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Choosing differently? College application behaviour and the persistence of educational advantage

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Choosing Differently? College Application Behavior and the Persistence of Educational Advantage *

by

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Abstract

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1. Introduction

Evidence suggests that there are large labor market returns to attending selective colleges and to completing high-status programs (majors).[1] Therefore, college and program choices have important implications for earnings inequality and social mobility. It is well established that students from more advantaged schools are more likely to attend selective colleges and enroll in highly sought programs. However, less is known about the extent that these findings result from differences in level of preparation for college versus differences in college application behavior by students.

College enrollment decisions are typically determined by a complex combination of student application behavior and admissions decisions by colleges, and it is usually difficult to distinguish the effect of student preferences across colleges and programs from that of their opportunities. Often, researchers have no information on student applications, so it is impossible to distinguish differences that arise from application behavior from those due to admissions decisions. In addition, in most systems, admission depends on multiple factors, some of which are not observed by researchers. Thus, it is difficult to compare applicants who have equal admission probabilities.

We use administrative data from Ireland to study differences in college application behavior between students from disadvantaged versus advantaged high schools. Ireland provides an interesting laboratory for this analysis as applicants use a single centralized application to provide a preference-ordering of college programs. College admission depends almost completely on grades in the terminal high school examinations. Thus, we can compare the applications of students who have equal chances of admission to college programs. We study differences in *application* behavior between students from disadvantaged schools (called DEIS schools in Ireland) and students from fee-paying schools, which largely educate

[1] See, for example, Hussain et al., 2009; Chevalier, 2011; Arcidiacono, 2004.

students from high income families. Conditional on attending college, approximately 42% of students from disadvantaged schools attend university, compared to 74% of students from advantaged schools.[2] Analyzing differences in application behavior across these school types is important for understanding these differences in enrolment behavior. Students from disadvantaged schools may be less ambitious in their choices than others, perhaps because they have less confidence in their ability to succeed in college or have less information on the range of college options available to them.

In Ireland, the admissions system to college is centralized and students provide a preference ranking of college programs.[3] The college degree program offered to the prospective student depends both on performance (measured in "points") in a set of exams at the end of high school (the Leaving Certificate exams) and on the preference ranking over programs provided by the applicant.[4] Thus, we can compare application behavior across students who have equal opportunities (equal points) but are from different backgrounds. The Irish system is also an interesting case because the barriers to college entry are very low due to a single centralized application, tuition fees are the same in each institution so students do not choose on this basis, and disadvantaged students are less likely to be deterred due to costs as they can obtain a fee waiver plus a maintenance grant to cover living expenses.

There is a substantial literature examining college enrollment behavior. Evidence from several countries shows that individuals from more disadvantaged backgrounds are less likely to attend college and particularly unlikely to attend more prestigious universities (Crawford et al. 2016; Anders 2012; Wyness 2017; Smith et al. 2013; Campbell et al. 2019).[5]

[2] The two major types of third level institutions in Ireland are institutes of technology and universities. We use "college" to refer to any third level institution and "university" to refer to the institutions that are specifically universities.
[3] Programs are both subject and institution specific. For example, a person's first preference could be science in University College Dublin and second preference could be engineering in Trinity College Dublin.
[4] Each program has a minimum points level that is required to enter. The required points vary from year to year depending on the preference rankings of students and the number of available places in the program.
[5] Loyalka et al. (2017) and Ye (2018a) study the centralized admissions system in China and find that rural students are more likely to be undermatched in terms of educational institution than their urban counterparts.

