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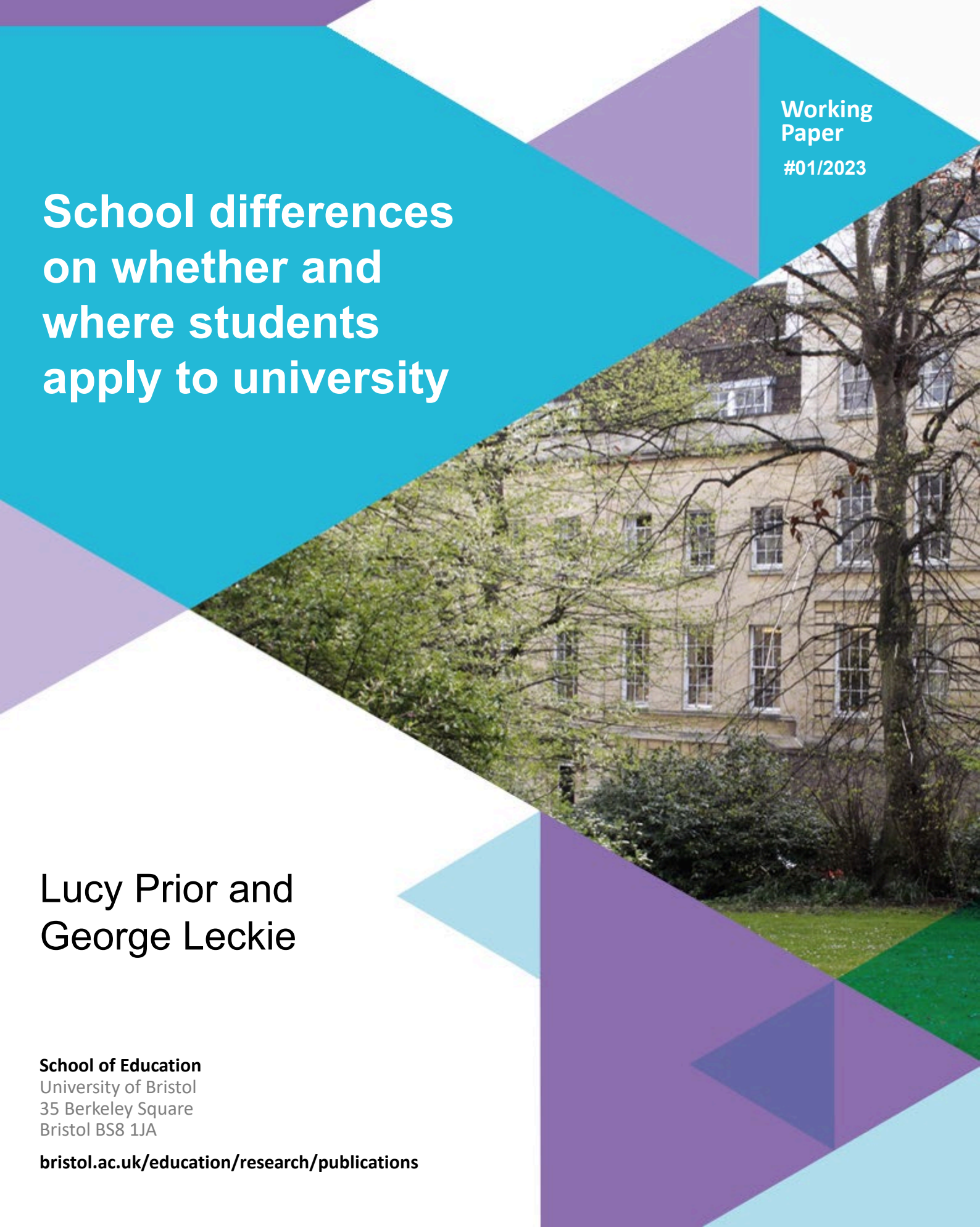
School differences on whether and where students apply to university



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School differences on whether and where students apply to university

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University of BRISTOL

SCHOOL OF EDUCATION

School differences on whether and where students apply to university

Abstract

Going to university is a key route to enhancing life opportunities for young people and for promoting social mobility. Despite the action of widening participation programs, substantial sociodemographic inequalities in participation persist. Few studies have focused on the role that school attended may play in exacerbating or mitigating these inequalities. We explore these issues via analysing student-level linked DfE-Ofqual-UCAS administrative data. We find substantial variation in application rates across schools, particularly regarding applications to Russell Group institutions. Crucially, meaningful school differences persist even after adjustment for school differences in student prior achievement and student sociodemographics. These findings suggest that unmodelled school-level policies, practices, and context may all be influencing students' decision making. We conclude that policymakers and university admissions teams would benefit from monitoring differences in application rates across schools and potentially using this information when devising and targeting interventions to widen participation and act on higher education inequalities.

Keywords: university applications, UCAS, student sociodemographics, school effects, multilevel model, widening participation

Introduction

Overview

Socioeconomically disadvantaged students continue to be underrepresented in higher education (HE), particularly at the most elite or prestigious universities (Boliver, 2017; Dilnot, 2018; Harrison, 2011; Gorard et al., 2019; Marginson, 2016). This is despite substantial expansion of the HE sector over the past 60 years and the move to a mass university system 30 years ago (Baker, 2020; Blanden and Machin, 2013). The drive to increase the national skill and knowledge base to support a thriving economy, and the widespread understanding of HE as a route to social mobility (Blanden and Machin, 2013; Boliver, 2011; Britton et al., 2021; Shiner and Noden, 2015) makes widening participation a continuing goal of educational policy (Archer and Hutchings, 2000; Dilnot and Boliver, 2018; Greenbank, 2006; Harrison, 2011; Younger et al., 2019). Therefore, the continued assessment of socioeconomic and other inequalities in university participation remains important. Many factors determine whether a student attends university. However, the role of schools is understudied in quantitative research. This paper addresses this by investigating school effects on whether and to which types of universities students apply to study.

The UK university admissions system

In the UK, admissions to HE providers, whether these be universities, or colleges and other institutions offering alternative degree-level courses, are administered by the Universities and Colleges Admissions Service (UCAS). Students typically apply during Year 13 of schooling (age 17/18), and so prior to sitting or receiving their A-level grades or other end of school qualifications. The process is multistage: (1) students apply to up to five university or HE courses; (2) admissions selectors use a range of information including predicted grades, personal statements and school references to decide whether or not to offer the applicant a place (typically conditional on achieving certain grades); (3) applicants make firm (preferred) and insurance (back-up) choices, with all other offers declined; (4) on results day, students achieving their required grades accept their offered places

at their firm or insurance choices, else they apply for an unfilled space at a different establishment through a process known as 'clearing'.

Previous research on sociodemographic inequalities in university participation

Final participation inequalities will develop across these admission stages. For example, research has suggested that whilst ethnic minorities apply for university in large numbers, they are at a disadvantage relative to their White counterparts in receiving offers (Boliver, 2016; Noden et al., 2014; Shiner and Modood, 2002). Del Bono et al. (2022) show that Black and South Asian students were more successful at attaining a place through clearing than White students, working to offset differences established earlier in the admissions cycle. In contrast, researchers have emphasised that participation inequalities for socioeconomically disadvantaged students may be most evident at the application stage (Anders, 2012; Boliver, 2013). Socioeconomically disadvantaged students may also apply for less ambitious and lower quality courses than their achievement record suggests (Campbell et al. 2019; Del Bono et al., 2022). Crucially, nearly all these studies analyse student administrative data provided for reanalysis by UCAS. As a result, they are restricted to analysing what happens to the subset of students who applied to university rather than being able to analyse the initial decision to apply at all. For example, Boliver (2013) explores the probability of applying to the Russell Group conditional on applying, while Del Bono et al (2022) explore differences in the 'ambition' of course applications (measured through the difference between a student's predicted tariff score and that of those accepted in the previous year). One exception is Anders (2012) who, via analysing the Longitudinal Survey of Young People in England, showed a large socioeconomic gap in the probability of university application. However, they gave limited attention to variation between schools and their data was drawn before the introduction of higher tuition fees in 2012 which may have influenced the relationship of socioeconomic disadvantage with university applications. We will contribute to the study of university participation by drawing on Department for Education (DfE)-Ofqual-UCAS linked administrative data to explore school effects on the decision to apply to university at all and how this interacts with socioeconomic characteristics for all A-level students in England in 2019.

