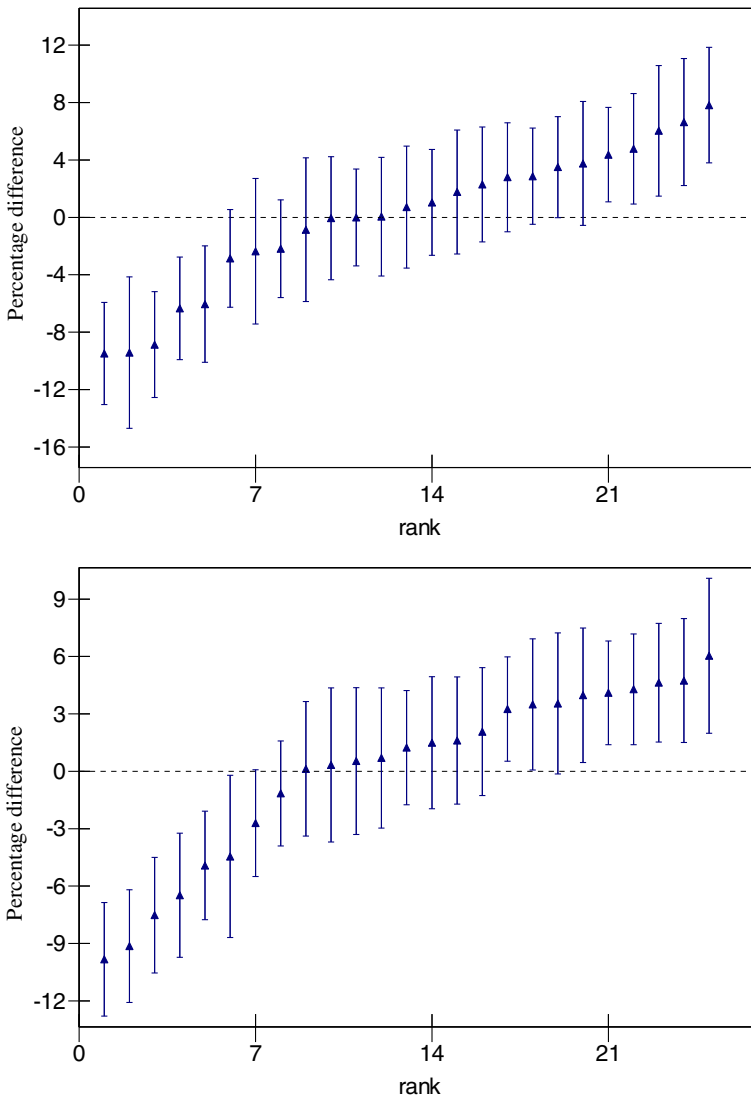
Fig. 1 Regional residuals from (*top*) the null model and (*bottom*) the full model predicting each school's percentage of students proceeding to higher education

above the national average, nevertheless these all overlap considerably with those to their left in the rank ordering, so there is no clear evidence of regions where significantly above average percentages were entering higher education.) Once the fixed effect variables are introduced, the regions that stand apart (according to the average residual value for schools in each) differ from those shown in the first graph. Six regions on the left-hand side of the lower graph have significantly fewer students proceeding into higher education than would be expected given their schools' A-level performance. In order they are South West B, South West A, South East D, South East C, South East A and South East B. This is a clear–and somewhat unexpected–

conclusion that, holding all of the other variables included in the model constant, schools located in all of the regions along England's south coast are less likely to have their students proceed to a higher education qualification than those in London and the country's midlands and north. Is this because students living in the more prosperous southeastern regions are more likely to have alternative, reasonably-rewarded careers available to them than their contemporaries in the northern regions, and so are less likely–at the margin–to decide to embark on a degree course?.