However, few researchers have been able to study the importance of college application behavior. Hoxby and Avery (2013) show that, in the U.S., low socio-economic status (SES) students who are high achievers but do not attend high schools with a critical mass of fellow high achievers are much less likely to apply for selective colleges than other students. Likewise, Dillon and Smith (2017) find that low income students are less likely to apply to more prestigious institutions. However, in the U.S., college applications are complicated and admission decisions may depend on many factors that are unobserved by researchers (such as essays, recommendation letters, and extra-curriculars). Thus, it is difficult to compare students who have equal college opportunities. Because admission in Ireland is based predominantly on high school achievement as measured in points, we can account for factors that determine college admission, and, thus, compare students who have equal college opportunities.[6]

Perhaps the closest paper to ours in spirit is Black et al. (2015) who examine racial differences in application behavior in Texas among the top 10% in each high school who are guaranteed admission to all public universities. They find racial differences in application to the most prestigious universities in Texas even when admission is guaranteed (see also Black et al., 2018). These differences are partly due to the heterogeneity in college preparation that exists among the top 10% group who are guaranteed acceptance. Our context differs in that admission is not guaranteed but is based predominantly on points, and students with similar points have both similar college opportunities and similar college preparation. We also differ in that we study application behavior across the achievement distribution, not just that of high achievers.

[6] Boliver (2013) shows that, in the UK, the decision to apply to a prestigious (Russell Group) university depends on SES even after controlling for A-level scores. However, unlike in Ireland, UK admission decisions may depend on unobserved factors such as a personal statement, a school reference, grades already attained, and predicted A-level grades. Indeed, Boliver (2013) shows that acceptance rates into Russell Group universities are lower for lower SES groups, even conditional on A-level scores.

We add to the literature in several ways. First, unlike most other papers in the literature, we observe preference rankings for all high school students who apply for college. Thus, we can study desired programs of study for all students who consider college, not just for the sample who actually attend. Second, the centralized and almost entirely points-based structure of the application system in Ireland implies that, unlike previous literature, we can compare the application preferences of students who have equal chances of acceptance. Third, we examine how application behavior differs across the achievement distribution, rather than focusing on high achievers. Finally, having examined how application behavior differs between students from advantaged and disadvantaged high schools, we then examine the extent to which differences in application behavior feed into differences in enrollment -- does the centralized points-based admissions system attenuate the effects of differences in application behavior?

We find that there are systematic differences in application behavior among students with the same college opportunities. Students from more advantaged schools are more likely to list a university program as first preference and more likely to list selective programs. These differences are present throughout the achievement distribution, not just for high achievers. Preferences of students from advantaged schools, particularly high-achieving students, are more likely to cluster by program selectivity (as measured by median entry points) rather than by field of study. Our results suggest that, while differences in achievement are very important, differences in college application behavior also lead to persons from more advantaged high schools being more likely to enroll in more selective college programs.[7] Importantly, we find that enrollment gaps are smaller than differences in application behavior; the relatively meritocratic admissions system based on Leaving Certificate achievement undoes much of the difference in application behavior between

[7] The achievement channel has been emphasized by Denny (2014) and Cullinan et al. (2013) in studies using a survey of Irish school leavers. See also the UK evidence in Chowdry et al. (2013).

advantaged and disadvantaged groups. However, a large gap in program selectivity remains for the highest achievers.

The structure of the paper is as follows: In the next section, we describe the institutional background and data, and, in Section 3, we describe the empirical strategy. In Section 4, we present our main regression results for the relationship between school disadvantage and application behavior. Section 5 examines some potential reasons for application differences by level of school advantage and Section 6 looks at how differences in application behavior result in differences in enrollment. Section 7 concludes.

2. Institutional Background and Data

Our data include all individuals who sat the Leaving Certificate in the years 2015 to 2017 and applied to a college in Ireland in the year that they sat the Leaving Certificate.[8] We use data obtained from the Central Admissions Office (CAO) in our analysis. The CAO is an independent company that processes applications for undergraduate programs in colleges in Ireland, issues offers to applicants, and records all acceptances. The CAO centralized system means that applicants do not have to apply separately to each college and that data are processed and collected in one place. When applying, applicants can list up to 10 level 8 programs (honors bachelor's degrees) and 10 level 6/7 programs (ordinary bachelor's degrees and higher certificates). At the end of the last year of high school, students sit the Leaving Certificate, typically in 7 or 8 subjects, and grades in the student's 6 best subjects are combined to form their total Leaving Certificate points. For the majority of programs, whether or not an applicant is accepted depends solely on their performance in the Leaving

[8] We exclude people who sat the Leaving Certificate in years prior to college application as they may have done further education that provides an alternative (non-Leaving Certificate based) route to some college programs. However, our results are unchanged if we include these persons in the sample.