Explaining socioeconomic inequalities

The decision to apply to university at all is the first step to enabling disadvantaged students to realise the benefit of HE. Previous studies highlight the role of low achievement in explaining socioeconomic differentials in university participation, with many studies showing diminished or non-significant relationships between socioeconomic status and attendance after controlling for prior achievement (Anders, 2012; Chowdry et al., 2013; Marcenaro-Gutierrez et al., 2007). However, research also emphasises the extra pressures and difficulties facing disadvantaged students that leave them less likely to take up HE opportunities, and less likely to receive the full benefit of these (Crawford, 2014; Gorard et al., 2019). These wider issues have been used to help explain the gulf between the 'promise' of university expansion and the persistence of inequalities (Brown, 2013; Thompson and Simmons, 2013). Qualitative studies have indicated the range of motives and factors that could play a role in application decisions for socioeconomically disadvantaged students. For instance: attitudes to financial risk which may also shape the locality of institutions applied to; the prospect of 'fitting-in' at a chosen institution; access to and weight placed on 'hot' knowledge (acquired through professional and peer networks) versus 'cold' knowledge (from prospectuses or websites); and differences in institutional habitus to orientate towards more elite choices compared with more advantaged students (Bathmaker et al., 2013; Baker, 2020; Reay et al., 2001; Shiner and Noden, 2015; Slack et al., 2014).

The role of schools

Schools differ in the sociodemographic make-up of their cohorts, and thus schools with larger numbers of disadvantaged students would be expected to show lower overall application rates given the national underrepresentation of disadvantaged students at university. Identifying variation across schools that remains once we have accounted for student disadvantage and prior achievement, as well as other demographic characteristics, may further understandings of participation inequalities. The greater the remaining variation across schools the more support for the argument that schools' policies, practices, and context directly influence students' decisions to apply. This in turn would support those promoting 'school-based' strategies for widening participation (Younger et al., 2019).

Equally, by studying the remaining variation across schools, one can identify schools with unusually high or low participation rates for further investigation. For instance, it may be useful to detect schools where the disadvantaged student application rate is better or worse than expected given the sociodemographic characteristics of the school cohort. School performance is already similarly monitored in terms of student destinations post 16-18 study, including progression to higher education or training (Department for Education, 2022), however, this takes the form of unadjusted 'raw' rates.

Differences in school culture and the support provided to students may help to explain identified associations where students attending grammar or independent schools are more likely to apply to the Russell Group (Boliver, 2013), have a higher likelihood of receiving an offer (Noden et al., 2014), and of being admitted to higher education (Anders, 2012; Marcenaro-Gutierrez et al., 2007). Schools may also create an institutional habitus that influences university decision-making. For instance, this could be teachers in private schools fostering early expectations for applying to 'Oxbridge' (Oxford or Cambridge university), whilst many state schools will not have the same culture of support around HE prospects, meaning students must rely on other social networks (Reay, 1998). The provision of specific subject teachers, curricula, and support around choices at educational transition phases means schools may also play a role in determining the subjects that students apply to study at university (Iannelli, 2013). Subject choice has been highlighted as a key factor in bridging or barring university applications (Dilnot, 2018) and is related to broader career aspirations (Baker, 2020), where subject studied at university may also impact on later earnings (Belfield et al., 2018; Britton et al., 2021). However, how schools influence application choices in terms of subject studied is not our focus here.

In all these studies, discussion of the role of schools is nearly always framed in terms of differences between school types; there is far less work focusing on the unique effects of individual schools. Where studies have acknowledged individual school effects, they have done so for the purpose of statistical control rather than to explore the magnitude of these school differences (Chowdry et al., 2013). This study addresses this gap using multilevel models to describe and explain variation in application rates across schools.

Importance of considering different types of applications

The effects of schools on applications to university may operate differently for different types of institutions. Despite the union of university provision under the Further and Higher Education Act 1992, there remains a division between so-called 'old' and 'new' universities (Boliver, 2015). Many older institutions and the 24 research-intensive universities comprising the 'Russell Group' routinely feature in the top half of prominent university league tables (Shiner and Noden, 2015). There may be particular concern for how well schools support applications to these most prestigious establishments, given their greater underrepresentation of disadvantaged students (Boliver, 2017; Dilnot, 2018; Gorard et al., 2019) and the links between these universities and higher labour market outcomes (Belfield et al., 2018; Bratti et al., 2004). We therefore explore school effects on university applications across the institution 'status' range.

Research questions

This study contributes to research exploring participation inequalities in HE by investigating school effects on university applications. We focus on the decision to apply to university at all, as well as then exploring which students applied to the Russell Group. We address the following research questions: (1) What is the extent of school-level variation in applying to university and to what extent do student characteristics explain these school differences? (2) What are the associations of student and school characteristics with university applications and how does this vary between types of application?

Data

Source

This analysis uses the GRading and Admissions Data for England (GRADE) dataset (ONS, 2021) (see https://www.gov.uk/government/collections/grade-data-sharing-project for more information). This is a unique and novel data collaboration between the Office for Qualifications and Examinations Regulation (Ofqual), the Department for Education (DfE) and the Universities and Colleges Admissions Service (UCAS), covering GCSE (age 16) and A-Level (age 18) grades between

2017 and 2020. The dataset combines information on GCSE and A-Level examinations and qualifications collected from awarding organisations (the Ofqual component), extracts from the National Pupil Database (NPD) containing sociodemographic student characteristics (the DfE component), and data from the university application process (the UCAS element).

Sample

To analyse school effects on the university admissions process, we use the NPD student census to identify a sample of 18-year-old A-level students from the 2018/2019 academic year. This is the most recent 'normal' year (where students last sat examinations before the Covid-19 pandemic) provided in the GRADE dataset. We link these students with their examination results from the Ofqual dataset and data from the UCAS admissions dataset where students made an application to university. Our sample therefore does not include privately educated students (who are not captured by the NPD) or those taking solely qualifications other than A-levels or participating in alternative 16-19 education routes such as apprenticeships. The final sample consists of 145,179 students, nested within 1,930 schools. We use schools throughout to refer to the educational establishments that students attend and in which they take their A-level examinations, however, in reality these represent a range of educational centres including for instance Sixth Form Centres and Further Educational Colleges.

Outcomes

Our outcomes are measured at the student level and we focus on application to universities, as opposed to other types of HE establishments. These represent the vast majority of applications (90.2% of all HE applications). Whilst our sample of students are based in England we include applications to any UK universities. There are 136 universities represented in our sample, 24 of which comprise the Russell Group (see the Supplementary Material for the university list).

We explore three outcomes: (1) whether the student makes any application to a university course and conditional on applying overall (2) whether they put in an application to at least one Russell Group university or (3) whether they apply to three or more Russell Group universities.

Student characteristics

We obtain a set of sociodemographic student characteristics from the NPD student Census dataset. These are the student's gender (Male, Female), ethnicity (White, Black, Asian, Chinese, Mixed, Other, Unclassified), Special Educational Needs (SEN) status (No SEN, SEN), speaking English as an Additional Language (EAL) (Not EAL, EAL), Income Deprivation Affecting Children Index (IDACI) quintile of their home neighbourhood, and Free School Meal eligibility (No FSM, FSM).

Additionally, from the Ofqual component of the GRADE dataset we utilise a mean GCSE score summarising the average achievement of the student across their age 16 examinations, split into quintiles. We also record whether the student took one, two or three or more 'facilitating' subjects at A-Level. The facilitating subjects are a set of subjects considered as most often preferred or required by universities and thus stand students in good stead for future options (NFER, 2019). The subjects are English literature, mathematics and further mathematics, physics, chemistry, biology, history, geography, and modern or classical languages. We do not adjust for A-level examination results as applications are typically made before these examinations are taken.

School characteristics

The Ofqual dataset component also provides some information on the school a student attends. We utilise information on school region and school type. Region is summarised as: London, North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, South East, and South West. We categorise school type into Academies (schools funded directly by the Government with more control over how they run), Comprehensives (schools run by the Local Authority), Selective (Grammar schools that actively select students based on high achievement), Sixth Form Colleges (those that only teach ages 16 to 19 for advanced school-level qualifications), Further Education Colleges/Tertiary (covering other study which is post-secondary but not part of HE) and an Other category to cover remaining establishments.