The coefficients for the type of institution in that regression are very largely as expected: selective, comprehensive, and modern schools and sixth form colleges, in that order, are more likely to have their students proceed into higher education (holding constant their students' average performance at A-levels and the proportions getting three or more A-E passes) than are those attending either Tertiary or Further Education Colleges.[11] Turning to the catchment area characteristics, the highly significant positive coefficient indicates that–ceteris paribus–schools located in areas with relatively large ethnic minority populations are more likely to send students into higher education, and there is a less significant, but nevertheless substantial, difference in higher education participation rates according to the class composition of a school's immediate neighbourhood. Schools in working class locations–whatever their nature and their students' A-level performances–are somewhat less likely to see their students enter onto a degree course than comparable schools in more middle class areas, although this is tempered somewhat in areas with large ethnic minority populations (sustaining other findings that the worst average performance levels involve white students from relatively disadvantaged backgrounds).

Turning to where the students go, the second set of results in Table 3 looks at the percentages attending Russell Group universities.[12] Most of the significant relationships are as anticipated: students from large sixth forms and with high proportions getting AABs were most likely to go to an elite, Russell Group university, especially if they attended a selective school. Schools with a Roman Catholic or Christian foundation were also more likely to have their students attend such an institution than either those that are non-denominational or those associated with the Church of England. And geography again mattered: the more middle class a school's immediate catchment area the more likely it was that their students would proceed to an 'elite university'.

There was also a regional variation, in both the null and the full model. For the latter, Fig. 2 shows the rank order of regional coefficients from the full model–i.e. after the fixed effects have been incorporated. Eight regions clearly have lower 'elite university' participation rates than the rest of England, with coefficients having error bands falling below the zero line: the eight, in order, are–London Central, South East C, London South, East of England B, South West A, London East, London West, and South East D. Again, perhaps surprisingly, these are all in southern (more affluent) England where the general expectation would probably be of higher participation rates than further north. Further exploration, beyond the scope of the data deployed here, is needed to evaluate this finding; the implication appears to be that, at the margin, successful

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[11] There is a significant difference between selective schools and the other three types, but not among the other three.

[12] Because of the small numbers involved, a multi-level model looking at the two Oxbridge universities only failed to converge. An OLS model excluding the multi-level framework identified only one clearly significant variable influencing that percentage–the proportion of students getting three passes at AAB or better.
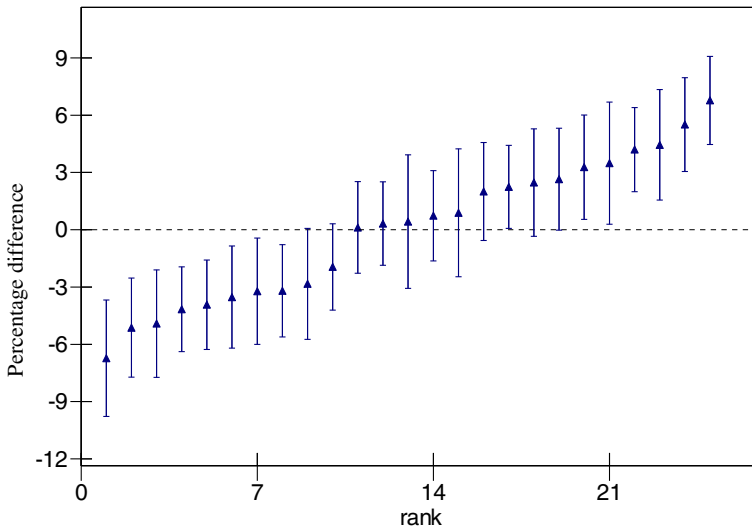
Fig. 2 Regional residuals from the full model predicting each school's percentage of students proceeding to higher education attending a Russell Group university

students from those southern regions are less likely to obtain (apply for and obtain?) a place at a Russell Group university than their northern contemporaries.