Certificate.[9] Applications are made by February of the year of entry and students can change the programs they list until July. When students apply to college, they do not know how many points they will have, and they do not know how many points each program will require. However, the required points in the previous year provide a strong indication of what required points will be and performance in practice "mock" exams gives a prediction of how well they are likely to perform in the Leaving Certificate.[10] After Leaving Certificate results are released in August, offers are made using a "serial dictatorship" allocation mechanism – the algorithm allocates the applicant with the highest points his/her first preference, then the second-ranked applicant gets an offer for his/her top ranked program amongst those still available, and so on.

Appendix Table A1 shows how points/grades are awarded.[11] As seen in Appendix Table A1, the grading scheme changed somewhat in 2017. To take account of this, when controlling for student achievement, we interact the points obtained with an indicator variable for 2017. If the student has points equal to or above the minimum for their first-ranked program, they are offered that program. If not, they are offered the highest ranked program for which they have enough points. A student can be offered both a level 6/7 and a level 8 program.[12]

[9] There are a small number of programs that base admissions on information other than Leaving Certificate points. For example, music programs typically require an audition, and arts/architecture programs may require a portfolio.

[10] The "mock" exams are taken about 4 months prior to the Leaving Certificate and are a complete rehearsal for the Leaving Certificate. Students sit the full set of exams under the same conditions that they later face in the Leaving Certificate. One possible issue is that students in more advantaged schools might receive more accurate grades in these "mock" exams. There are two reasons why this is unlikely to be the case: Firstly, these "mock" exams are provided to schools by a small number of companies and so the exams taken are the same across large numbers of schools and, secondly, grading does not differ systematically across school types, as similar to the Leaving Certificate exams, scripts have strict grading criteria that must be followed.

[11] English, Irish and mathematics are compulsory high school subjects and the student can then choose other subjects to study. All subjects are offered at a higher or lower level. In 2017, the maximum number of points obtained from a subject at the lower level is 56 while at the higher level it is 100. Since 2012, to induce more students to study higher level mathematics, an additional 25 points bonus is given in mathematics to those who pass the subject at higher level.

[12] A student is offered one program from each list -- the highest ranked program for which they have sufficient points. If the student does not accept either offer, then they cannot attend any college.

We have program preferences for all students who filled out a CAO form -- the group of people who at least considered going to college. This group constitutes 83% of all students who sit the Leaving Certificate. We believe that this group is an appropriate one to study as it excludes persons who have no intention of going to college but does not suffer from the selection bias that may arise from considering only persons who successfully obtain and accept a college place.[13]

The CAO data we use cover the period 2015 to 2017 and include information on the applicant's age, gender, high school, Leaving Certificate subjects and grades, county of origin, year they sat the Leaving Certificate, and whether they have a foreign qualification (see Delaney and Devereux (2019) for further information about these data). We restrict the sample to applicants between the ages of 16 and 20. In addition, we only consider applicants who have taken at least six subjects in the Leaving Certificate. We also delete cases with missing information on school attended and a small number of cases where the student did not take English or mathematics for the Leaving Certificate.

The CAO data do not include any individual measure of socio-economic status (SES) so we focus on the level of advantage of the school attended. Schools with high concentrations of students from socioeconomically disadvantaged backgrounds have been designated as "DEIS" schools and these receive extra supports from the state (somewhat lower pupil-teacher ratios and extra state funding for other purposes) and we treat them as our disadvantaged group.[14] On the other hand, fee-paying schools charge about €6,000-€8,000 per annum and are generally attended by high SES students. Therefore, we consider 3

[13] A relatively small number of Irish students go abroad to study. They are probably still in our dataset as all students are advised by guidance counselors to apply to Irish colleges in case they do not get accepted abroad or change their mind. Thus, we think that our application estimates are very unlikely to be affected by missing students who plan to study abroad. Also, students who plan to take a gap year are encouraged to apply anyway in case they change their mind and, so, non-applicants are generally the least academically inclined students.
[14] DEIS denotes *Delivering Equality of Opportunity in Schools*.

categories of schools – disadvantaged (DEIS) schools, advantaged (fee-paying) schools, and other schools.

