



# Student sociodemographic and school type differences in teacher-predicted vs. achieved grades for university admission

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## Abstract

In England, students apply to universities using teacher-predicted grades instead of their final end-of-school A-level examination results. Predicted rather than achieved grades therefore determine how ambitiously students apply to and receive offers from the most selective courses. The Universities and Colleges Admissions Service (UCAS) encourages teachers to make optimistic predictions to motivate students to apply ambitiously and achieve higher grades. However, little is known about variations in optimism across students and schools, as well as the mechanisms behind such variations. If certain groups of students or schools are predicted more optimistically than others, this may distort application, offer, and acceptance rates between these groups. Such distortions have the potential to impact efforts to promote wider participation and enhance social mobility. In this study, we use newly linked administrative education data to show predicted grades are differentially optimistic by student sociodemographic and school characteristics. These variations are often substantial and can only be partially explained by differences in students' prior achievements, the subjects they studied at A-level, the degree subjects they pursue, and their choices of university and courses. We find less educationally advantaged students are in general more rather than less optimistically predicted, although there are two important exceptions to this trend. Once we control for GCSE score and A-level subject, greater optimism is observed in independent schools and among Oxbridge applications. Thus, differential optimism is positively impacting some of the most educationally advantaged students in the country. Our findings contribute to the growing consensus advocating for reforms to the admissions system, including whereby students can continue to revise their course choices until they receive their achieved grades, and universities only make offers after that date.

**Keywords** University admissions · Teacher-predicted grades · A-level examination grades · Sociodemographic differences

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## Introduction

In England, students submit their university applications for undergraduate courses with predicted grades provided by their teachers, rather than their final A-level exam results. Consequently, teacher-predicted grades play a crucial role in determining the level of ambition with which students apply for competitive courses and whether they are granted admission offers. The Universities and Colleges Admissions Service (UCAS) promotes the practice of teachers providing optimistic predictions to inspire students to pursue selective courses and attain better grades. An important concern is that certain students and schools might receive more optimistic predictions than others and that this might impact the way different students apply to, receive offers from, and ultimately enrol in the courses that best suit their needs. Murphy and Wyness (2020), for example, show that students predicted more optimistically, all else equal, are more likely to apply to more selective courses. Such distortions would then have important implications for perceptions of fairness (Boliver, 2013), especially if they exacerbate the known underrepresentation of ethnic minority (Boliver, 2016; Noden et al., 2014; Shiner & Modood, 2002) and socioeconomically disadvantaged students in higher education (Boliver, 2017; Dilnot, 2018; Harrison, 2011; Gorard et al., 2019; Marginson, 2016), particularly at the most prestigious universities (Del Bono et al., 2022). If any distortions do play out in this way, they would work against efforts to promote widening participation (Archer & Hutchings, 2000; Chowdry et al., 2013; Greenbank, 2006; Harrison, 2011; Younger et al., 2019) and more fundamentally higher education as a championed route to increased social mobility (Blanden & Machin, 2013; Britton et al., 2021; Shiner & Noden, 2015).

In this study, we analyse recently linked administrative education data from the 2018/2019 UCAS applicant cohort (the final cohort prior to COVID-19). Our aim is to investigate and quantify the extent to which predicted grades exhibit varying degrees of optimism across student sociodemographic and school characteristics. Additionally, we seek to understand to what extent these disparities across groups can be attributed to differences in their GCSE prior achievements, A-level subject selections, chosen degree programs, universities, and courses. Our contribution is two-fold. Firstly, we present results based on more up-to-date and notably more detailed data compared to prior studies. Murphy and Wyness (2020), the most recent and comprehensive prior study, analysed the 2015/2016 cohort and was restricted to a limited set of student characteristics (gender, ethnicity, residential deprivation) and school characteristics (type). In contrast, using similar methods to Murphy and Wyness, we analyse the more recent 2018/2019 cohort with a far richer set of student characteristics (gender, finer-grained ethnicity data, multiple measures of socioeconomic status and residential deprivation, disability, and prior examination results), school characteristics (region, county, type, gender), A-level qualifications (number of qualifications, subjects studied), and application characteristics (number of applications, subject area, university prestige). This leads us to not just update the results of prior studies but to extend them, providing new insights. In particular, we find that while optimism is, in general, greater for less educationally advantaged groups, once we control for GCSE score and A-level subject, greater optimism is observed in independent schools and among Oxbridge applications, positively impacting some of the most educationally advantaged students in the country. Secondly, we provide a more comprehensive interpretation of these optimism variations, shed light on the potential mechanisms underpinning them, and propose solutions to mitigate

these effects. Our new insights and richer interpretation are facilitated by studying how mean optimism differences change with increased control for other variables.

## Previous research

Ofqual (2020), the exams regulator in England, reviewed previous studies comparing teacher-predicted and achieved A-level grades (BIS, 2011, 2013; Delap, 1994; Murphy & Wyness, 2020; Shiner & Modood, 2002; UCAS, 2016). They conclude that optimism is higher for Black and some Asian subgroup students and is higher for more socioeconomically disadvantaged students, except perhaps among the highest achieving students. In contrast, Ofqual concludes that evidence is more mixed in terms of any age or gender effects, and while there are some effects of A-level subject and school type, they deem these effects small.

Ofqual's review stresses the importance of exploring not just simple mean differences in optimism by each student sociodemographic characteristic, but to explore whether each mean difference persists once the influence of other variables is taken into account. The review notes that optimism decreases with increased achieved grade due to a ceiling effect in the A-level grade scale. The A-level grades are A\*, A, B, C, D, E, and U, where an A or higher is considered excellent, a C or higher is good, while a U is an unclassified or failed grade. Thus, while a B student could potentially be predicted two grades higher, an A student can only be predicted a maximum of one grade higher, and an A\* student cannot be optimistically predicted at all: there is no A\*\* grade. So, while it may seem fairest if all student groups are, on average, overpredicted by the same amount, for example, by 1 grade, the ceiling effect prevents this. Thus, mean optimism will, in general, be lower for higher achieving student groups. It is therefore important to move beyond simple mean differences to establish whether these differences persist after one has adjusted for the A-level scale ceiling effect and other potential explanations for differences in optimism. Delap (1994), for example, shows that the ethnic group simple mean differences seen in their univariate analyses disappear once they control for achieved grades and other variables. In contrast, a gender effect, whereby mean optimism is higher for male versus female students, only becomes apparent upon control.

The subtle point alluded to above that among the highest achieving students, disadvantaged students are predicted slightly less optimistically than their more advantage peers was made by Murphy and Wyness (2020). They also show that among this subgroup, state school students received less optimistic predictions than their independent school peers. They argue that these two distortions may be deterring high achieving disadvantaged students from applying to the most selective courses as their predicted grades are misinforming them as to their potential relative to more advantaged but similarly high achieving students.

A limitation with all previous studies and which will also apply to our study is that optimism is defined by comparing predicted to achieved grades, but achieved grades will to some extent be positively influenced by the degree of optimism applied to the predicted grades. Indeed, this influence is part of the motivation for encouraging optimistic predictions. A preferable analysis might be to compare predicted grades to the grades that students are on track to achieve at the point predictions are made, but no such data is available.

Interestingly, the above studies offer few explanations for differences in optimism beyond the A-level scale ceiling effect noted above. An exception is Murphy and Wyness

(2020) who suggest three possibilities: teacher unconscious bias, differential growth in achievement over the last 6 months of A-level studies, and differential effect of predicted grades on motivation and effort. A further explanation implicit in the advice that UCAS provides to teachers (UCAS, 2023b) is that predicted grades should not be “affected by student, parental, guardian, or carer pressure”, or “influenced by university or college entry requirements or behaviours”. Thus, it may additionally be the case that some student groups place more pressure on their teachers to predict high than other student groups or if certain student groups tend to apply to more selective courses than others, their teachers may respond to this difference by predicting them more optimistically than their peers to make sure they still have a good chance of receiving offers.

## Background on UCAS

Most students apply to university via UCAS in their final year of secondary schooling (year 13, age 17/18). Students may apply to up to five courses. Students apply some 6 months before their end-of-school A-level examinations and some 9 months before they intend to start their preferred courses. Given these constraints, students apply with teacher-predicted grades for the three subjects they have chosen to study at A-level rather than the actual grades they go on to achieve. While students also submit their General Certificate of Secondary Education (GCSE) examination results (year 11, age 15/16), other student background data, a personal statement, and a school-provided written reference, predicted grades are nevertheless the main information provided on students’ suitability for different courses. As a result, predicted grades play a crucial role in shaping which courses students apply to and the level of aspiration associated with these choices. The two processes, however, are not sequential. Students discuss their aspirations with their teachers while the latter are determining their predicted grades. Therefore, student aspirations are likely to influence predicted grades, just as predicted grades influence aspirations. These predicted grades then influence whether courses offer places back to applicants, and subsequently, which offers students declare as their preferred “firm” offer (with typically higher entry requirements) and “insurance” offer (with typically lower entry requirements). This approach is taken with the anticipation that students accept their “firm” offer after their actual grades are revealed. In the 2018/2019 cohort that is our focus, 34.1% of UK 18-year-olds entered university with 73.6% placed on their preferred course (UCAS, 2019). See UCAS (2023a) for further detail about the application process.