Table 4 presents the results for the other two types of institution–the proportions of students attending either non-Russell Group universities or non-University higher education providers respectively. Again, most of the fixed effect model significant relationships are as would be hypothesised: the larger the proportion of students getting three passes at AAB or better the smaller the percentage going to non-Russell Group universities, and Tertiary Colleges were more likely to have their students attend such universities than any of the other five types of institution. Schools located in low social class areas were also more likely to have students reading for degrees there than elsewhere: whatever their overall performance rate, schools located in middle class areas were more likely to send their students to the more elite universities.

There was also a much clearer regional dimension in the fixed effects part of the model for the percentage going to non-Russell Group universities. Figure 3 shows seven regions on the left of the continuum whose coefficient error bands fall below the zero line (i.e. they have significantly lower participation rates in such institutions than otherwise expected) and nine with error bands above that line (significantly greater participation rates than average). Those in the first group are North East B, East Midlands A, North West C, South and West Yorkshire, West Midlands B, North Yorkshire and the Humber, and North West B; those in the second are South East A, South West A, London North, London West, South East D, London East, London South, East of England B, and London Central. They describe a clear north–south divide: holding constant school type and overall student performance, plus nature of the catchment area, schools in the south (particularly London and the south east) are more likely to send their students to non-Russell Group universities than their counterparts further north (especially those in the metropolitan regions).

Finally, the models for the percentage of students reading for degrees at non-University institutions show few clear patterns. Further Education Colleges are more

Table 4 Results of two further multi-level model analyses of higher education admissions by school (significant coefficients at the 0.05 level or better are shown in bold)

Per Cent Entering

Dependent Variable	Non-Russell Group University		Non-University Provider	
Null model				
Random Effects				
Constant	81.375	0.830	1.507	0.303
Region	**13.778**	**4.860**	**1.832**	**0.648**
School	**176.705**	**6.576**	**24.025**	**0.894**
−2*loglikelihood		11811.752	8880.094	
Full Model				
Random Effects				
Constant	145.349	4.019	2.847	1.601
Region	**21.251**	**6.396**	**1.120**	**0.379**
School	**62.702**	**2.400**	**10.335**	**0.396**
Fixed Effects				
Number of students	−0.002	0.002	0.001	0.001
Average Points Score	**−0.249**	**0.018**	−0.004	0.007
Proportion with three AAB	**−56.099**	**3.172**	−0.987	1.284
School type (comparator: Tertiary College)				
Comprehensive	**−7.477**	**1.977**	−1.478	0.801
Selective	**−9.995**	**2.291**	−1.279	0.926
Modern	*−4.105*	*2.349*	−1.406	0.950
Further Education College	**−4.656**	**1.783**	**6.051**	**0.723**
Sixth-Form College	**−5.135**	**1.800**	−1.479	0.729
Denomination (comparator: none)				
Church of England	−1.096	0.999	0.635	0.405
Roman Catholic	*−1.329*	*0.725*	−0.149	0.293
Christian	−1.553	1.748	−0.114	0.709
Gender (comparator: mixed)				
Boys	−1.482	1.209	−0.088	0.490
Girls	0.081	0.966	0.172	0.392
Catchment Characteristics				
Ethnicity	0.182	0.354	0.124	0.134
Social Class	**1.485**	**0.296**	*0.205*	*0.118*
Inner City	−0.247	0.274	−0.038	0.110
−2*loglikelihood		9769.667	7238.210	