Methods

In this analysis we are interested in exploring the effect of schools on the decision to apply to university. Firstly, we use descriptive statistics to summarise both school-level variation in application rates and the variation in application rates by student characteristics. Secondly, we use multilevel models to explore the variation in our application outcomes positioned at the school level. We explore a series of models to address our research questions. Model 1 is an unadjusted model with no covariates, the purpose of which is to establish the baseline variation across schools in the probability of applying to university. Models 2 and 3 add, firstly the sociodemographic characteristics of students, and then student prior achievement and facilitating subjects taken to evaluate how school-level variation reduces on accounting for these student characteristics. As we progressively adjust our models, we ideally move closer to isolating the impact of schools' policies, practices and context on our chosen outcomes separated from simple school differences in student intake. However, we cannot rule out the possibility that the identified school effects are reflections of other unobserved student characteristics. Model 4 controls for the school characteristics, and so in this model we shift focus slightly from trying to isolate the impact of schools to examining the degree to which variation across schools may be explained by features of schools themselves.

Our outcomes are binary, whether a student makes a certain type of application or not. We explore relationships to university applications using linear probability models. These models offer a close approximation to a logit model where the overall probability of the binary outcome is not extreme (generally between 0.25 and 0.75) (Scott Long, 1997). The overall rates for our outcomes are 0.72 for applying to any university, and conditional on applying 0.71 for applying to at least one Russell Group university and 0.40 for applying to three or more Russell Group universities. We therefore capitalise on this simpler and more efficient modelling strategy.

Results

Descriptive results

Overall, 72.2% of students made applications to universities in the 2019 application cycle. Conditioning on making an application to university, 70.9% of students apply to at least one Russell

Group university, whilst 40.1% apply to three or more Russell Group universities. The breakdown of application rates by number of Russell Group applications is given in the supplementary material (Table S1).

Table 1 provides the application rates for our three outcomes (applying overall, to at least one Russell Group, and to at least three Russell Group universities) by the student characteristics. It shows that ethnic minority students show the highest application rates overall (relatedly EAL students also show higher rates of application than non-EAL students). In the case of Russell Group applications, Chinese students are particularly more likely to apply (both for making at least one (88.6%) or three or more Russell Group applications (65.3%)) in comparison to White students (68.9% and 39.4% respectively). Asian and other ethnicity students also show some of the highest application rates to the Russell Group. Despite high overall application rates, Black students show the lowest rates when we consider applying to three or more Russell Group universities (35.0%). Students with SEN show lower application rates across all three outcomes compared to non-SEN students.

By our socioeconomic variables, we see that students eligible for FSM are only marginally less likely to apply to university overall (71.1% compared with 72.3% for No FSM students), but the difference is larger as we consider applying to more Russell Group establishments (around 8.3 percentage points). Likewise, there is only a 0.9 percentage-point difference between the most and least deprived students in the overall application rate, but this increases to 5.9 percentage points for applying to at least one Russell Group and to 13.8 percentage points for applying to three or more Russell Group universities. Therefore, socioeconomic differentials appear more prominent when considering elite university applications. However, it is important to remember that our student sample is conditional on staying in school post-16 and studying A-levels. The equivalent application rates taking the sample of students as present at GCSE (age 16, 498,539 students) are given in Supplementary Table S2. From this we can see much more dramatic differences in application rates across the socioeconomic measures, even for overall applications. Therefore, underrepresentation for students of lower socioeconomic status at universities is an issue that may emerge earlier in the educational life course.

Additionally, Table 1 shows the application rates by quintiles of mean GCSE score and the number of 'facilitating' subjects taken. These variables show the most dramatic differences in application rates. Students in the lowest quintile of GCSE score have a 54.6% overall application rate, whilst those in the top quintile show an application rate of 88%. The differences are further exaggerated as we consider whether and to how many Russell Group universities students apply. For example, there is a 76.1 percentage-point difference between the lowest and highest GCSE score quintiles when considering applying to three or more Russell Group establishments, and a 59.1 percentage-point difference in application rate between those taking no facilitating subjects and those taking three or more for the same outcome. The descriptive statistics for the sample are provided in Supplementary Table S3.

In terms of school characteristics (Table 2), we see that those in academically selective schools show the highest rates of application overall (82.4%) and to the Russell Group (85.6% for at least one Russell Group application made, 59.2% for three or more). In contrast, students in typical comprehensives, academies or sixth form colleges show relatively lower application rates to Russell Group institutions (68.7%, 70.2% and 68.4% for making at least one Russell Group application). There is some regional variation evident as well. Students in the South West (66.1%), North West (66.9%) and North East (67.3%) show the lowest overall application rates, whilst those in London (76.4%) show the highest. However, considering applications made to the Russell Group it is those in the East Midlands who show the lowest application rates (62.2% and 32.2% for at least one and for three or more Russell Group applications), compared with 77.6% and 46.2% shown for London (which shows the highest application rates across all three outcomes). As these descriptive summaries do not take other factors into account, the higher rates of application in London may be an effect of the greater proportion of ethnic minority students (which we have seen are more likely to apply) in this region.

Figure 1 shows the percentage of students within schools making applications to university. Overall, in many schools the majority of students apply for university (peak at around 70 to 80%). However, there is a long tail of schools where the percentage making applications is much lower.

Conditioning on making an application to university at all, there is a large spread of schools with differing percentages of students applying to at least one or to three or more Russell Group universities. A long tail of schools with very high percentages of students applying to three or more Russell Group institutions is present, and there are a substantial number of schools where all students are applying to at least one Russell Group university. Altogether, there appears to be a considerable degree of school-level variation in university applications.

Research Question 1: What is the extent of school-level variation in applying to university and to what extent do student characteristics explain these school differences?

Firstly, in Model 1 (the unadjusted model, see Table 3) we find a reasonable degree of school-level variation in the probability of applying to university, and particularly so as we consider making more Russell Group applications. For applications overall, 7.5% of the variation in the probability of applying to university relates to school-level differences in application rates, compared with 12.1% for making at least one Russell Group application and 13.9% for making three or more such applications. The addition of student sociodemographic characteristics in Model 2 explains a small degree of the school-level variation in the probability of applying. The sociodemographic characteristics explain 20% of the school-level variation for overall applications, 4% for applying to at least one Russell Group and 6.1% for applying to three or more Russell Group universities. Therefore, other features of schools (apart from the sociodemographic mix of their cohorts) may be accounting for the differences we see between schools. For instance, some schools may have a stronger culture orientating students towards elite universities, stronger links to local institutions, or a broader vocational direction which influences application decisions.

More dramatic reductions in school variation are seen in Model 3 where we additionally control for mean GCSE score and the number of facilitating subjects a student took at A level, particularly in the case of our two Russell Group outcomes. For example, the school-level variation in the probability of applying to at least one Russell Group university drops by 66.7% from Model 2 to Model 3, whilst the decrease is 71.0% for applying to three or more Russell Group universities. This leaves use with 5.2% and 5.8% of total variation in the probability of applying positioned between

schools for these outcomes respectively. Therefore, the achievement profile of students within a school is a powerful factor in explaining differences between schools in applications. In Model 4, we shift focus to relating the variation in school effects to variation in school characteristics. We find that school type and region explain a further small proportion of school-level variation in application rates, and more so for Russell Group applications.

Though the variation between schools in our adjusted models is considerably smaller than in the unadjusted models, we can still identify considerable heterogeneity between schools. In our adjusted model we have, in effect, statistically equated the student body in each school and so the school differences remaining reflect factors beyond those captured by our rich set of control characteristics. Examining the difference between schools lying at the 25th and 75Th percentiles from Model 3 we find an approximately 10 percentage-point difference in the application rate across all three outcomes. If we compare schools moving from the 10th to the 90th percentile this relates to around a 19 percentage-point difference for the three outcomes (see Supplementary Table S4). This is larger than many of the differences between student characteristics we identified in Table 1. Furthermore, for applying to any university, 38.0% of school effects are significantly different from average in Model 1, but 21.7% of schools still have effects significantly above or below average in Model 4. Similar results are found for applications to at least one Russell Group university (39.4% and 16.2%) and to three or more Russell Group universities (39.1% and 18.4%).