In their advice to teachers, UCAS (2023b) states that predicted grades should be “aspirational but achievable” or in other words the grades students are “likely to achieve in positive circumstances”. Their argument is that “stretching predicted grades can be motivational for students” presumably as they increase students’ chances of applying to and receiving offers from more selective courses with higher entry requirements and this in turn will lead students to work harder towards these higher grades. Thus, where students do fulfil their potential, they will be able to attend an appropriately selective course rather than having to reapply (via Clearing). UCAS, however, does not give any numerical guidance as to just how optimistic predictions should be, although they do warn that excessive optimism can disadvantage rather than advantage students as then “applicants may receive offers they are unlikely to meet” or may “gain admission to courses which they cannot succeed in”. In 2018/2019, 79% of accepted 18-year-olds missed their predicted grades (UCAS, 2019).

## Data

### Source

The data are provided by the Grading and Admissions Data for England (GRADE) data sharing project, a joint open data initiative initiated between UCAS, Ofqual, and the Department for Education (DfE) in 2020 (GRADE, 2021). The first student-level linked data was made available via the Office for National Statistics (ONS) Secure Research Service (SRS) in spring 2022. The provided data relate to the population of students in England who applied to universities via UCAS in 2018/2019 with one or more A-level results. The data therefore do not include any mature or international students. They also do not include any non-A-level or non-qualifications. The data links students' A-level results and university application data to their sociodemographic and school characteristics and their earlier GCSE qualifications.

### Sample selection

The data contain one row per A-level subject studied per student. The initial population consists of 188,918 students from 2562 schools with 530,597 A-level qualifications. We make various sample restrictions, resulting in a final sample of 170,750 students (90%) from 2490 schools (97%), with 465,723 A-level qualifications (88%). The biggest of these relates to dropping students with no GCSE scores. This leads the sample to become slightly less educationally advantaged, as those with no GCSE score are typically students from independent schools who have taken other qualification types. The majority of students (71%) apply with three A-level qualifications, while 8%, 17%, and 4% apply with one, two, or four A-level qualifications, respectively.

### Variables

#### Predicted grades, achieved grades, and grade optimism

Predicted and achieved A-level grades are letter grades to which we assign numeric values ( $A^* = 6$ ,  $A = 5$ ,  $B = 4$ ,  $C = 3$ ,  $D = 2$ ,  $E = 1$ ,  $U = 0$ ). We define grade optimism as predicted grade minus achieved grade.

#### Student sociodemographic characteristics

Student sociodemographic characteristics include gender, ethnicity, socioeconomic status (SES), and disability. Ethnicity includes six and 15 group versions. SES is captured via three measures: the national statistics socioeconomic classification (NS-SEC), the index of multiple deprivation (IMD), and the participation of local area (POLAR). NS-SEC is an ordinal measure of students' parents' employment status and occupation. IMD and POLAR are middle super output area (MSOA) quintile measures of residential deprivation and the proportion of young people aged 18 or 19 who participate in

higher education, respectively. MSOAs are mid-sized geographic areas used for reporting small area statistics.

### **School characteristics**

School characteristics include region, county, type, and gender. Type distinguishes state schools (free) from independent schools (fee-paying). State schools are further distinguished into academies (relatively autonomous), grammar schools (which have entrance exams), and sixth form and further educational colleges (only teach students aged 16 and over).

### **Student GCSE prior achievement**

Student GCSE prior achievement is a continuous point score derived by summing across each student's eight best GCSE examination grades (most students take eight to ten GCSEs). We categorize this into 25 quantiles.

### **A-level subject studied**

We observe predicted and achieved grades across 32 subject areas. For some analyses, we focus on so-called facilitating subjects: English literature, maths and further maths, biology, chemistry, physics, geography, history, modern languages, and classical languages. These subjects are traditionally the most asked for in course entry requirements to Russell Group universities (Russell Group, 2019), a self-selected association of 24 universities traditionally viewed as the most prestigious for students to attend.

### **Application characteristics**

For each student, we observe the number of courses applied to, the predominant degree subject area applied to, the proportion of applications that are Russell Group applications, and whether an application was made to Oxbridge (University of Oxford or University of Cambridge, traditionally considered the two most elite institutions).

## **Methodology**

Our interest lies in whether, how, and why grade optimism systematically varies by student sociodemographic and school characteristics and the extent to which any such differences can be understood in terms of the different GCSE prior achievement, A-level subject, and application characteristics of these student and school groups.

First, we describe the overall predicted grade, achieved grade, and grade optimism distributions. Next, we calculate mean optimism and show how this varies by each student sociodemographic and school characteristic in turn. Then, we shift to a series of student-subject-level linear regression models to explore how mean optimism by each characteristic changes as we increasingly statistically control for other characteristics. All models are estimated with school cluster robust standard errors. Model 1 replicates the unadjusted mean difference in optimism by regressing optimism on the characteristic of interest and so provides our baseline. Model 2 controls for student GCSE score and number of A-levels

studied to adjust for the ceiling effect. We do not additionally control for achieved A-level grade due to the concern that it might be positively influenced by the predicted grade. This approach contrasts Murphy and Wyness (2020) who did not have access to GCSE scores and adjusted for achieved A-level grades. However, as explained in the “Introduction”, this does not mean that the current analysis is entirely free of this problem. It remains a concern that affects all studies of optimism, given the definition of optimism as the difference between predicted and achieved grades. Model 3 additionally controls for A-level subject studied. Model 4 adds in application characteristics (less than five applications, degree subject, number of Russell Group applications, applied to Oxbridge). Model 5 adds in other student sociodemographics (gender, ethnicity minor, NS-SEC, IMD, POLAR, disability). Model 6 adds in school characteristics (county, type, gender). Model 7 adds in school fixed-effect dummy variables. Note that, with the inclusion of the school fixed-effect dummy variables, the model 6 school characteristics are no longer identified and therefore omitted from model 7. We present the model results by plotting predicted mean optimism by each characteristic holding all control variables at their sample means against model number. See the Supplementary Information for model equations and further details.

## Results

### Predicted grades, achieved grades, and grade optimism

Figure 1 shows the predicted and achieved grade distributions. Predicted grades are optimistic: the predicted distribution is notably more concentrated in the highest A\* and A grades relative to the achieved distribution. Teachers overpredict 60.7% of grades, accurately predict 31.8% of grades, and underpredict just 7.5% of grades. Almost one in four predicted grades (23.8%) are overpredicted by two or more grades. The optimism distribution (predicted minus achieved grade) is approximately symmetric with a mean of 0.84 grades per subject ( $SD = 1.05$ ). Summing across three A-levels, students

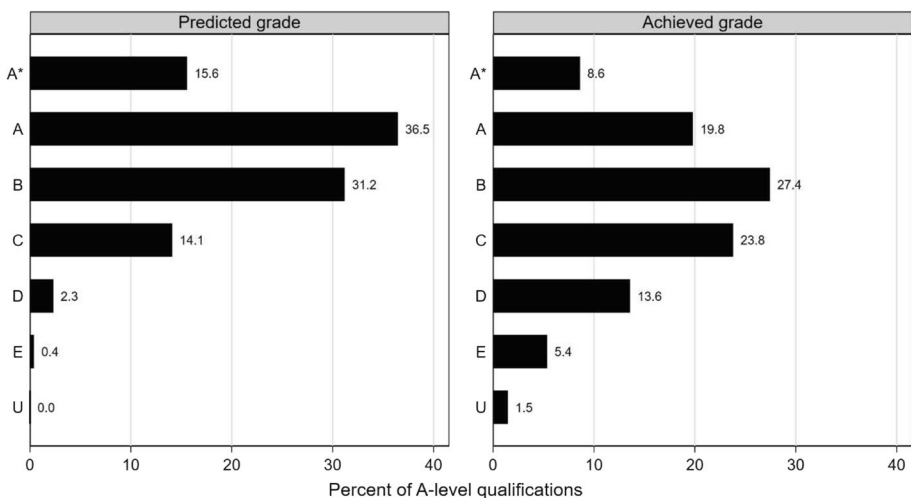


Fig. 1 Predicted and achieved grade distributions

are therefore, on average, overpredicted by 2.52 grades. Thus, students who achieve, for instance, BBB are, on average, predicted AAB or AAA. Importantly, mean optimism will decrease as a function of achieved grade due to the A-level scale ceiling effect and it follows that mean optimism will therefore also be lower for higher achieving student and school groups, a point we will return to once we have described simple mean differences in optimism by each student and school characteristics.