likely to have their students attend such institutions than any others (in some cases, students may remain at the colleges where they obtained their A-level qualifications) and there is slight evidence (a coefficient significant at the 0.05-0.10 level only) that students from schools in more working-class areas are more likely to follow that route. A small number of regions deviate substantially from the general pattern, however
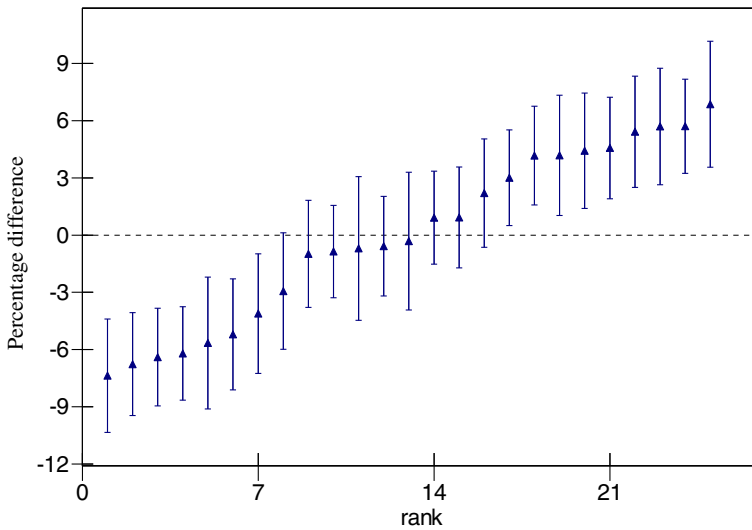
Fig. 3 Regional residuals from the full model predicting each school's percentage of students proceeding to higher education attending a non-Russell Group university

(Fig. 4): in those four (East Midlands A, South and West Yorkshire, North Yorkshire and the Humber, and North East B–from left to right on the right-hand side of the graph) the implication is that students with relatively low A-level results from schools in one corner of the country are more likely than those elsewhere to pursue a degree qualification outside a university context.

Discussion and conclusions

As with most studies of educational performance and access to institutions of higher education, the analyses presented here are constrained by the nature of the available data (much of which, as with those employed here, apply to a single cross-section only). The impact of their contributions reflects the light they are able to throw on issues for which the evidence is, as yet, far from conclusive and for which they point the direction for further study–especially if, as is the case here, their findings are relevant to wider policy issues, such as the extent to which students from different backgrounds, living in different places and experiencing different types of schooling are able to realise their potential. This study was undertaken in the expectation that newly-available data sets would allow such insights–and they have.

Although some of the findings presented here are entirely as expected and not only resonate with conventional wisdom but also reflect other studies–as with the performance of selective as opposed to other types of school, for example–those on which we have focused, because of their novelty, are revealing of new (if sometimes anticipated) patterns of, in effect, educational relative advantage and disadvantage that are embedded within the country's geography. Such findings have been reported here with regard to both average student performance at A-level–according to the school attended–and progression into higher education. Those geographical findings have clear import for
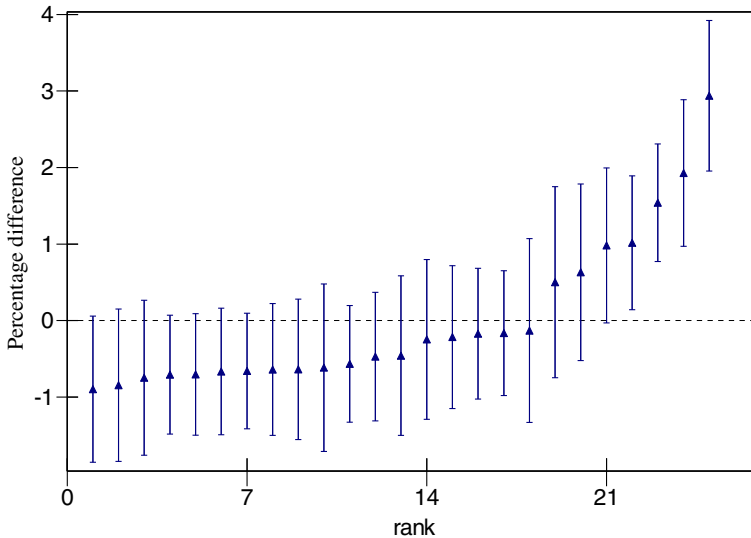
Fig. 4 Regional residuals from the full model predicting each school's percentage of students proceeding to higher education attending a non-university degree provider

the widening participation programmes to which successive governments have been committed and which they require universities to implement (with that implementation being monitored through the Office of Fair Access).