There are no data available to researchers about the socio-economic characteristics of individual schools in Ireland. However, the *Growing Up in Ireland (GUI)* cohort survey provides relevant information on several SES measures across each school type. Table A2 in the appendix shows that there are large systematic differences in the distribution of equivalized household income, parental occupational class, and parental highest educational level across the three types of schools.[15] For example, 38% of students in disadvantaged schools have equivalized household income of at most €10,000 compared to 3% of students in advantaged schools; 6% of those in disadvantaged schools have a parent working as a professional compared to 33% of students in advantaged schools, while 18% of students in disadvantaged schools have a parent with at least a bachelor's degree compared to 58% of students in advantaged schools.

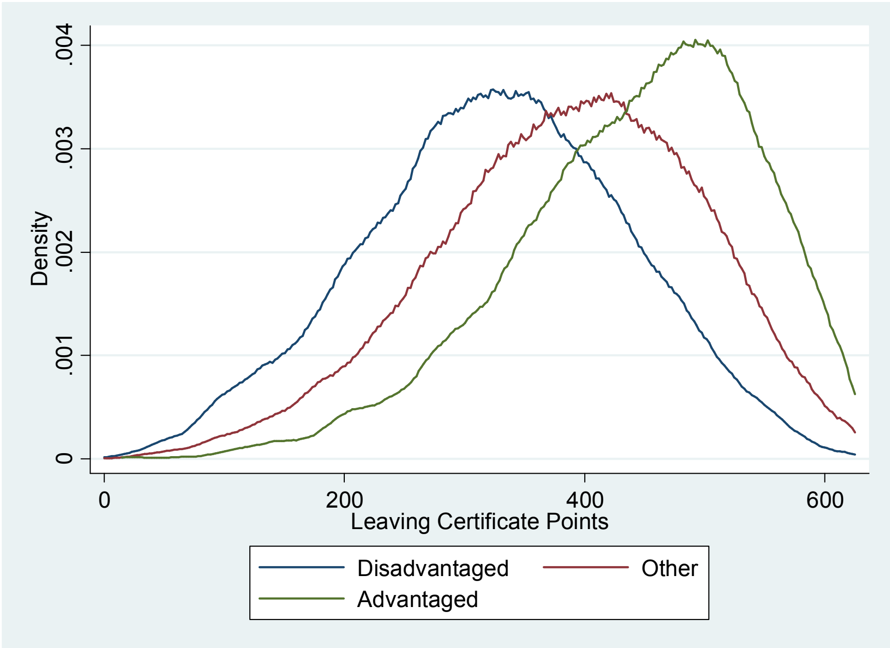
Our categorization has the benefit of providing a clear demarcation by the typical SES of students in the school and our measure of school advantage probably largely picks up differences between students from different SES backgrounds. However, since our measure is at the school-level, our findings could also reflect peer effects due to the influence of other students in the school, or role model effects based on the history of students from the school choosing selective college programs and succeeding in them. Teachers and guidance counselors also probably play an important role in influencing student choices and their input may differ systematically in advantaged and disadvantaged schools.[16]

Figure 1 shows the distribution of Leaving Certificate points in our data across school types. On average, students in our sample from disadvantaged schools obtain 318 points in

[15] The *Growing Up in Ireland (GUI)* survey is a cohort study that started in 2006 following the lives of 9-year-olds and 9-month-olds. We use the latest wave consisting of a representative sample of 17-year-olds in 2017.
[16] An advantage of studying behavior by the level of advantage of the school is that policy interventions (such as information provision) are most easily implemented at the school-level.

their Leaving Certificate exams, those from other schools score 380 points, while those from advantaged schools achieve 444 points.[17] Given that the standard deviation of points is 117, these are large gaps.