Figure 2 provides the caterpillar plots of the predicted application percentages at the school level from Model 1 and 3 for all outcomes, where we have centred these around the overall national mean application percentage (indicated by the line on the plot). We have restricted to those school effects whose predicted application percentages are within the 0 to 100 range (the overwhelming majority), however, some effects still show confidence intervals outside this range as an effect of using the linear probability model. The range of effects is larger in the unadjusted model compared with the more adjusted version, as we would expect. For example, for applications to at least one Russell Group university, most schools lie somewhere between 50 and 80%, whereas in Model 3, this is reduced to between 60 and 70%. There is a noticeable tail of schools with particularly high

percentages of applicants to three or more Russell Group universities in the unadjusted model, and whilst diminished, there remains a small set of unusually high percentage schools in the adjusted model. Similarly, there is an outlying school with particularly low application rates for overall applications. Examination of the underlying data reveals this is an all-boys school. We do not have further detail on the school, for instance, whether it is particularly vocationally orientated which could contribute to the lower rates seen. This highlights a utility of examining individual school effects: the ability to identify unusual or outlying cases where further investigation to assess the reasons behind that unusual behaviour may be prudent. Overall, schools appear to remain an important source of variability in university applications, even in our model adjusted for student sociodemographic characteristics, prior achievement and taking facilitating subjects.

Research Question 2: What are the associations of student and school characteristics with university applications and how does this vary between types of application?

Examination of the model results in Supplementary Tables S5 to S7 reveals how the student and school characteristics relate to university applications, conditional on students staying in school post-16 and doing A-Levels. The regression coefficients measure the change in the predicted probability of applying associated with the presence of each characteristic, conditioning on the other characteristics. In Model 2, it is clearly apparent that Black, Asian and Chinese students have the highest likelihood of applying overall, with regression coefficients relating to a 0.12, 0.10 and 0.10 higher probability of applying in comparison with White students. Chinese students show a substantially higher likelihood of applying to Russell Group universities, for instance, their regression coefficient shows a 0.13 increase in probability over White students in applying to three such institutions. EAL students also show higher probabilities of applying overall and to at least one Russell Group, but these differences are smaller in magnitude. SEN students show a consistently lower probability of applying, with a stronger association as students apply to more prestigious universities. Female students are more likely to apply overall, however, they have a lower probability for Russell Group applications (regression coefficients of -0.02 for both Russell Group outcomes).

In Model 2, across the IDACI quintiles the results suggest students in more deprived areas have a lower probability of applying, and this is most pronounced for applying to three or more Russell Group universities. For instance, the regression coefficient for students in the most deprived areas shows a 0.08 decrease in probability in comparison with those in the least deprived areas, whereas for students in the second least deprived area the difference is only 0.03. By FSM status we identify small but significant decreases in comparison with non-FSM students for all the outcomes. Our sample consists of those that stayed on to study A-levels post-16, were we to include all students we would likely see a stronger relationship with the socioeconomic characteristics. This is the case where we repeat the analysis with the sample of students as present age 16 at GCSE (see Supplementary Table S8). It may be that disadvantaged students are already choosing a more vocational rather than academic track (Baker, 2020).

Model 3 includes controls for student prior achievement at GCSE and the number of facilitating subjects studied at A-Level. As one would expect, these appear strongly related to the probability of applying to university. Having a mean GCSE score in the top quintile relates to a 0.22 probability increase in applying overall compared to the students scoring in the lowest quintile. This increases to a 0.48 and a 0.59 probability increase when we consider applying to at least one or to three or more Russell Group universities. Taking facilitating subjects at A-level also appears strongly related to applications, where students taking three or more of these subjects show a 0.17 increase in the probability of applying overall compared with those not taking any facilitating subjects (accounting for the other sociodemographic characteristics and their prior achievement). The educational history of students is clearly important to their probability of application.

The addition of prior achievement and facilitating subjects in the model also impacts on the other associations. The coefficients for Chinese students are reduced in size from an increase of 0.13 in probability over White students in applying to three or more Russell Group universities to a 0.07 higher probability. In the case of Black students, we find in Model 3 that the associations for this group increase, most notably for applications to the Russell Group. For applying to at least one Russell Group Black students move from a 0.02 higher probability to a 0.08 higher probability,

whereas for applying to three or more Russell Group universities the change is from a negative coefficient (-0.03) to a positive relationship (0.03). This shows that Black students may be making ambitious university choices in comparison to White students when considering their educational track record and subject choice. With the additional controls in Model 3 we find no significant association with FSM status, and there is little differentiation seen across the IDACI quintiles. It may be that disadvantaged students who stay on to study A-Levels post-16 share other unmeasured characteristics that relate to university application decisions.

Finally, in Model 4 we add school characteristics. Students in selective schools show a higher probability of applying (all else equal) for all three outcomes compared with those in academies with this being most evident in relation to applying to three or more Russell Group applications (0.05). Students in the North West and North East are less likely to apply overall (-0.04 and -0.06), but this relationship does not hold for our two Russell Group outcomes conditional on the other student characteristics. When considering applications to three or more Russell Group universities, all the regions show significantly lower probabilities for applying than the reference of London.

Discussion

In this study we capitalise on a new linked administrative dataset to investigate school effects in university applications, including the decision to apply at all, and so we address two previously understudied aspects of participation inequalities. We identify substantial heterogeneity between schools in the probability of making applications to university, and this is particularly the case regarding applying to Russell Group universities. In the unadjusted models we find 12.1% of variation in the likelihood of applying to at least one Russell Group university is positioned between schools, rising to 13.9% for applying to three or more of these prestigious establishments. Importantly, we show that, whilst diminished, significant differences across schools remain on accounting for key student characteristics, including their prior achievement at GCSE and taking 'facilitating' subjects at A-level. For instance, in the fully adjusted models we find an approximate 10 percentage-point difference between schools at the 25th and 75th percentiles of application rates across all three outcomes. These differences across schools are apparent despite any underlying widening

participation policies currently in operation, which we are not able to document or control for with our dataset.

Our results also demonstrate the benefit of examining school effects to identify unusual or outlying cases. For instance, those with particularly low rates, even given the sociodemographic and achievement composition of their students. Whilst we cannot rule out the possibility that the identified school effects are reflections of other unobserved student characteristics, unusual schools may still offer useful information which can be used to target further investigations and interventions for improving university participation. This could be, for instance, establishing widening participation connections with universities, creating networks to facilitate the transfer of 'hot' knowledge to prospective applicants (Slack et al., 2014). Unusual schools may also serve as useful case studies for understanding the operation of different support systems for applications.

Additionally, our findings further understandings of sociodemographic inequalities in university admissions by demonstrating differences at the application stage. Previous research has indicated ethnic inequalities in university participation, with minorities at a disadvantage particularly regarding admission to high-status universities (Boliver, 2016; Noden et al., 2014). We show that ethnic minority students were more likely to make applications overall and particularly to apply to Russell Group universities. This indicates that ethnic inequalities in university participation are likely to emerge at latter stages of the admissions process, suggesting further review of the process may be required. As with previous studies (Chowdry et al., 2013) our models demonstrated that prior achievement is a vitally important factor for application decisions, diminishing much of the differences between schools and reducing associations of student sociodemographics with applications. Earlier intervention to support educational achievement for the most disadvantaged groups may thus be an effective tool to increase university participation and support social mobility.

Considering the role of prior educational record in university applications is complicated by the role of subject choice in limiting or facilitating a student's options, and this applies throughout time from GCSE choices to A-Level to university decisions (Dilnot and Boliver, 2018). We accounted for the number of 'facilitating' subjects a student took at A-Level, however, future research would

benefit from using the GRADE dataset to explore how more detailed subject choices relate to university/course combinations for different student groups. Previous work has indicated that socioeconomic gaps may vary according to the subject studied (Britton et al., 2021) and that there may be differences in university and subject choices between students from vocational or academic educational tracks (Baker, 2020). In the analysis of subject choice, the role of schools could also be important, given potential differences in teacher and curriculum provision, as well as support for informed choices earlier in secondary schooling. Furthermore, we had a limited set of school characteristics to draw upon for this analysis, future analyses could explore which features of schools are associated with particularly low or high application rates. It would be useful to know school attitudes to university, whether the school has a particular technical or vocational focus and what widening participation schemes the school may be involved in, for example.