With regard to both performance and progression, these analyses have clearly demonstrated that where a school or college is located within England's residential mosaic can have a substantial, statistically significant, impact on how well its students perform at A-level and which types of higher education provider (if any) they then progress to. Whatever the type of school (selective, modern, comprehensive etc.) the more middle class the immediate area in which it is located (from which, in most cases, it will draw many, if not most, of its students) the better its students' overall A-level performance–whether measured by average points score, the proportion getting five passes at grades A-E, or the proportion getting at least three passes at grades AAB or better. It has been argued in the context of widening participation programmes that many students may not realise their potential at A-level, and so be precluded from attending an 'elite university', because of the local context in which they are educated. Our data on the socio-economic characteristics of a school's immediate neighbourhood–and thus, it is assumed, on the types of home and area from which students are drawn–provide strong evidence that this is the case, and thus sustain arguments for outreach and admissions policies which recognise this significant geographical structuring to the educational system.[13]

Those geographical variations are also found in our analyses of whether students proceed from A-level to a degree programme and, if so, at what type of institution.

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[13] A recent think-tank report on the future of the English university system shows major variations in the percentage of students attending university according to the level of socio-economic disadvantage in their neighbourhoods: in 2006–2007 whereas 55% of all young adults living in the quintile of areas with the least disadvantage attended university, only 15% from the most disadvantaged quintile did so (IPPR, 2013, 26); see also HEFCE (2005; 2007).

Again, the social class of the school's immediate catchment area comes through as very influential. Whatever the type of school and how well its students perform at A-level, students at establishments in more working-class areas are less likely to take up a degree course place and less likely to do so at the more elite Russell Group universities. Whatever your level of achievement, where you go next appears to be influenced by where your school is located–which may reflect on how that school prepares you for higher education (in turn reflecting the resources it has available for that task, given its other functions and roles). Furthermore, encompassing this fine-grained geography are some intriguing (to some extent counter-intuitive) regional variations. In general there is a north–south divide with, holding constant both school type and performance, students from southern regions less likely to either enter onto a degree programme or attend an 'elite university'–a finding clearly calling for more research, of a qualitative nature rather than the aggregate quantitative methods deployed here.

Just how extensive are those variations according to the socio-economic class of each school's catchment area? To address this, Figs. 5–7 show the estimated values for several of the dependent variables in these analyses, deploying the coefficients from the full models presented in Tables 2–3. Figure 5, for example, shows the variation across the full range of factor scores, from −3.0 (the least working-class areas) to +3.0 (the most working-class areas), on the assumption that the school is a comprehensive and has an average-sized sixth form of 203 students. The variation is from approximately 212 points at one end of the scale to 187 at the other: for average-sized comprehensive schools, therefore, students on average performed 134% better (25 points as a percentage of 187) in the most middle-class as in the most working-class areas.[14]

Figure 6 reports similar estimated values for each comprehensive school's proportion of students getting either three or more A-level A-E passes or three passes at AAB or better. Here again the variations are quite substantial: for the proportion getting A-E passes the difference between schools in the least and most working-class neighbourhoods is from 0.72 to 0.87 (a 21% increase); and for the proportion getting three passes at AAB or better the range was from, in effect, zero to 0.14. Finally, Fig. 7 shows the estimated percentage entering higher education, and the percentage of those students proceeding to either Russell Group or non-Russell Group universities. (As well as focusing on comprehensive schools with an average-sized sixth form, the first of these also focuses on those with an average proportion of 0.824 students getting three or more A-levels at A-E, while the other two use the average proportion–0.0998– getting three passes at AAB or better.) For the first of these, there is just a four point difference across the full range: average-sized comprehensives with average A-level results in the most middle class areas sent 43.5% of their students to higher education, whereas those in the most working class areas sent 39.5%. In terms of where those students went to read for a degree, however, the differences were much larger: from the most middle class areas 21.3% went to a Russell Group university, whereas from the most working class areas the percentage was only 9.6 (a more than two-fold variation); and comprehensives in the most working-class areas sent 86% of their average-performing students to non-Russell Group institutions compared to 77% serving the most middle class catchments. Differences between schools according to their

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[14] All of the other categorical variables are set at 0–i.e. the comprehensive schools being compared are non-denominational and mixed–and the two other factor scores are also set at 0.0.