Figure 1: Distribution of Points by School Level of Advantage (2015-2017)



Descriptive statistics for the sample are in Table 1. Girls constitute 51% of our sample compared to 50% of those who sit the Leaving Certificate, reflecting the slightly higher proportion of boys who decide not to apply for college. Applicants are about 17 years old on average, take an average of 7.3 subjects for Leaving Certificate, and list an average of 7 honors degree programs (out of a maximum of 10) on their CAO form. About 60% of students attend mixed-sex high schools. Of the persons who apply to the CAO, 71% accept some college program and, amongst college enrollees, 58% attend a university. In Appendix Figure A1, we show a map of Ireland with schools and colleges marked.

In addition to the overall means, Table 1 also shows means by the level of advantage of the school. Students from more advantaged schools are older on average, probably because

[17] Doris et al. (2019) show that achievement differences between fee-paying schools and DEIS schools are predominantly due to the selection of students into the schools rather than differences in value-added.

they are more likely to have done a non-academic "transition" year in their 4^{th} year of high school. They are also disproportionally male and more likely to be in same-sex high schools. We control for both age and gender in our regressions and also report estimates by gender.[18] Students from more advantaged schools are more likely to enroll in college (84% of the advantaged group compared to 57% of the disadvantaged group and 72% of the other group). This understates the differences between the schools as the proportion applying to college is higher for the more advantaged schools. Amongst enrollees, median points of the students in the accepted program are 370, 408, and 454 for the disadvantaged, other, and advantaged groups, respectively. So, there are large gaps in the selectiveness of the enrolled programs between the three groups. There are also large differences in university attendance by school type. Conditional on attending college, approximately 42% of students from disadvantaged schools attend university, compared to 59% of students from medium advantage schools and 74% of students from advantaged schools.

A small number of applicants get into programs despite having fewer than the minimum points either because of disability (the DARE scheme) or socio-economic deprivation (the HEAR scheme). Applicants apply for these schemes through the CAO but decisions about entry on sub-minimum points are made by individual colleges and vary across programs. We do not have information on whether a student is on such a scheme, but we see in Table 1 that 6% of enrollees (about 4% of applicants) enter a program with sub-minimum points. Unsurprisingly, the proportion is higher for disadvantaged schools (12%) as students from these schools are most likely to be eligible for the HEAR scheme.[19] The HEAR scheme may encourage students from disadvantaged schools to apply for selective college programs and, thus, lead us to find smaller application gaps by level of school advantage than

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[18] We have also tried adding a control for whether the school is a mixed-sex school, and this has little effect on the estimates.

[19] Students from advantaged schools are slightly more likely to enroll in programs with sub-minimum points than students from other schools. We suspect these students are participating in the DARE program, and students from advantaged schools may be more successful at obtaining the necessary evidence of disability.

would otherwise be the case. However, as we note later, when we exclude students who enroll with sub-minimum points, it has little effect on our application estimates.

Table 1: Means of Selected Variables

	Full Sample	Disadvantaged School	Other School	Advantaged School	N Full Sample
Age at January 1st of Reference Year	17.36	17.20	17.37	17.60	125236
Year of Application	2016	2016	2016	2016	125236
Female	0.51	0.47	0.53	0.41	125236
Total Leaving Certificate Subjects	7.30	7.39	7.29	7.25	125236
Leaving Certificate Points	376	318.38	380.02	443.66	125236
Distance (km) to Nearest University	55.23	67.35	57.41	15.32	125236
Distance (km) to Nearest Non-university	28.54	30.32	30.24	10.99	125236
Mixed-Sex High School	0.59	0.84	0.56	0.39	125236
Number of Preferences Listed (Level 8 if list both or else level 7)	6.66	5.87	6.68	7.89	125236
List Only Level 7s	0.04	0.07	0.04	0.01	125236
List Only Level 8s	0.30	0.21	0.30	0.43	125236
List Both Level 7s and Level 8s	0.67	0.72	0.67	0.56	125236
Enroll in College	0.71	0.57	0.72	0.84	125236
Conditional on Enrollment					
Enroll in a University	0.58	0.42	0.59	0.74	88749
Enroll in Portfolio/Interview Program	0.04	0.03	0.04	0.06	88749
Median Points of Enrolled Program	411	373	411	457	88749
Enroll in STEM	0.33	0.37	0.32	0.30	88749
Enroll in Business Administration and Law	0.24	0.23	0.23	0.29	88749
Enroll in Arts and Social Sciences	0.22	0.19	0.22	0.30	88749
Enroll in Education	0.05	0.04	0.06	0.02	88749
Enroll in other field	0.26	0.18	0.17	0.09	88749
Enroll with Leaving Certificate Points < Required Points	0.06	0.12	0.05	0.07	81229