## Simple mean optimism by student sociodemographics and school characteristics

### Student sociodemographics

Figure 2 shows how mean predicted grade (right line) and mean achieved grade (left line) vary by gender, ethnicity (major and minor), SES (NS-SEC, IMD, and POLAR), and disability. We present these mean scores with 95% confidence intervals. We sort the categories of each sociodemographic characteristic by their mean achieved grade. Visually, mean optimism is depicted by the horizontal distance between the two lines, and we report these values on the plot.

Mean optimism varies across the categories of each student sociodemographic characteristic except gender where mean optimism is 0.83 grades per subject for males versus 0.84 for males (range=0.01). For all other characteristics, the degree of mean optimism noticeably reduces with increased achieved grade (the line plots converge as we move from bottom to top). This pattern is consistent with the A-level scale ceiling effect. However, the differing profiles of the predicted grade lines from those of the achieved grade lines indicate that there is more to differential mean optimism than just this mechanical explanation.

In terms of optimism differences across major ethnic categories, mean optimism ranges from 0.77 for white students to 1.07 for black students (range=0.30) with Asian students overpredicted, on average, by 1.00 grade per subject. However, within each major ethnic category, there is variation across minor ethnic subcategories, especially for Asian students where mean optimism ranges from 0.81 for Chinese students to 1.08 for students from other Asian backgrounds (range=0.27). Importantly, mean predicted grades do not increase monotonically with increasing mean achieved grade. We see notably lower mean optimism for White and Black Caribbean, White and Black African, and White students versus what we might expect given their mean achieved grades and the overall trend between mean predicted and mean achieved grades for the 15 ethnic groups (the predicted line noticeably drops down for these three ethnic groups relative to the achieved line).

Turning attention to SES, mean optimism is negatively associated with increasing SES whether we measure this by NS-SEC, IMD, or POLAR. For example, in terms of IMD, mean optimism ranges from 0.72 in the least deprived areas to 1.01 in the most deprived areas (range=0.29).

Mean overprediction also varies by disability, ranging from 0.68 for students with learning difficulties to 0.89 for students with mental health disabilities or deaf/partial hearing (range=0.21). In contrast, mean optimism for the 90% of students with no disabilities is 0.84. We see lower mean optimism for learning difficulty versus what we might expect given their achieved grades and the overall trend between mean predicted and mean achieved grades.



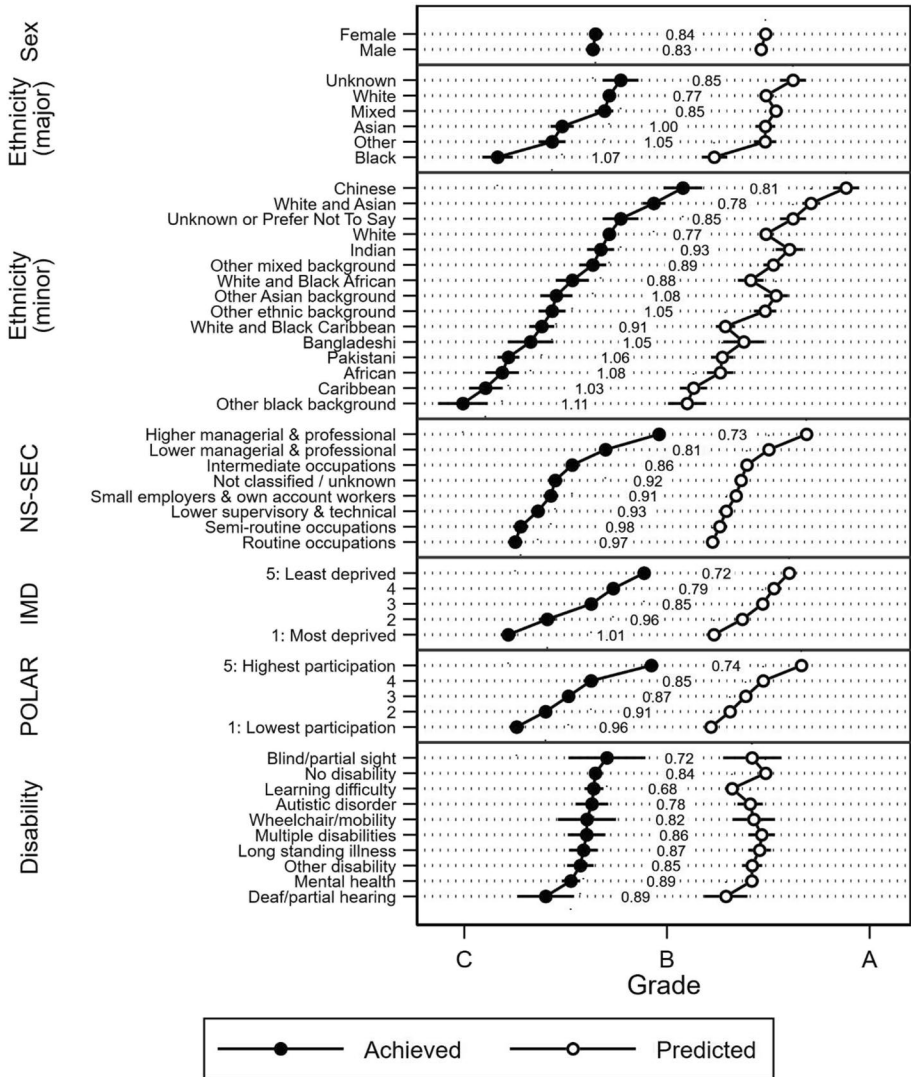


Fig. 2 Mean predicted and achieved grades by student sociodemographic characteristics

### School characteristics

Figure 3 shows how mean predicted grade, achieved grade, and optimism vary by region, county, school type, and school gender.

Mean optimism ranges from 0.72 in the South East to 0.97 in London (range = 0.25). Relative to other regions, mean optimism appears higher in London versus what we might expect given their achieved grades. Turning attention to counties, mean optimism ranges from 0.57 in East Sussex to 1.05 in Staffordshire (range = 0.48). Mean optimism is noticeably lower in Leicestershire and noticeably higher in Rutland