Overall, there is considerable school-level variation in student applications to university, and this varies according to the type of application students are making. In the pursuit of understanding and acting on inequalities in university participation, it may be beneficial for researchers and policymakers to pay attention to schools as sites for widening participation activities. It may not be sufficient or effective to simply target underrepresented or disadvantaged students without also being aware of their institutional environment. More broadly, whilst the decision to apply at all is a crucial step in university participation, and thus supporting applications should aid in addressing participation inequalities, it is important to not fall into the trap of thinking this will unproblematically translate to improvements for social mobility. As others have highlighted (Byrom and Lightfoot, 2013; Crawford, 2014; Gorard et al., 2019), disadvantaged students face a remit of heightened challenges in progressing successfully through university and into the labour market, therefore, addressing wider social inequalities, alongside a focus on university participation, should remain a key goal.

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Tables

Table 1. Application rates by student characteristics for applying to any university, applying to at least one Russell Group University or to three or more Russell Group universities.

		All students	Conditional on applying to any university	
		Applied to university	Applied to at least one Russell Group university	Applied to three or more Russell Group universities
Sex/Gender	Male	70.8	72.7	42.0
	Female	73.4	70.0	38.5
Ethnicity	White	68.8	68.9	39.4
	Black	82.5	71.7	35.0
	Asian	83.5	76.0	41.3
	Chinese	84.4	88.6	65.3
	Mixed	74.8	75.2	45.4
	Other	80.3	77.5	43.5
	Unclassified	73.9	73.4	44.3
FSM	No FSM	72.3	71.1	40.5
	FSM	71.1	67.0	32.2
EAL	Not EAL	70.6	70.3	40.3
	EAL	80.7	73.8	39.1
SEN	No SEN	72.6	71.2	40.3
	SEN	65.3	64.8	34.7
Deprivation	Q5 – Highest IDACI	73.6	69.6	34.6
	Q4 – IDACI	71.7	68.5	36.0
	Q3 – IDACI	70.9	69.7	39.1
	Q2 – IDACI	70.6	71.1	42.0
	Q1 – Lowest IDACI	74.5	75.5	48.4
GCSE score	Q5 – Highest GCSE	88.0	96.6	81.5
	Q4 – GCSE	80.0	85.4	51.2
	Q3 – GCSE	73.0	69.2	28.5
	Q2 – GCSE	65.8	51.3	13.4
	Q1 – Lowest GCSE	54.6	34.9	5.4
Facilitating subjects taken	3+	85.4	91.4	68.1
	2	81.3	80.8	48.9
	1	68.1	61.3	25.7
	0	54.4	39.9	9.0

Note: All student sample is 145,179 students, the sample conditional on applying to any university is 104,858 students. FSM = Free School Meals, EAL = English as an Additional Language, SEN = Special Educational Needs.

Table 2. Application rates by school characteristics for applying to any university, applying to at least one Russell Group university or to three or more Russell Group universities.

		All students	Conditional on applying to any university	
		Applied to university	Applied to at least one Russell Group university	Applied to three or more Russell Group universities
School region	London	76.4	77.6	46.2
	North East	67.3	77.5	44.8
	North West	66.9	76.4	48.8
	Yorkshire and the Humber	74.0	70.6	40.3
	East Midlands	73.8	62.2	32.2
	West Midlands	77.0	70.1	35.5
	East of England	70.1	65.3	35.6
	South East	72.1	67.3	37.1
	South West	66.1	71.9	41.8
School type	Academies	72.3	70.2	39.8
	Comprehensives	69.6	68.7	35.8
	Selective	82.4	85.6	59.2
	Sixth Form	74.2	68.4	35.2
	FE/Tertiary	76.3	71.1	42.1
	Other	71.8	73.7	39.9

Note: All student sample is 145,179 students, the sample conditional on applying to any university is 104,858 students. FE = Further Education.

Table 3. School and student variances, percentage of total variance at the school-level and percentage change in school-level variance from the previous model for making any application to university, to at least one Russell Group university and to three or more Russell Group universities.

		Applied to university		Applied to at least one Russell Group university		Applied to three or more Russell Group universities	
		Est.	SE	Est.	SE	Est.	SE
Model 1: Unadjusted	School variance	0.015	0.001	0.025	0.001	0.033	0.001
	Student variance	0.187	0.001	0.183	0.001	0.201	0.001
	% school-level	7.5%		12.1%		13.9%	
	% change	-		-		-	
Model 2: Socio-demographics	School variance	0.012	0.001	0.024	0.001	0.031	0.001
	Student variance	0.185	0.001	0.182	0.001	0.2	0.001
	% school-level	6.3%		11.5%		13.3%	
	% change	-20.0%		-4.0%		-6.1%	
Model 3: Prior achievement and facilitating subjects	School variance	0.009	0	0.008	0	0.009	0
	Student variance	0.173	0.001	0.146	0.001	0.147	0.001
	% school-level	4.7%		5.4%		5.7%	
	% change	-25.0%		-66.7%		-71.0%	
Model 4: School characteristics	School variance	0.008	0	0.006	0	0.007	0
	Student variance	0.173	0.001	0.146	0.001	0.147	0.001
	% school-level	4.2%		4.1%		4.6%	
	% change	-11.1%		-25.0%		-22.2%	

Note: All student sample is 145,179 students, the sample conditional on applying to any university is 104,858 students.

Figures

Figure 1. School-level histograms of the percentage of students applying to university overall (top), to at least one Russell Group university (middle), and to three or more Russell Group universities (bottom) with schools.