Note: 16% of the sample come from disadvantaged schools, 9% come from advantaged schools, and 75% come from other schools. There are fewer observations for the last row as some programs, such as music and architecture, base admissions on information other than Leaving Certificate points.

3. Empirical Strategy

While students can list up to 10 level 6/7 and 10 level 8 programs, in practice, the most important decisions are what programs to place at or near the top of the lists. Therefore, in the analysis, we focus on the first listed program and the programs listed as top 3 preferences (about 50% of applicants, and about 70% of enrollees, enroll in one of their top 3 preferences). Throughout the analysis, if the student listed both level 6/7 and level 8 (honors degree) programs, we use the characteristics of the level 8 programs, otherwise we use the programs on the list used by the student.

We characterize application behavior using two broad sets of variables – the type of institutions and programs listed as top 3 preferences, and whether the top 3 preferences cluster by institutions, fields, or selectivity of programs.

A. Programs listed as top choices

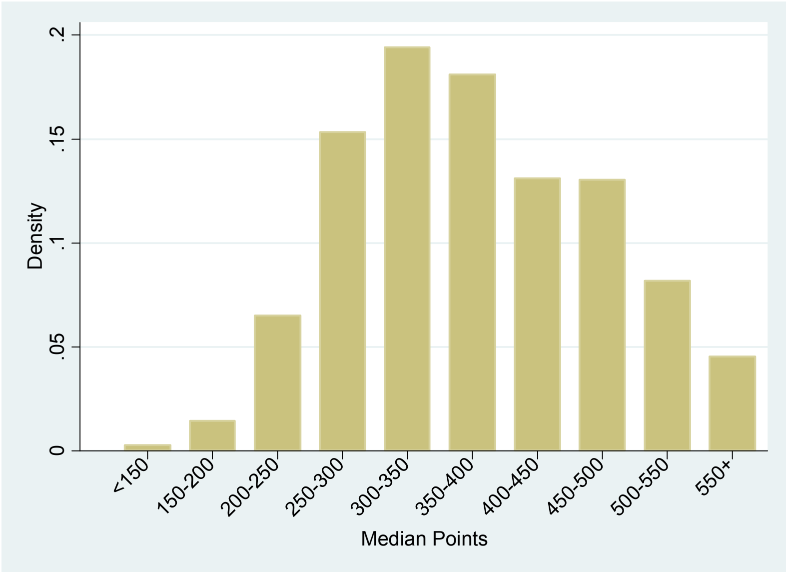
We use several different metrics to characterize the application behavior of students. First, we use whether the first ranked program is in a university – in Ireland, the universities are generally considered more prestigious than other colleges, most of which are institutes of technology.[20] While going to university or not speaks to the type of program accepted, a more precise measure of the selectivity of the program is the median points of all persons starting the program.[21] Therefore, second, we use the median points of entrants to the first ranked program as a measure of selectivity.[22]

There is large variation in program selectivity in Ireland. While the number of colleges that students could apply to varied between 39 and 44 during the 3 years we study, in each year there were over 1,300 unique college programs that students could choose from. The points required to access programs varies greatly – some programs have no minimum points requirement (zero selectivity), others require very low points (over 10% of programs have required points less than 200), while others require very high points (over 5% of