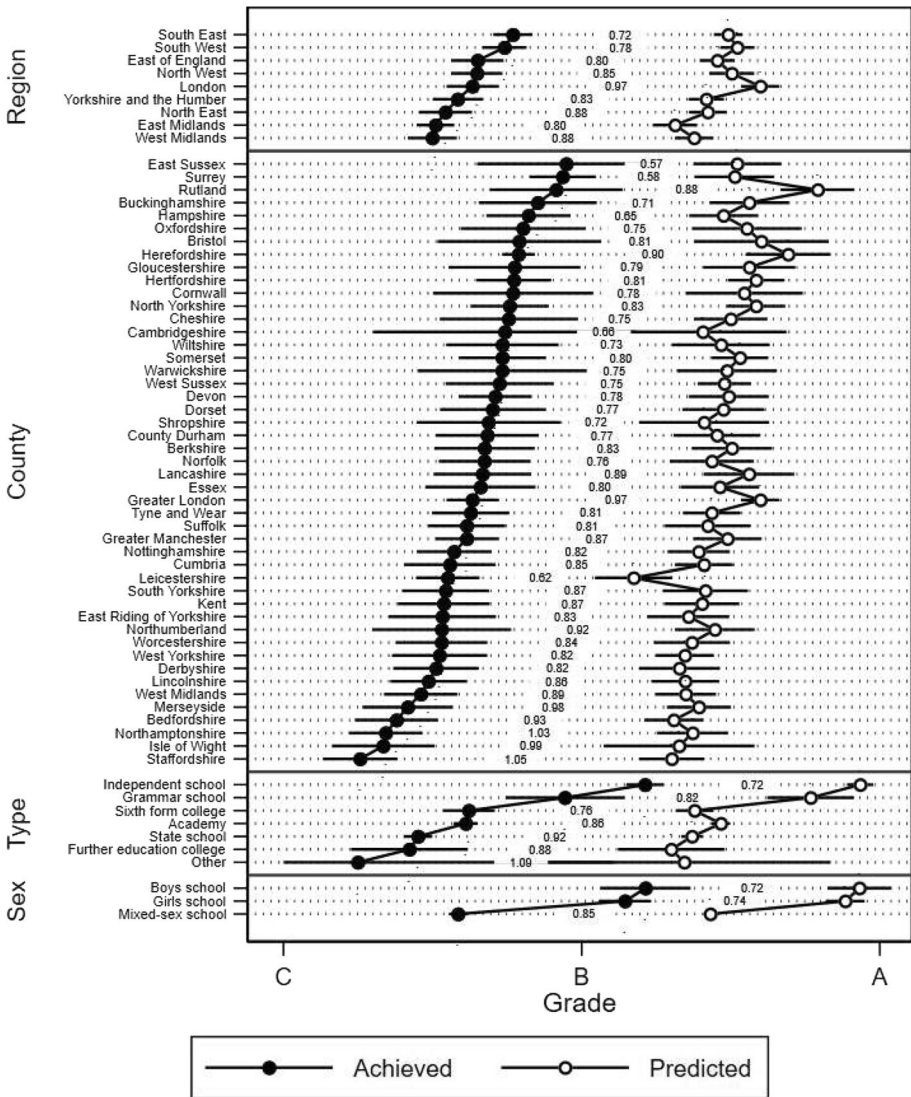


Fig. 3 Mean predicted and achieved grades by school characteristics

relative to what one would expect given the mean achieved grades in these two counties and the overall relationship between mean predicted and mean achieved grades. By school type, mean optimism ranges from 0.72 in independent schools to 1.09 in other schools (range = 0.37), though we note that there are relatively few of the latter. The lower mean optimism in independent schools (and single-sex versus mixed-sex schools) is expected given the especially high achieving students these schools teach.

### Simple mean optimism by student GCSE achievement, A-level subject, and application characteristics

The variation in mean optimism by student and school characteristics will, to some extent, be explained by differences in GCSE score, A-level subjects (determined prior to the assigning of predicted grades), and application choices made by these groups (made concurrent with predicted grades). To facilitate our interpretation when we control for these variables, we first briefly describe mean optimism for each of these sets of characteristics.

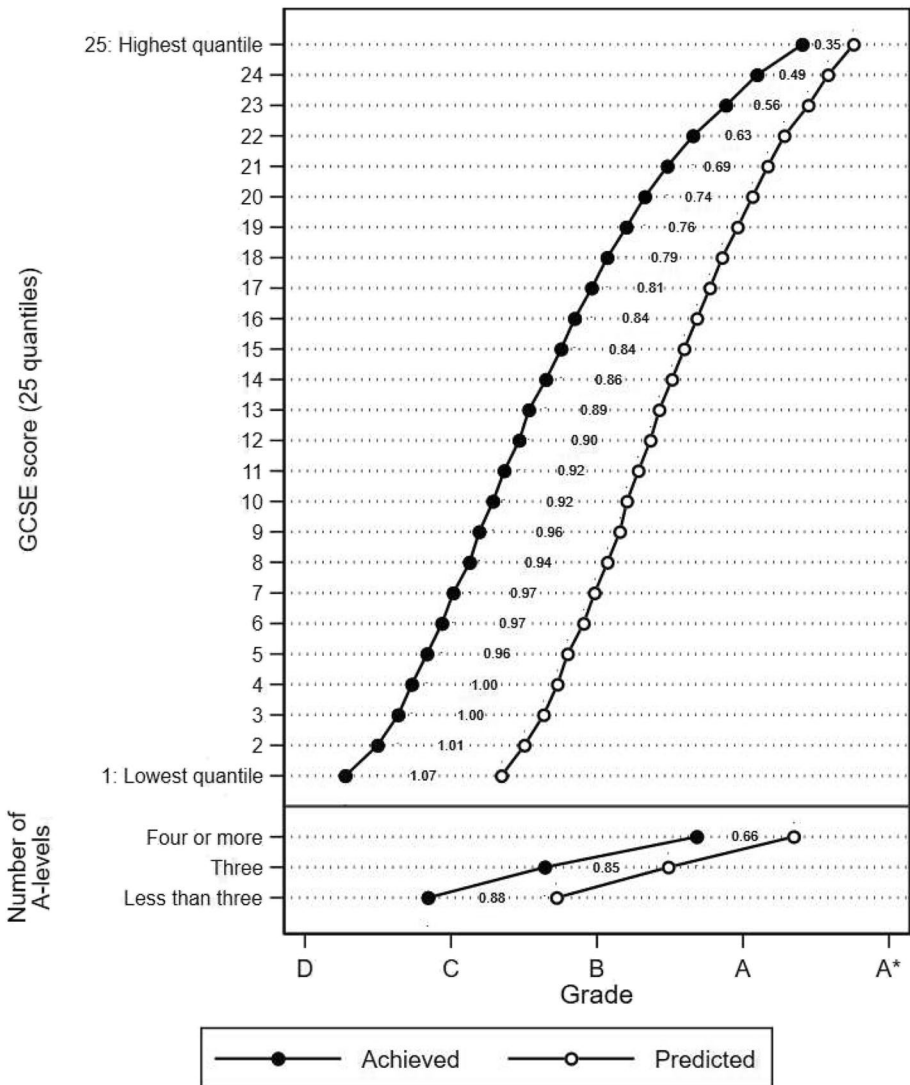


Fig. 4 Mean predicted and achieved grades by student GCSE score

Student prior achievement characteristics

Figure 4 shows how mean predicted grade, achieved grade, and optimism vary by GCSE score and number of A-levels. Mean optimism narrows dramatically with increased GCSE score quantile. This is the clearest illustration of the A-level scale ceiling effect.

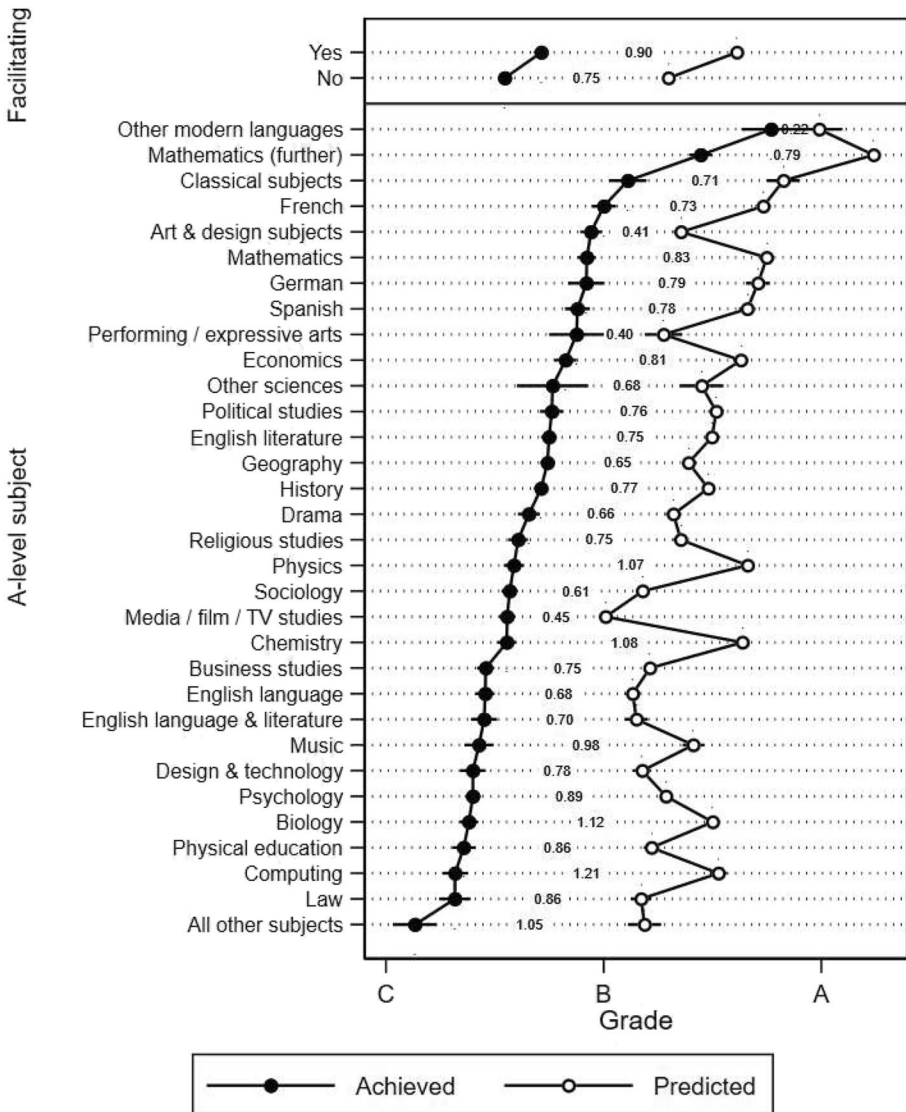


Fig. 5 Mean predicted and achieved grades by A-level subject

A-level subject characteristics

Figure 5 shows how mean predicted grade, achieved grade, and optimism vary by A-level subject. Mean optimism is higher in facilitating subjects. In terms of individual subjects, as mean optimism increases, we see a general shift from creative art subjects to social sciences, then humanities and modern languages, then maths, and lastly psychology and the traditional sciences. Particularly noteworthy is that the high optimism seen in the sciences and the low optimism seen in the arts are higher and lower than