Fig. 5 The estimated A-level point score for students at a comprehensive school according to the socio-economic class score of its immediate neighbourhood

catchment areas are not only statistically significant but also substantial: where a school is located is linked not only to its students' A-level performance but also how many of them go on to a degree course, and at which type of institution.

Increasingly over the last two decades–and in part because of political pressure[15]– English universities and many educational commentators have realised that many students with the potential to benefit from a degree programme (especially one at an 'elite university' with high admissions standards) fail to realise that, because it is not fostered (sufficiently) in their homes and in their schools. Hence they have introduced a wide range of outreach and widening participation programmes devised to encourage students to apply for such degree places and to some extent compensate for their disadvantaged backgrounds in the criteria they will apply when assessing their applications. Such policies were applauded in some quarters but derided by others, by commentators who were opposed to what they saw as social engineering through positive discrimination which necessarily disadvantaged those who met the standard admissions criteria–the majority of whom came from relatively advantaged backgrounds (Vinober, 2013; Harrison and McCaig, 2014).[16] Such policies have in the main had to be based on at best partial, sometimes only anecdotal, evidence. As more research is conducted, however, analyses like those reported here provide the more rigorous evidence needed to sustain the universities' and the politicians' case: where you live and where you go to school influences the extent to which to are able to realise your innate potential–and that should

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[15] One of the highest profile examples of this was the attack by the then Chancellor of the Exchequer–Gordon Brown–on the University of Oxford for denying a place to a student from a Tyne and Wear comprehensive school: see http://news.bbc.co.uk/1/hi/education/764141.stm.