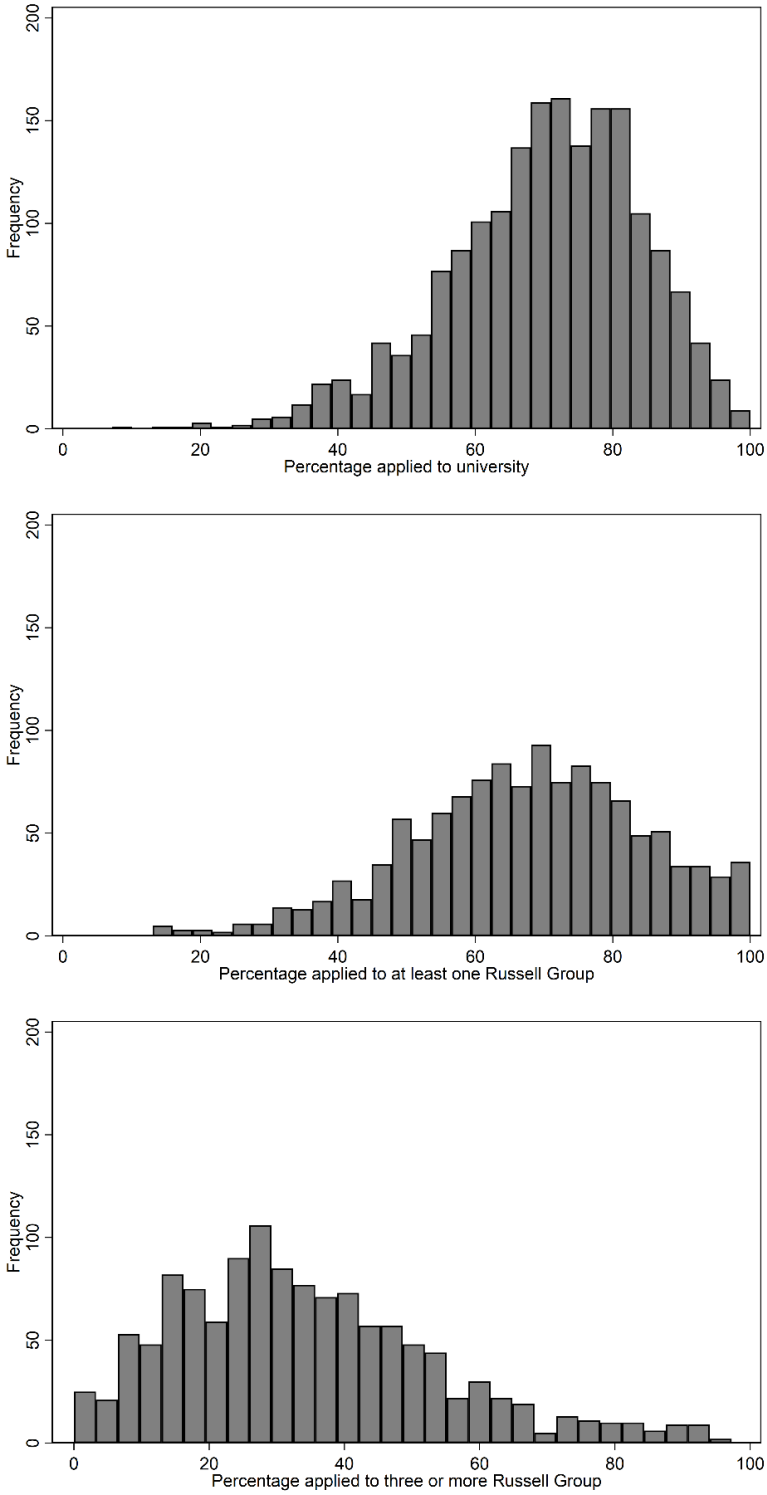
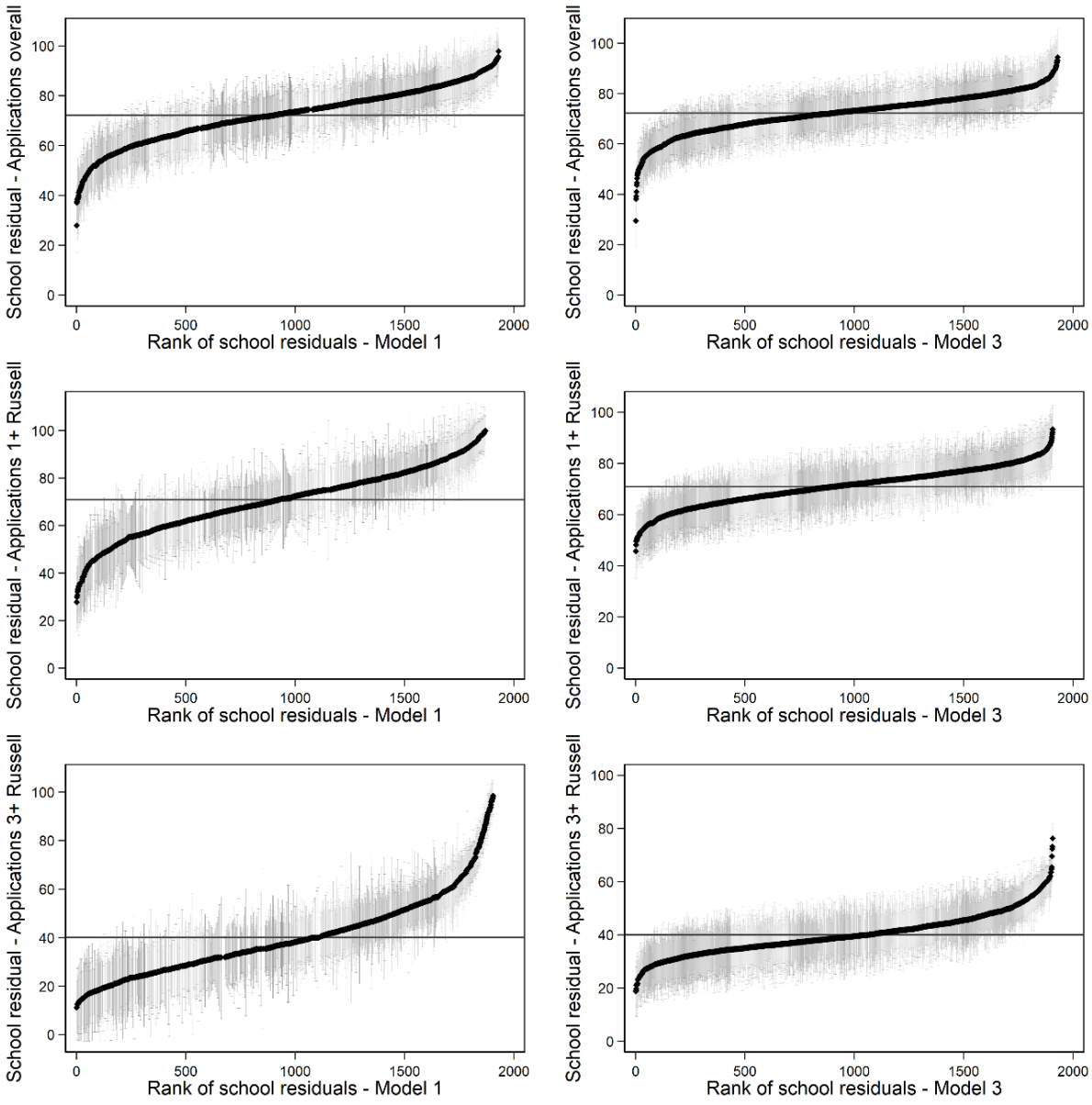


Figure 2. Predicted percentage rates of application for schools in rank order for models unadjusted (Model 1, left) and adjusted for student sociodemographics, prior achievement and facilitating subjects taken (Model 3, right) for applying to university overall (top), applying to at least one Russell Group university (middle), and applying to three or more Russell Group universities (bottom).



Supplementary Material

Methodology

The multilevel linear probability models used in the analysis can be written as follows:

$$y_{ij} = \mathbf{x}'_{ij}\boldsymbol{\beta} + \mathbf{w}'_{j}\boldsymbol{\delta} + u_j + e_{ij}$$

where $\mathbf{x}_{ij}$ denotes the vector of the intercept and student level characteristics and $\mathbf{w}_j$ denotes the vector of school-level characteristics. The vectors of regression coefficients measuring the main effects of these covariates are then denoted by $\boldsymbol{\beta}$ and $\boldsymbol{\delta}$ respectively for the student and school level. The school random intercept effects are given by u_j, measuring how much higher or lower the mean probability of participation is in that school relative to the overall mean, and e_{ij} denotes the student-level residuals measuring how each student's probability of success (i.e., making an application) deviates from their school mean. The school random effect and student residuals are assumed normally distributed with means of zero and constant school and student variances. Within the linear probability framework predictions outside of the 0-1 probability range can occur. We have summarized these for the model series in Supplementary Table S9.

Russell Group Institutions

- University of Birmingham
- University of Bristol
- University of Cambridge
- Cardiff University
- Durham University
- University of Edinburgh
- University of Exeter
- University of Glasgow
- Imperial College London
- King's College London
- University of Leeds
- University of Liverpool
- London School of Economics and Political Science
- University of Manchester
- Newcastle University
- University of Nottingham
- University of Oxford
- Queen Mary University of London
- Queen's University Belfast
- University of Sheffield
- University of Southampton
- University College London
- University of Warwick
- University of York

Supplementary Tables

Table S1. Application rate of students applying to different numbers of Russell Group universities, conditional on having made an application.

Number of Russell Group applications	Freq.	%
0	30,505	29.1
1	17,171	16.4
2	15,174	14.5
3	15,204	14.5
4	15,727	15.0
5	11,077	10.6

Table S2. Application rates by student characteristics for applying to any university for the sample of students as present during their GCSEs (age 16, 2017 academic year).

		Applied to university
Sex/Gender	Male	29.3
	Female	38.8
Ethnicity	White	30.2
	Black	45.6
	Asian	52.3
	Chinese	67.4
	Mixed	37.0
	Other	45.2
	Unclassified	34.7
Free School Meals (FSM)	No FSM	36.1
	FSM	19.4
English as an Additional Language (EAL)	Not EAL	31.9
	EAL	45.4
Special Educational Needs (SEN)	No SEN	37.3
	SEN	12.0
Income Deprivation Affecting Children Index (IDACI)	Q1 – Lowest IDACI	44.7
	Q2 – IDACI	36.9
	Q3 – IDACI	32.3
	Q4 – IDACI	29.8
	Q5 – Highest IDACI	25.6
GCSE Mean score	Q1 – Lowest GCSE	0.8
	Q2 – GCSE	11.8
	Q3 – GCSE	31.1
	Q4 – GCSE	51.4
	Q5 – Highest GCSE	75.8
Facilitating subjects taken at GCSE	0	10.0
	1	10.9
	2	13.6
	3	21.5
	4	40.9
	5+	60.2

Note: The GCSE student sample consists of 511,706 students. The number of facilitating subjects taken has more categories than present for the A level sample to reflect the greater number of subjects students typically take at GCSE.