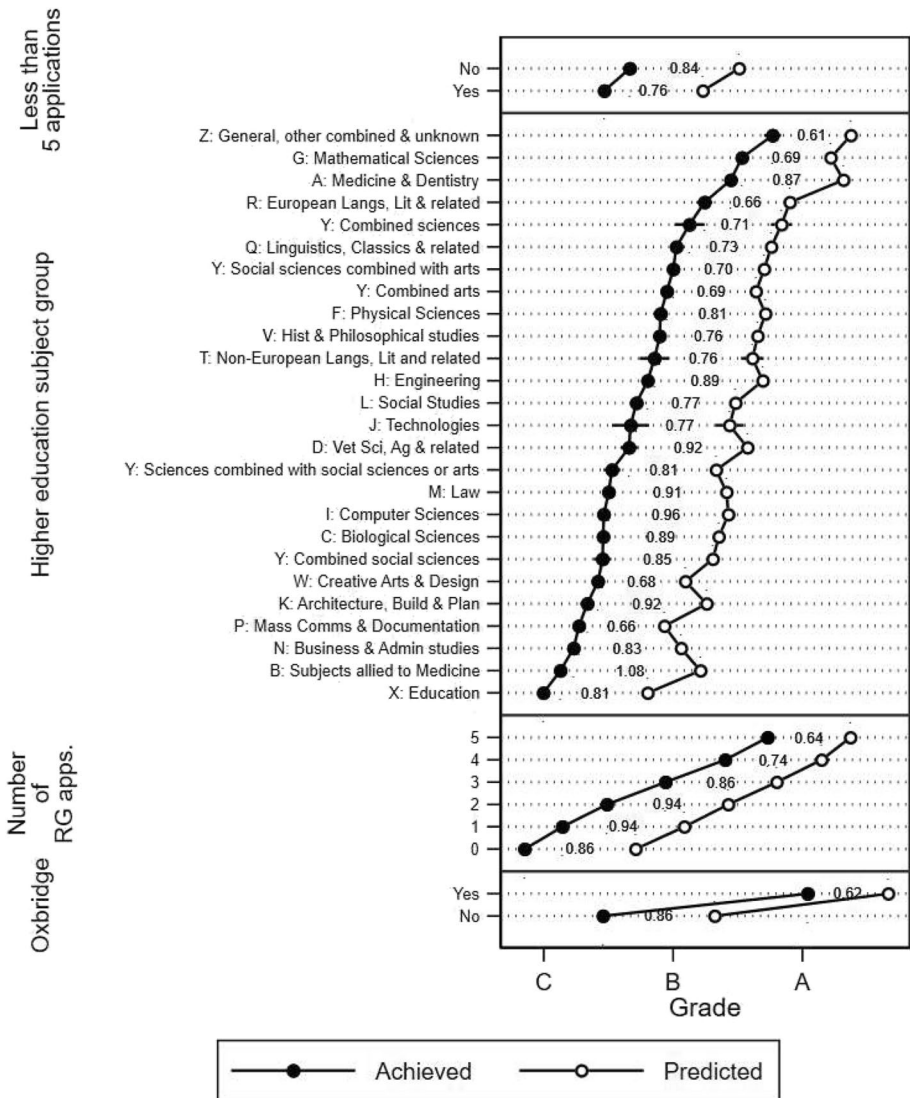


Fig. 6 Mean predicted and achieved grades by application characteristics

what we might expect given the mean achieved grades and the overall trend between mean predicted and mean achieved grades for the 32 subjects.

## Application characteristics

Figure 6 shows how mean predicted grade, achieved grade, and optimism also vary by different application-specific characteristics. Here we see some agreement with the findings for A-level subject (Fig. 5) in that sciences (and now associated subjects, including medicine, dentistry, engineering, and architecture) show the highest mean optimism, with social sciences and arts showing lower optimism. Turning attention to where students apply, mean optimism is lower for those who apply exclusively to Russell Group universities and those who apply to Oxbridge versus other applicants. As one would expect, these last two characteristics are strongly correlated with mean predicted and mean achieved grades.

## Adjusted mean optimism by gender, ethnicity, IMD, county, school type, and Oxbridge

The variation in mean optimism by nearly all student sociodemographic characteristics (Fig. 2) and school characteristics (Fig. 3) is considerable. However, there is greater variation by GCSE score (Fig. 4) and academic subject (Fig. 5) and important variation by application characteristics (Fig. 6). These latter variables will be strongly associated with student sociodemographic and school characteristics. In this section, we therefore explore how student sociodemographic and school characteristic differences in mean optimism change when we adjust for these factors. We focus on the most interesting results.

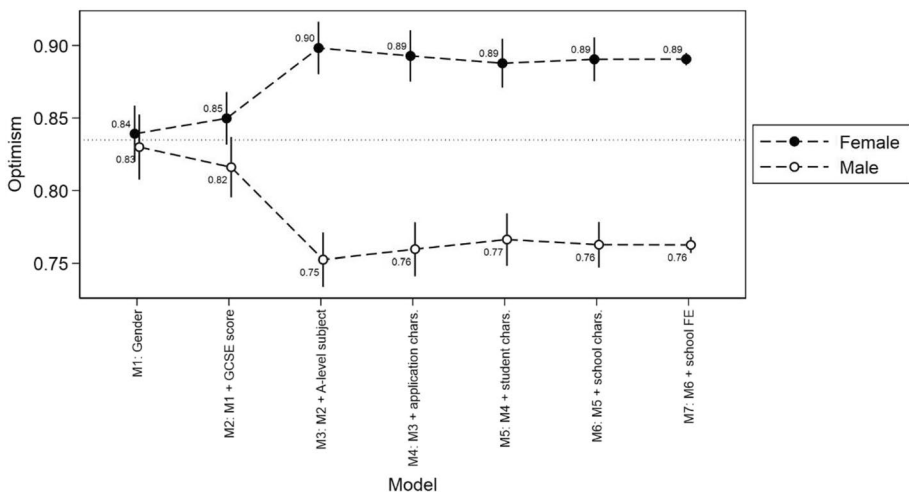


Fig. 7 Adjusted mean optimism, by gender

## Gender

Figure 7 plots mean optimism for male and female students against model number where each successive model controls for additional variables. The adjusted mean optimism values are reported on the plot and are presented with 95% confidence intervals. These values are model predictions where we hold all other variables at their sample mean values.

The plot shows that while there is no overall gender mean difference with males and females overpredicted 0.83 and 0.84 respectively (model 1,  $d=0.01$ ,  $p=.230$ ; see also Fig. 2), as soon as we adjust for GCSE score (model 2) and especially A-level subject (model 3), a gender difference appears with male and female students now overpredicted 0.75 and 0.90 respectively ( $d=0.03$ ,  $p<.001$  and  $d=0.15$ ,  $p<.001$ ). In contrast, subsequent adjustments for application characteristics, other student sociodemographics, and school characteristics make little further difference to the results. Recall that the SD of optimism is 1.05 grades and so the gender difference of 0.15 grades equates to 0.14 of a SD and is therefore meaningful.

The intuition for this suppression effect is that, on average, females show higher GCSE scores than males and are concentrated relatively higher in arts and social science A-level subjects rather than sciences. Both higher GCSE scores and arts and social sciences A-level subjects are associated with lower optimism (Figs. 4 and 5). The intuition why further adjustments (models 4–7) make no impact is that, in contrast to GCSE score and A-level subject, gender does not strongly correlate with application, student sociodemographics, or school characteristics and so these characteristics cannot predict why females are predicted more optimistically than males.