[16] The University of Essex was one of the first to introduce and publicise such a policy–in the mid-1990s–and was roundly castigated for it in the *Daily Mail* by the former head of a leading public school.
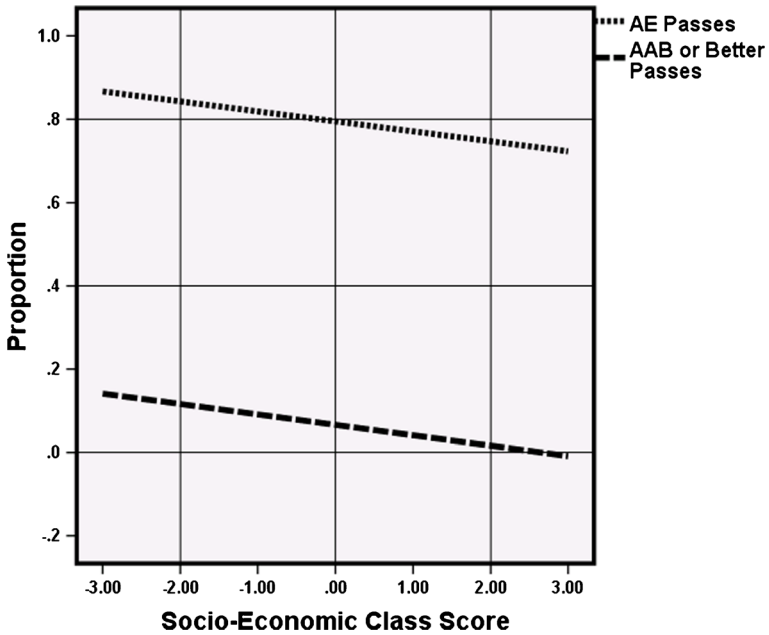
Fig. 6 The estimated proportions of students at a comprehensive school according to the socio-economic class score of its immediate neighbourhood getting (**a**) three or more A-level passes at grades A-E and (**b**) three A-level passes at grades AAB or better
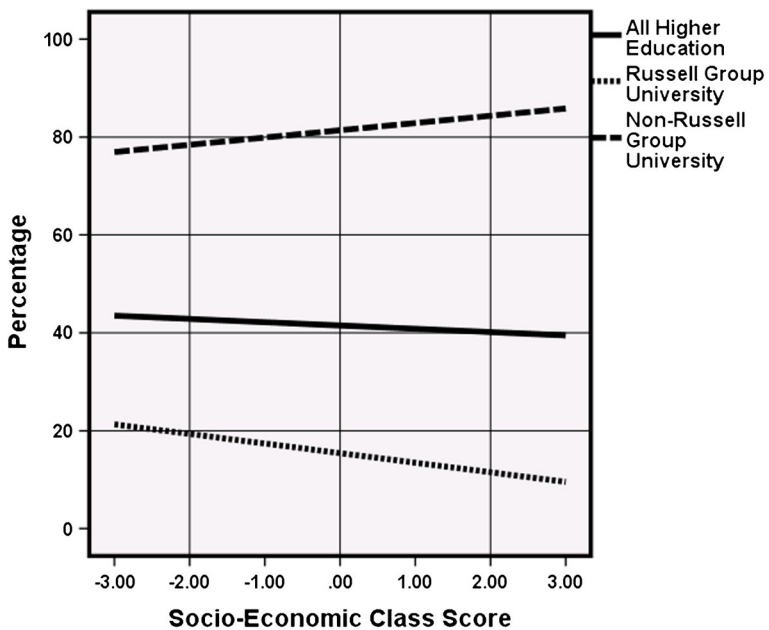

Fig. 7 The estimated percentages of students at a comprehensive school with an average A-level performance according to the socio-economic class score of its immediate neighbourhood (**a**) proceeding into higher education, (**b**) attending a Russell Group university and (**c**) attending a non-Russell Group university

be reflected in policies that seek to overcome such geographically-based disadvantage. More widely, the results presented here not only indicate that, after some two decades of increasing attention to widening participation practices, there is substantial evidence of geographical variations in untapped educational potential but also that pursuit of the goal of greater social mobility–reflected in the creation of a Social Mobility and Child Poverty Commission–requires close attention to the where as well as the how and why of educational provision. Geography, our analyses indicate, provides an important context within which both A-level examination performance and progression into higher education is mediated: there is a clear north–south divide, with students educated in northern English schools more likely to progress into higher education than their contemporaries with similar backgrounds living further south; and the socio-economic and demographic characteristics of the local areas within which schools are cited (indicative of their catchment areas) are also linked to student performance and progression.

Appendix

North East A–Cleveland and Durham.
North East B–Northumberland and Tyne and Wear.
North West A–Lancashire and Cumbria.
North West B–Greater Manchester.
North West C–Cheshire and Merseyside.
North Yorkshire and the Humber.
South and West Yorkshire.
East Midlands A–Derbyshire and Nottinghamshire.
East Midlands B–Leicestershire, Lincolnshire and Northamptonshire.
West Midlands A–Shropshire and Staffordshire.
West Midlands B–Herefordshire and Worcestershire.
West Midlands C–Warwickshire and West Midlands Metropolitan County.
East of England A–Bedfordshire, Cambridgeshire, and Hertfordshire.
East of England B–Essex, Norfolk and Suffolk.
London Central.
London East
London North
London South
London West
South East A–Berkshire, Buckinghamshire and Oxfordshire
South East B–Hampshire and the Isle of Wight
South East C–Surrey and West Sussex
South East D–Kent and East Sussex
South West A–Cornwall, Devon and Dorset
South West B–Gloucestershire, Somerset and Wiltshire

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