Table S3. Descriptive statistics for students and school characteristics for the full student and conditional on applying samples.

		All students		Conditional sample of applicants	
		Freq.	%	Freq.	%
Sex/Gender	Male	65,549	45.2	46,434	44.28
	Female	79,630	54.9	58,424	55.72
Ethnicity	White	104,870	72.2	72,174	68.83
	Black	8,100	5.6	6,684	6.37
	Asian	19,227	13.2	16,063	15.32
	Chinese	1,027	0.7	867	0.83
	Mixed	7,269	5.0	5,438	5.19
	Other	2,660	1.8	2,135	2.04
	Unclassified	2,026	1.4	1,497	1.43
Free School Meals (FSM)	No FSM	137,072	94.4	99,095	94.5
	FSM	8,107	5.6	5,763	5.5
English as an Additional Language (EAL)	Not EAL	122,197	84.2	86,317	82.32
	EAL	22,982	15.8	18,541	17.68
Special Educational Needs (SEN)	No SEN	138,653	95.5	100,598	95.94
	SEN	6,526	4.5	4,260	4.06
Income Deprivation Affecting Children Index (IDACI)	Q1 – Lowest IDACI	29,042	20.0	21,632	20.63
	Q2 – IDACI	29,354	20.2	20,717	19.76
	Q3 – IDACI	28,799	19.8	20,414	19.47
	Q4 – IDACI	28,955	19.9	20,745	19.78
	Q5 – Highest IDACI	29,029	20.0	21,350	20.36
GCSE Mean score	Q1 – Lowest GCSE	29,101	20.0	15,899	15.16
	Q2 – GCSE	29,195	20.1	19,202	18.31
	Q3 – GCSE	29,230	20.1	21,328	20.34
	Q4 – GCSE	28,768	19.8	23,002	21.94
	Q5 – Highest GCSE	28,885	19.9	25,427	24.25
Facilitating subjects taken	0	31,828	21.9	17,306	16.5
	1	43,295	29.8	29,487	28.12
	2	42,755	29.5	34,759	33.15
	3+	27,301	18.8	23,306	22.23
School region	London	28,991	19.97	22,149	21.12
	North East	8,901	6.13	5,989	5.71
	North West	8,888	6.12	5,942	5.67
	Yorkshire and the Humber	12,390	8.53	9,169	8.74
	East Midlands	10,737	7.4	7,928	7.56
	West Midlands	14,831	10.22	11,421	10.89
	East of England	21,870	15.06	15,321	14.61
	South East	24,129	16.62	17,400	16.59
	South West	14,442	9.95	9,539	9.1
School type	Academies	93,512	64.41	67,615	64.48

Comprehensive	38,697	26.65	26,939	25.69
Selective	8,812	6.07	7,260	6.92
Sixth Form	2,006	1.38	1,488	1.42
FE/Tertiary	249	0.17	190	0.18
Other	1,903	1.31	1,366	1.3

Note: The full student sample consists of 145,179 students, the student sample conditional on applying to university is 104,858. The full school sample consists of 1,930 schools, the school sample conditional on applying to university is 1,907.

Table S4. The 10th, 25th, 50th, 75th and 90th percentiles for school effects from the series of models for applying overall, to at least one Russell Group and to three or more Russell Group universities.

	Percentile	Model 1: Unadjusted	Model 2: Socio-demographics	Model 3: Achievement and subjects	Model 4: School characteristics
Applied to university	10	-0.148	-0.130	-0.097	-0.091
	25	-0.070	-0.063	-0.046	-0.044
	50	0.009	0.011	0.007	0.004
	75	0.078	0.069	0.053	0.049
	90	0.135	0.118	0.093	0.087
Applied to at least one Russell Group university	10	-0.187	-0.179	-0.098	-0.080
	25	-0.097	-0.092	-0.050	-0.041
	50	0.005	0.003	0.005	0.001
	75	0.097	0.094	0.054	0.043
	90	0.185	0.181	0.091	0.077
Applied to three or more Russell Group universities	10	-0.187	-0.179	-0.090	-0.079
	25	-0.118	-0.114	-0.052	-0.041
	50	-0.026	-0.025	-0.010	-0.006
	75	0.090	0.084	0.043	0.039
	90	0.206	0.206	0.101	0.086

Table S5. Model results predicting making an application to any university from multilevel linear probability models. Coefficients are reported on the probability scale. * denotes the reference category.

	Model 1: Unadjusted		Model 2: Socio-demographics		Model 3: Attainment and subjects		Model 4: Centre characteristics	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Fixed								
Intercept	0.703	0.003	0.695	0.004	0.474	0.005	0.477	0.008
Male*								
Female			0.031	0.002	0.027	0.002	0.027	0.002
White*								
Black			0.121	0.006	0.133	0.005	0.133	0.005
Asian			0.108	0.004	0.100	0.004	0.097	0.004
Chinese			0.096	0.014	0.060	0.013	0.060	0.013
Mixed			0.042	0.005	0.041	0.005	0.041	0.005
Other ethnicity			0.079	0.009	0.069	0.009	0.069	0.009
Unclassified			0.034	0.011	0.032	0.010	0.032	0.010
No FSM*								
FSM			-0.021	0.005	-0.003	0.005	-0.003	0.005
Not EAL*								
EAL			0.035	0.004	0.031	0.004	0.031	0.004
No SEN*								
SEN			-0.063	0.006	-0.027	0.005	-0.026	0.005
Q1 – Lowest IDACI*								
Q2 IDACI			-0.030	0.004	-0.022	0.004	-0.022	0.004
Q3 IDACI			-0.035	0.004	-0.023	0.004	-0.023	0.004
Q4 IDACI			-0.051	0.004	-0.031	0.004	-0.031	0.004
Q5 - Highest IDACI			-0.052	0.004	-0.025	0.004	-0.025	0.004
Q1 – Lowest GCSE*								
Q2 – GCSE					0.073	0.004	0.073	0.004
Q3 – GCSE					0.115	0.004	0.115	0.004
Q4 – GCSE					0.159	0.004	0.159	0.004
Q5 – Highest GCSE					0.215	0.004	0.214	0.004
0 facilitating subjects*								
1 facilitating subject					0.091	0.003	0.091	0.003
2 facilitating subjects					0.173	0.004	0.173	0.004
3+ facilitating subjects					0.173	0.004	0.172	0.004
Academies*								
Comprehensive							-0.017	0.005
Selective							0.025	0.012
Sixth form college							0.007	0.029
FE/Tertiary							0.018	0.052
Other school type							-0.035	0.018
London*								
North East							-0.037	0.011

North West							-0.061	0.011
Yorkshire and Humber							0.033	0.010
East Midlands							0.044	0.011
West Midlands							0.053	0.009
East of England							-0.001	0.009
South East							-0.003	0.008
South West							-0.030	0.010
Random								
Centre variance	0.015	0.001	0.012	0.001	0.009	0.000	0.008	0.000
Student variance	0.187	0.001	0.185	0.001	0.173	0.001	0.173	0.001

Note: FSM = Free School Meals, EAL = English as an Additional Language, SEN = Special Educational Needs, IDACI = Income Deprivation Affecting Children Index.

Table S6. Model results predicting making an application to at least one Russell Group university, conditional on having made any university application, from multilevel linear probability models. Coefficients are reported on the probability scale. * denotes the reference category.