## Ethnicity

Figure 8 shows how mean optimism for each major ethnic group changes with statistical control. We highlight the three largest groups, White, Black, and Asian students. Mean optimism is 0.30 grades higher for Black students ( $p<.001$ ) and 0.23 grades higher for

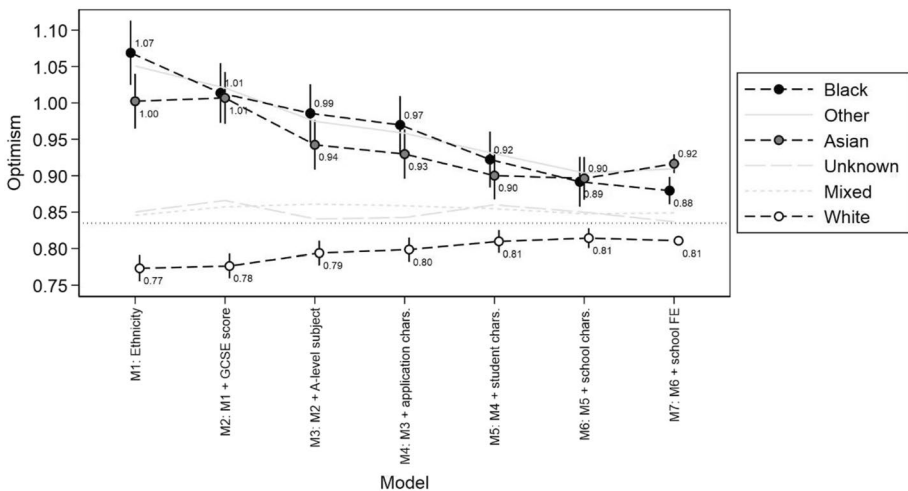


Fig. 8 Adjusted mean optimism, by ethnicity (major)

Asian students ( $p < .001$ ) versus White students (see also Fig. 2). As White students account for 71% of all applications, mean optimism moves less with statistical control than for Black (5.6%) and Asian (15.8%) students. In contrast to the results for gender, here adjusting for GCSE score (model 2) and A-level subject (model 3) do explain some of the differences in mean optimism between ethnic groups (as Black students have lower mean GCSE scores than White and Asian students and Asian students and to a lesser extent Black students study subjects where mean optimism is in general higher than White students: sciences rather than arts). Also, and again in contrast to the results for gender, adjusting for other student characteristics (model 5) narrows the mean differences further (as Black and to a lesser extent Asian students are, on average, lower SES than White students). Nevertheless, even in the most complex models (Model 6 and 7), Black and Asian students continue to be, on average, predicted more optimistically than White students.

### Index of multiple deprivation (IMD)

Figure 9 shows that while mean optimism is, on average, 0.29 grades higher for those in the most deprived areas compared to those in the least deprived areas (model 1,  $p < .001$ ), adjusting for GCSE score, A-level subject, then application characteristics (model 4) narrows this to 0.17 grades ( $p < .001$ ). However, this is still equivalent to almost one in five poorer students being predicted one grade higher than otherwise observationally equivalent richer peers. While adjustment for other student sociodemographics (model 5) narrows this to 0.08 ( $p < .001$ ), we note that these sociodemographics include adjustments for NS-SEC and POLAR, two competing measures of SES. So, in maintaining a common set of controls for comparability across each focal characteristic, in this instance, we are perhaps over adjusting the IMD mean differences.

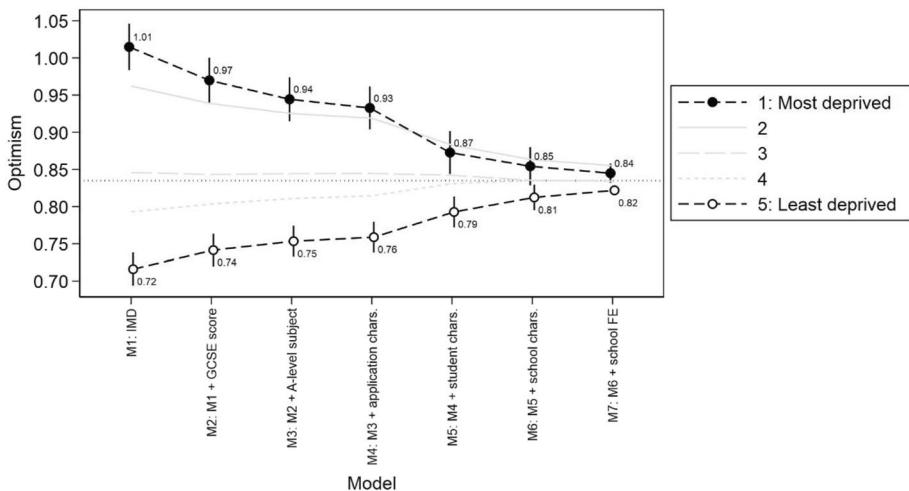


Fig. 9 Adjusted mean optimism, by index of multiple deprivation (IMD) quantile



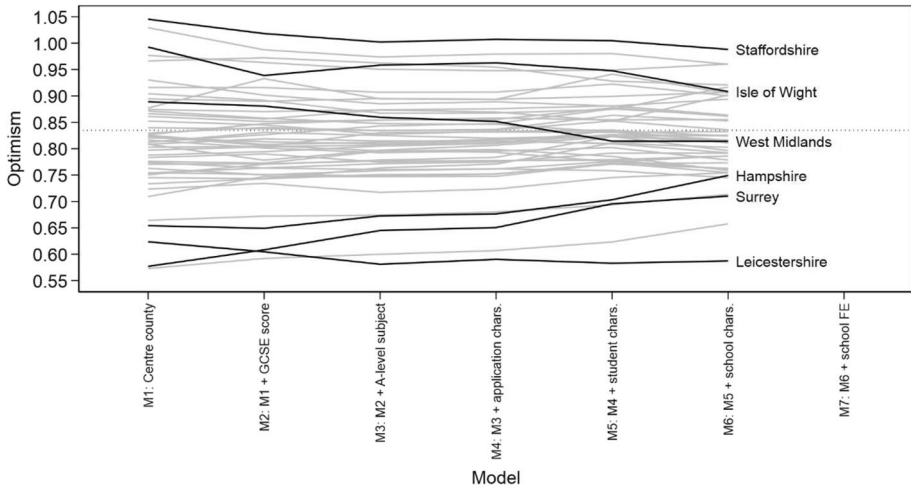


Fig. 10 Adjusted mean optimism, by county

### County

Figure 10 shows how mean optimism in each county changes with statistical control. Note that no results are plotted for model 7, as it is not possible to estimate county effects in the presence of school fixed effects. Schools are nested within counties, resulting in perfect collinearity between the two sets of effects. The overall impression is that, in contrast to gender (suppression) and ethnicity and IMD (explanation), we see relatively little change in differences in mean optimism across counties as we apply statistical control. Indeed, as we move from model 1 to model 6, the range in mean optimism across the 47 counties

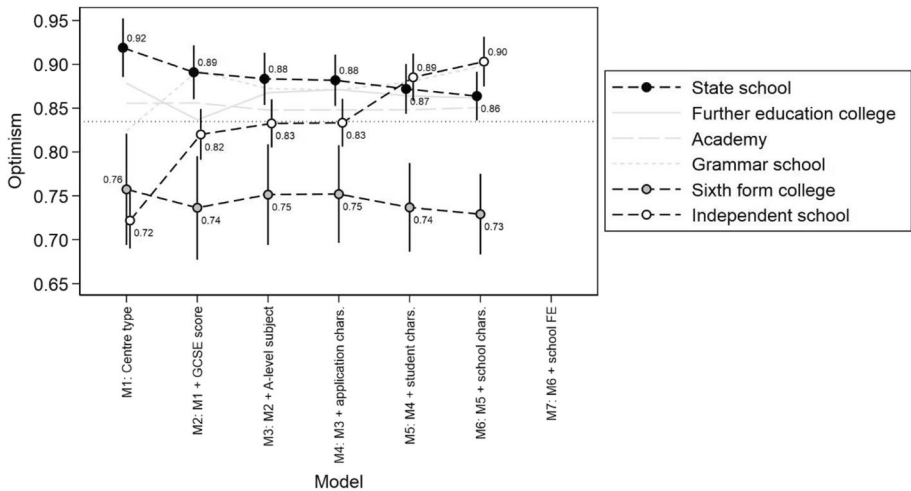


Fig. 11 Adjusted mean optimism, by school type

only drops from 0.50 (= 1.05–0.55) to 0.40 (= 0.99–0.59) and the correlation is very high at 0.91. One explanation might relate to potential geographic differences in schools and teachers' underlying tendencies to predict optimistically that are largely unrelated to student characteristics, for example, geographic variation in school policies, practices, culture, or the way teachers are trained.

## School type

Figure 11 shows how mean optimism by school type changes with statistical control (we omit the very small Other category). We highlight state schools (21% of students), independent schools (9.6%), and sixth-form colleges (SFCs; 21.3%). The general impression once again differs from those drawn for the earlier characteristics studied. With statistical control, we see a noticeable reordering of how optimistic the school types are. While the unadjusted mean optimism scores show optimism is lowest in independent schools (0.72 grades, model 1), once we adjust for the full set of covariates, mean optimism is highest in independent schools (0.90 grades, model 6). Adjusting for GCSE score leads mean optimism in independent schools to increase. This is driven by the very high mean GCSE score of students attending this school type. Adjusting for A-level subject raises mean optimism further. As an aside, mean optimism in grammar schools also increases when adjusting for GCSE scores but decreases when adjusting for subject. This is because, although grammar schools have similarly high GCSE scores to independent schools, they concentrate more on facilitating subjects where mean optimism is higher than for non-facilitating subjects. Further adjustment for student sociodemographics sees another large increase in mean optimism for independent schools (and to a lesser extent grammar schools) reflecting the very socioeconomically advantaged nature of their students. For state schools, the successive adjustments pull their mean optimism towards the overall sample average of 0.84 (in particular, as they show below average GCSE score). SFCs on the other hand do not converge towards the overall average. That is, in contrast to independent schools, the covariates do not explain why this school type shows such low optimism. SFCs are much larger than

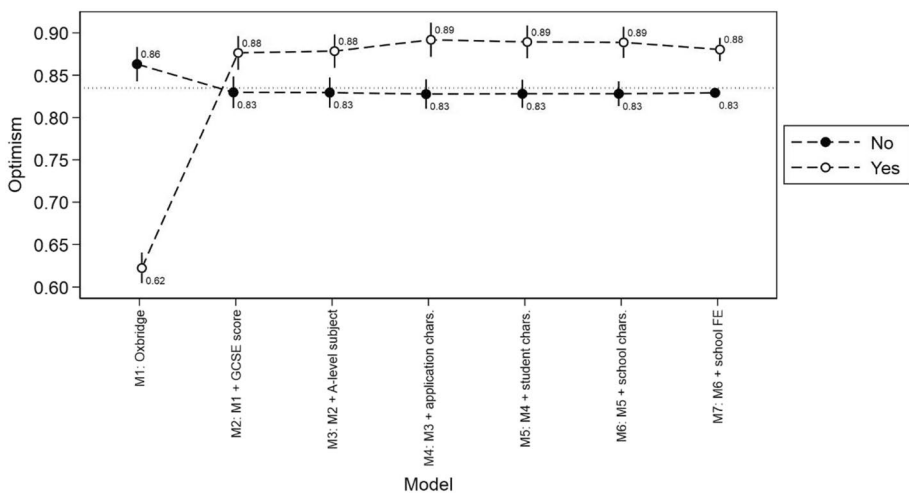


Fig. 12 Adjusted mean optimism, by whether student applied to Oxbridge

other school types (the mean SFC has 270 students vs. 68 in the average school), so one explanation may be that predicted grades and therefore optimism are internally moderated more in larger institutions. Their greater size may also lead to less personal teacher-student relationships making teachers less likely to feel pressured to predict optimistically.

## Oxbridge

Finally, Fig. 12 shows how mean optimism by whether students apply to Oxbridge changes with statistical control. Here we see an even more exaggerated version of the story seen for independent schools versus state schools. While the unadjusted mean optimism scores show optimism is lower among Oxbridge applicants (0.62 grades, model 1) versus non-Oxbridge applicants (0.86,  $d=0.24$ ,  $p<.001$ ), once we adjust for GCSE scores we see that mean optimism is higher for Oxbridge applicants (model 2, 0.88 vs. 0.83,  $d=0.05$ ,  $p<.001$ ). Further adjustment for the remaining covariates does little to alter this result (models 3–7). However, we did not find any evidence of especially high mean optimism among applicants who both attended independent schools and applied to Oxbridge.

## Discussion

### Key findings

#### Predicted grades are optimistic

Teacher-predicted A-level grades are optimistic. Our analysis of the 2018/2019 UCAS cohort of applicants shows that 61% of grades are overpredicted with the average student predicted 0.84 grades higher per A-level subject than they go on to achieve. This is equivalent to being overpredicted 2.5 grades across their three subjects. For example, a BBB achieving student would, on average, have been predicted AAB or AAA. This is higher than the 1.7 grades reported by Murphy and Wyness (2020) in their analysis of the 2012/2013–2014/2015 UCAS cohorts, which is in line with the understanding that optimism has increased rapidly in recent years (DfE, 2021). UCAS encourages teachers to predict optimistically arguing that stretching grades are motivating for students (UCAS, 2023b). Questions that arise are, therefore, “How optimistically should teachers predict?” and “Is 0.84 grades per subject optimal?” However, UCAS gives no such numerical guidance. UCAS does warn that excessive optimism may lead students to receive offers they are unlikely to meet or to gain admission to courses which they then struggle on (UCAS, 2023b). However, here too they do not quantify at what point desirable optimism strays into excessive optimism. These concerns are by no means the only ones. For example, excessive optimism may also lead certain students to experience undue stress in pursuit of unattainably high predicted grades (DfE, 2022). Other students may be demotivated by excessively optimistic predicted grades, undermining the central argument for optimism in the first place. Other students again may receive unconditional offers (whereby students are offered places on courses regardless of what grades they go on to achieve) when they would not have done with more realistic predicted grades. This may demotivate these students from achieving their best grades. Finally, if stretching grades are indeed motivational, then students not applying to university would appear to be missing this benefit.

## Predicted grades are differentially optimistic for different student and school groups

Our main finding, however, is not that optimism is high in general, but that it is differentially high across student and school groups, often substantially so, and with greater optimism among less educationally advantaged groups. Importantly, this trend while diminished remained even after adjusting for GCSE scores and therefore the A-level scale ceiling effect. Furthermore, even after additional adjustments for A-level subjects and application related factors, differences in optimism across student and school groups often remain sizeable. These findings suggest that the reliance on predicted grades, rather than achieved grades, in the application process may distort students' applications, the offers they receive, and ultimately which students are accepted at the most prestigious universities and courses (Murphy & Wyness, 2020). Further research using the GRADE data analysed here, along with the increasingly rich Longitudinal Education Outcomes (LEO, 2024) linked administrative education data, is needed to explore this.

In terms of our specific results, these mainly support the Ofqual (2020) review on previous research comparing teacher-predicted and achieved grades, namely that optimism is higher for Black, Asian (Fig. 8), and low SES students (Fig. 9). However, in contrast to Ofqual's conclusions, we find many large A-level subject effects (Fig. 5) and we view the school type differences we find as important (Fig. 11). We also show many new results such as more optimistic predictions for girls that only becomes apparent once we control for GCSE score and A-level subject (Fig. 7) and large persistent region and especially county differences in optimism (Fig. 10). We note that our ethnic group findings and our finding that girls are predicted more optimistically than boys both contradict those reported by Delap (1994) suggesting that patterns of differential optimism have changed over time, though we note there may be other explanations.

While, in one sense, any differences in optimism among student groups might appear unfair, particularly after accounting for GCSE score and A-level subject, many might perceive the finding of higher optimism among less educationally advantaged groups as a potentially positive result. This is because it may be encouraging historically under-represented groups to aim higher than they might otherwise, thereby supporting initiatives aimed at widening participation and enhancing social mobility. However, if we are to accept and support this argument, it would be better for this differential optimism to be intentionally set via advice and guidance, rather than depending on its emergence in the current ad hoc and unmonitored manner. Yet, given our previous discussion about excessive optimism, it is not certain that greater optimism for less educational advantaged groups really is a positive. We also note that while optimism is, in general, greater for less educationally advantaged groups, there are notable exceptions. In particular, once we control for GCSE score and A-level subject, we find greater optimism being applied in independent schools (Fig. 11) and among Oxbridge applications (Fig. 12) and so to some of the most educationally advantaged students in the country.

While our focus has been on studying mean optimism and how this varies by student and school groups, we note that 7.5% of grades are predicted pessimistically (where the predicted grades are lower than the achieved grades). Future work might study how the prevalence of being predicted pessimistically likely also varies across student and school characteristics. This is important, as students who receive pessimistic predictions are perhaps the most disadvantaged by the current system.

## Explanations for differential optimism across different student and school groups

### Student and school groups vary in how much they are impacted by the ceiling effect

The most fundamental explanation for differential optimism appears to be a mechanical one, namely that higher achieving student and school groups have less potential to be predicted optimistically due to the A-level scale ceiling effect (see also Ofqual, 2020). However, this will be by no means the sole explanation, especially as we have shown that mean predicted grades rarely increase monotonically with increasing mean achieved grades across the various student and school characteristic categories (Figs. 2 and 3).