	Model 1: Unadjusted		Model 2: Socio-demographics		Model 3: Attainment and subjects		Model 4: Centre characteristics	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Fixed								
Intercept	0.660	0.004	0.695	0.005	0.279	0.005	0.330	0.008
Male*								
Female			-0.020	0.003	-0.027	0.003	-0.027	0.003
White*								
Black			0.020	0.006	0.079	0.006	0.075	0.006
Asian			0.033	0.005	0.046	0.004	0.045	0.004
Chinese			0.106	0.015	0.064	0.013	0.064	0.013
Mixed			0.038	0.006	0.050	0.006	0.049	0.006
Other ethnicity			0.052	0.010	0.059	0.009	0.055	0.009
Unclassified			0.009	0.012	0.026	0.011	0.026	0.011
No FSM*								
FSM			-0.028	0.006	0.004	0.005	0.003	0.005
Not EAL*								
EAL			0.015	0.004	0.018	0.004	0.017	0.004
No SEN*								
SEN			-0.075	0.007	-0.009	0.006	-0.010	0.006
Q1 – Lowest IDACI*								
Q2 IDACI			-0.020	0.004	-0.010	0.004	-0.010	0.004
Q3 IDACI			-0.030	0.004	-0.011	0.004	-0.012	0.004
Q4 IDACI			-0.044	0.005	-0.012	0.004	-0.015	0.004
Q5 - Highest IDACI			-0.050	0.005	-0.003	0.004	-0.009	0.004
Q1 – Lowest GCSE*								
Q2 – GCSE					0.123	0.004	0.122	0.004
Q3 – GCSE					0.268	0.004	0.267	0.004
Q4 – GCSE					0.400	0.005	0.400	0.005
Q5 – Highest GCSE					0.480	0.005	0.479	0.005
0 facilitating subjects*								
1 facilitating subject					0.106	0.004	0.106	0.004
2 facilitating subjects					0.186	0.004	0.186	0.004
3+ facilitating subjects					0.220	0.005	0.219	0.005
Academies*								
Comprehensive							-0.006	0.005
Selective							0.034	0.011
Sixth form college							0.028	0.028
FE/Tertiary							0.019	0.051
Other school type							0.022	0.018
London*								
North East							0.040	0.011

North West							-0.013	0.011
Yorkshire and Humber							-0.024	0.010
East Midlands							-0.099	0.010
West Midlands							-0.045	0.009
East of England							-0.104	0.008
South East							-0.096	0.008
South West							-0.029	0.009
Random								
Centre variance	0.025	0.001	0.024	0.001	0.008	0.000	0.006	0.000
Student variance	0.183	0.001	0.182	0.001	0.146	0.001	0.146	0.001

Note: FSM = Free School Meals, EAL = English as an Additional Language, SEN = Special Educational Needs, IDACI = Income Deprivation Affecting Children Index.

Table S7. Model results predicting making an application to three or more Russell Group universities, conditional on having made any university application, from multilevel linear probability models. Coefficients are reported on the probability scale. * denotes the reference category.

	Model 1: Unadjusted		Model 2: Socio-demographics		Model 3: Attainment and subjects		Model 4: Centre characteristics	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Fixed								
Intercept	0.334	0.005	0.395	0.006	0.047	0.005	0.110	0.008
Male*								
Female			-0.018	0.003	-0.033	0.003	-0.033	0.003
White*								
Black			-0.033	0.007	0.031	0.006	0.026	0.006
Asian			-0.010	0.005	0.001	0.004	-0.002	0.004
Chinese			0.127	0.016	0.071	0.013	0.071	0.013
Mixed			0.030	0.007	0.042	0.006	0.040	0.006
Other ethnicity			0.021	0.011	0.027	0.009	0.022	0.009
Unclassified			-0.006	0.013	0.012	0.011	0.010	0.011
No FSM*								
FSM			-0.030	0.006	0.006	0.005	0.004	0.005
Not EAL*								
EAL			0.005	0.005	0.006	0.004	0.004	0.004
No SEN*								
SEN			-0.078	0.007	-0.004	0.006	-0.004	0.006
Q1 – Lowest IDACI*								
Q2 IDACI			-0.026	0.005	-0.013	0.004	-0.014	0.004
Q3 IDACI			-0.042	0.005	-0.019	0.004	-0.020	0.004
Q4 IDACI			-0.062	0.005	-0.026	0.004	-0.029	0.004
Q5 - Highest IDACI			-0.078	0.005	-0.026	0.005	-0.032	0.005
Q1 – Lowest GCSE*								
Q2 – GCSE					0.042	0.004	0.042	0.004
Q3 – GCSE					0.156	0.004	0.155	0.004
Q4 – GCSE					0.343	0.005	0.342	0.005
Q5 – Highest GCSE					0.590	0.005	0.589	0.005
0 facilitating subjects*								
1 facilitating subject					0.053	0.004	0.052	0.004
2 facilitating subjects					0.134	0.004	0.134	0.004
3+ facilitating subjects					0.210	0.005	0.209	0.005
Academies*								
Comprehensive							-0.012	0.006
Selective							0.054	0.012
Sixth form college							0.000	0.029
FE/Tertiary							0.008	0.053
Other school type							-0.004	0.019
London*								
North East							0.005	0.011

North West							-0.020	0.011
Yorkshire and Humber							-0.026	0.010
East Midlands							-0.092	0.011
West Midlands							-0.086	0.009
East of England							-0.101	0.009
South East							-0.104	0.009
South West							-0.045	0.010
Random								
Centre variance	0.033	0.001	0.031	0.001	0.009	0.000	0.007	0.000
Student variance	0.201	0.001	0.200	0.001	0.147	0.001	0.147	0.001

Note: FSM = Free School Meals, EAL = English as an Additional Language, SEN = Special Educational Needs, IDACI = Income Deprivation Affecting Children Index.

Table S8. Model results predicting making an application to any university for the sample of students as present during their GCSEs (age 16, 2017 academic year), from multilevel linear probability models. Coefficients are reported on the probability scale. * denotes reference category.

	Model 1: Unadjusted		Model 2: Socio-demographics		Model 3: Attainment and subjects	
	Est.	SE	Est.	SE	Est.	SE
Fixed						
Intercept	0.299	0.003	0.370	0.003	-0.023	0.005
Male*						
Female			0.083	0.001	0.025	0.001
White*						
Black			0.145	0.003	0.146	0.003
Asian			0.188	0.003	0.136	0.002
Chinese			0.239	0.010	0.110	0.009
Mixed			0.051	0.003	0.040	0.003
Other ethnicity			0.114	0.005	0.089	0.005
Unclassified			0.037	0.007	0.042	0.006
No FSM*						
FSM			-0.090	0.002	-0.016	0.002
Not EAL*						
EAL			0.045	0.002	0.047	0.002
No SEN*						
SEN			-0.197	0.002	-0.012	0.002
Q1 – Lowest IDACI*						
Q2 IDACI			-0.052	0.002	-0.018	0.002
Q3 IDACI			-0.099	0.002	-0.031	0.002
Q4 IDACI			-0.130	0.002	-0.035	0.002
Q5 - Highest IDACI			-0.153	0.002	-0.038	0.002
Q1 – Lowest GCSE*						
Q2 – GCSE					0.086	0.002
Q3 – GCSE					0.258	0.002
Q4 – GCSE					0.433	0.002
Q5 – Highest GCSE					0.641	0.002
0 facilitating subjects*						
1 facilitating subject					0.019	0.005
2 facilitating subjects					0.022	0.005
3 facilitating subjects					0.029	0.005
4 facilitating subjects					0.081	0.005
5+ facilitating subjects					0.120	0.005
Academies*						
Comprehensive						
Selective						
Sixth form college						
FE/Tertiary						

Other school type						
London*						
North East						
North West						
Yorkshire and the Humber						
East Midlands						
West Midlands						
East of England						
South East						
South West						
Random						
Centre variance	0.028	0.001	0.015	0.000	0.003	0.000
Student variance	0.201	0.000	0.189	0.000	0.143	0.000

Note: The GCSE student sample consists of 511,706 students. The number of facilitating subjects taken has more categories than present for the A level sample to reflect the greater number of subjects students typically take at GCSE. FSM = Free School Meals, EAL = English as an Additional Language, SEN = Special Educational Needs, IDACI = Income Deprivation Affecting Children Index.

Table S9. Summary of predicted effects and percentage of effects falling outside the 0-1 probability range for the series of models for applying overall, applying to at least one Russell Group, and applying to three or more Russell Group universities.

	Model 1: Unadjusted		Model 2: Socio-demographics		Model 3: Achievement and subjects		Model 4: School characteristics	
	Predictions outside 0-1 range		Predictions outside 0-1 range		Predictions outside 0-1 range		Predictions outside 0-1 range	
	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Applied to university	-	-	-	-	0.24	342	1.0	1,445
Applied to at least one Russell Group	-	-	-	-	3.3	3,457	6.7	6,994
Applied to three or more Russell Group	-	-	-	-	2.3	2,360	4.2	4,382

Note: The student sample for applying to university overall is 145,179, the sample of students conditional on applying is 104,858.