### Student and school groups vary in their concentration on different A-level and degree subjects

A second explanation for differential optimism is that different student and school groups study different A-level subjects and mean optimism varies greatly by subject (Fig. 5). We saw, for example, that girls' A-level subject choices are more concentrated in arts and social sciences while boys are more concentrated in sciences and maths. But why might mean optimism vary across A-level subjects in the first place? We found mean optimism was higher in facilitating subjects, especially sciences and maths, and lower in non-facilitating subjects, especially the arts and social sciences. One potential explanation is that students studying A-level sciences or maths apply to similar degree subject areas and these degree subject areas tend to have very high entry requirements. This may place greater pressure on their teachers to predict optimistically versus teachers in other subject areas. Furthermore, science and maths degree courses often specify the specific grades students should have in these subjects. For example, to apply to many physics degree courses, students must often not only study physics A-level but achieve an A grade in that subject. In contrast, students studying sociology A-level who apply to sociology degree courses will typically face lower entry requirements in general, with no specific grade requirement in that subject or often even the requirement to have studied sociology at all. Another explanation for the optimism ordering of A-level subjects may be that, in contrast to science and maths A-levels, creative arts subjects often have substantial coursework components. Many of these components may have already been marked, or at least teachers are aware of their quality by the time predictions are made. This results in reduced uncertainty and limited room for optimistic predictions regarding students' remaining components and therefore their overall grades. While we have provided some potential explanations for differential optimism across subjects, further research is needed into individual subjects to obtain a more in-depth understanding.

### Student and school groups may vary in the progress they make post predicted grades

A third explanation for differential optimism is that predicted grades are based on how students are performing at the point at which predictions are made, but some student and school groups will progress more rapidly than others over their next and final 6 months of study. For example, the result that girls are predicted more optimistically than boys (Fig. 7) might reflect boys, on average, going on to achieve higher grades than expected, given their current and past performance. This explanation would be consistent with the stereotype

that boys work less steadily than girls over their A-level studies, but cram effectively just before their exams (Times, 2017). If teachers do not consider this future behaviour, then, on average, boys are more likely to achieve results closer to their predicted grades compared to girls. As a result, boys will then appear less optimistically predicted than girls. More generally, the progress of many student and school groups may change over the last 6 months of A-level studies. These changes may not just reflect different study approaches, but also different levels of home support, parental pressure, and the differing responses of different groups to their optimistic predicted grades.

### **Student and school groups may vary in how ambitious they are**

A fourth explanation for differential optimism is that different student and school groups may apply more ambitiously than others to Russell group and Oxbridge courses, which tend to have higher entry requirements. Teachers naturally want to support their students' chances of being offered a place on their preferred course and this would lead them to predict higher for more ambitious student groups than others. There may also be student and school differences in the extent to which students and their parents directly pressure their teachers to predict high (DfE, 2022). This may even include situations where some students apply to Oxbridge even though they are unlikely to go (due to low acceptance chances or personal preference) as a strategy to boost their predicted grades, enabling them to apply to more selective courses in general. Importantly, where students are offered places, many students are often still admitted even if they only slightly miss their entry requirements (DfE, 2022; UCAS, 2019). Thus, teachers may view predicting higher grades for more ambitious or forceful student groups as a beneficial action for those specific students, not realizing that this practice may be distorting the application system more generally.

Different school groups may also be differentially ambitious. For example, the higher mean optimism seen in independent schools, after adjusting for all the control variables (Fig. 11), could stem from apotentially more aggressive promotion of their students' abilities in their attempts to place these students into Oxbridge.

### **Student and school groups may vary in their teachers' tendencies towards optimism**

Some teachers may be inherently more optimistic than others. Teachers are not randomly assigned to schools and, as a result, they are not randomly assigned to student or school groups. It is therefore possible that inherently more optimistic teachers may end up disproportionately teaching particular student or school groups. While our most complex models include school fixed-effects and therefore control for this possibility, they do not control for the additional possibility that students may not be randomly assigned to teachers within schools. In particularly large schools, where, for example, ability setting takes place, two or more teachers may teach and predict grades for systematically different students. If, for example, inherently more optimistic teachers tend to teach lower ability sets, then this would also provide an explanation for the higher mean optimism seen among more educationally disadvantaged student groups. If teacher information were available, one could attempt to additionally control for this possibility by including teacher fixed-effects into the regression models to obtain within-teacher comparisons of optimism across student groups within each class, but no such information exists in our data.

## **Student and school groups may vary in the unconscious bias they receive from teachers**

Teachers may exhibit differential unconscious bias across the different student groups they teach. However, this appears a less likely explanation for the patterns of differential optimism we have shown. This is because we would expect unconscious bias to operate against least educationally advantaged groups (Burgess & Greaves, 2013), yet we have found greater optimism for these groups.

### **Given differential optimism, how might course administrators, students, and teachers respond?**

A useful thought experiment is to explore how course administrators, students, and teachers might respond to learning that teachers predict girls more optimistically than boys. We are not recommending the following responses; rather, we are presenting them solely to highlight the tensions that emerge from differential optimism.

#### **Course administrators**

From the standpoint of a course administrator, the understanding that teachers predict girls more optimistically than boys suggests that when an otherwise observationally equivalent boy and girl present with the same predicted grades, the admissions officer now has the knowledge that, on average, the boy is more likely to achieve their predicted grades than the girl. Consequently, the admissions officer might reasonably lean toward offering place to the boy. However, this action might be perceived as selection based on gender, a protected characteristic, and this categorized as discrimination (Equality Act, 2010). However, an alternative perspective is that this action serves as a form of corrective measure against the underlying predicted grades, which is where gender-based discrimination truly originates.

#### **Students**

From a boy's standpoint, the knowledge that teachers predict girls more optimistically may seem unfair, and worse still consequential if it deters boys from applying to more selective courses compared to otherwise equivalent girls. This might suggest that boys should aim higher despite this penalty or try to remove this penalty by working harder earlier in their studies to reveal their true potential. This would then allow boys to benefit from the same higher predicted grades that girls are given. From a girl's perspective, the knowledge that they are less likely to reach their predicted grades than boys might suggest that they should be a little more cautious in just how ambitiously they apply to courses.

#### **Teachers**

From a teacher's perspective, they would want to correct the finding that they have been predicting girls more optimistically than boys. Thus, in future years, they might try to

factor into their predicted grades the increase in progress that boys tend to make in the final 6 months of study.

## Potential solutions to differential optimism

### Greater guidance to teachers

One response to differential optimism might be for UCAS to give teachers more guidance around setting predicted grades (UCAS, 2023b). For example, many of the practical suggestions made by Ofqual (2021) to teachers having to assign A-level grades to students in 2020/2021 in lieu of their COVID-19-cancelled A-level examinations are also relevant to teachers assigning UCAS-predicted grades. The general guidance from the Joint Council for qualifications (JCQ, 2023) is also relevant. Guidance could also be given on known patterns in differential progress across student groups. However, UCAS would still need to define what the optimal degree of optimism is and explain how this must necessarily taper with increased achievement due to the A-level scale ceiling effect. So, while increased guidance may help, there would be challenges in articulating and implementing the concept of optimism.

### Data-driven predictions

Another response would be to replace teacher-predicted grades with data-predicted grades. For example, one could build a prediction model using the previous student cohort's data where achieved grades are known (Wyness et al., 2022). However, assuming that optimism was to be retained, UCAS would still need to quantify the degree of optimism that the prediction model should incorporate. The problem of the A-level scale ceiling effect would then also persist. Then, there is the subtler concern that the achieved grades observed in the previous student cohort are themselves distorted by those students' (differential) reactions to their teacher-predicted grades and the differential mean optimism applied to different student and school groups. These distortions would then be propagated onto the current cohort. Even if we put aside these challenges, however, this proposed response is unlikely to appeal to UCAS, ministers, or the public, considering the fallout from the Ofqual algorithm used to assign data-predicted A-level grades to students in 2019/2020 due to the cancellation of exams amidst the COVID-19 pandemic (Kelly, 2021). Perhaps, at most, data-driven predictions might support rather than replace teacher predictions.

### Post-qualifications admission system

The government recently consulted on potential post-qualifications admissions systems (PQA) which would remove or at least reduce the reliance on predicted grades (DfE, 2021). In their first model, students would only apply once they received their achieved grades with results day being brought forward to the end of July and degree courses pushed back to the start of October to make the system work. In their second model, students would continue to apply as they presently do. However, they would have the option to modify their choices at any point up to and including when their results are released. Only offers and decisions would be made post results day. A minority of respondents to the consultation thought that either model would be better than the current system. Key criticisms were that the contracted timescale would negatively impact course admissions using interviews,



tests, or auditions (DfE, 2022). Furthermore, obtaining application data only after results day would create challenges for courses in terms of anticipating student numbers and hinder their ability to build relationships with students while they finalize their choices. Additionally, students would miss out on the substantial support, information, advice, and guidance that teachers offer, and this would particularly affect disadvantaged students. Ultimately, the DfE concluded that the present moment was not suitable for implementing reforms, as priority should be on educational and exam recovery from the repercussions of COVID-19 (DfE, 2022). What is certain, is that the debate around predicted grades and differential optimism will persist until a resolution is found, whether that solution involves post-qualifications admissions reform or other means.

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**Conflict of interest** The authors declare no competing interests.

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