[20] There were seven universities during this period: University College Dublin (UCD), Trinity College Dublin (TCD), Dublin City University (DCU), Maynooth University (MU), National University of Ireland, Galway (NUIG), University College Cork (UCC), and University of Limerick (UL). We also include the Royal College of Surgeons (RCSI) and two teacher training colleges as universities as they offer degrees that are equivalent to those offered by the universities.
[21] The sample size is reduced by a tiny amount when we use this variable because there are some programs which are listed as preferences but are not ultimately offered as a program due to lack of numbers or other funding reasons. We cannot calculate the median Leaving Certificate points of the entrants to these programs.
[22] An alternative would be to use the required points for the program. In practice, these two measures have a correlation of 0.94 and give very similar results.

programs have required points greater than 500). Figure 2 below shows the wide distribution of median points across programs: Over 10% of programs have median points greater than 500 while over 20% of programs have median points less than 300.[23]

Figure 2: Distribution of Program Median Points 2015-2017



B. Whether preferences cluster by institutions, fields, or points levels of programs

Because we see the entire rankings of students, our data provide a rare opportunity to examine the coherence of top ranked programs and better understand how students make choices. Do they choose a field and then list programs from that field, do they choose a level of selectivity and then perhaps include programs from different fields, or do they tend to choose an institution and choose multiple programs from that college?

We explore these types of clustering by examining the characteristics of the top 3 preferences. We examine whether the top 3 are in the same institution to see whether students tend to view institution as being more important than program. We also examine whether the top 3 programs have similar median entry points (within 50 points of each other) to see

[23] There is also large variation in required and median points across programs within institutions. For example, in Trinity College Dublin, required points in 2015 vary from 310 points required to enter *Catholic Theological Studies* to 585 points required for *Nanoscience, Physics and Chemistry of Advanced Materials*.

whether students appear to list programs based on selectivity. Additionally, we examine whether the top 3 are in the same field of study to see whether students are determined to access a particular subject area.

C. Main Regressions

We regress each of our dependent variables on indicator variables for the level of advantage of the school the student attends. The basic specification has the form

$$y = \beta_0 + \beta_1 OTHER + \beta_2 ADV + \delta' X + u \qquad (1)$$

where y denotes the outcome being studied, ADV denotes an indicator for coming from an advantaged (fee-paying) school, and $OTHER$ is an indicator for coming from a school that is neither advantaged nor disadvantaged. The omitted category is disadvantaged school. X is a vector of controls including indicators for gender, age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017) and indicator variables for whether the student satisfies several common program requirements.[24] We report standard errors that are clustered at the school level.

The logic of controlling for points and fulfilled program requirements is that we want to compare students from different groups who have similar college options. Students with equal points may not have equal "ability" as it may be easier for students from more advantaged schools to maximize their potential in the Leaving Certificate. Therefore, we are not necessarily comparing students of equal ability; rather students who have equal college options.

[24] Many programs have subject and grade requirements that must be satisfied to enter the program. Even if the applicant has Leaving Certificate points above the cut-off for the program, they will not be admitted if they do not also satisfy the program requirements. We control for the following common subject- and grade-specific requirements for programs and colleges: passing 5 subjects; passing 1 science subject; getting at least 60% (an H4) in higher level mathematics; getting at least 40% (an H6) in a higher level science subject; passing 6 subjects including English, mathematics and a foreign language; passing 6 subjects including at least 2 higher level subjects.

4. Results

We report the estimates in Table 2. Each row refers to a separate regression and the dependent variable is listed in the first column. We show the means of each of our dependent variables in Appendix Table A3.

Programs listed as top choice

In Appendix Table A3, we see that students from advantaged schools are 32 percentage points more likely to list a university program as first choice than students from disadvantaged schools. When we add controls in Table 2, this gap falls to 8 percentage points.[25] This tendency to list more selective programs as first preference is further demonstrated by the points of the median entrant to the highest ranked program being 26 points higher for the advantaged schools (compared to a raw gap of 85 points in Appendix Table A3). The standard deviation of median points for the first preference program is 83, so this translates into about one-third of a standard deviation.[26] While the differences between students from advantaged schools and those from disadvantaged schools are substantial, the differences between disadvantaged schools and other schools are much smaller – a 3 percentage point difference in listing a university first, and a difference in median points for the first ranked program of only 3 points. These are much smaller than the raw gaps that we see in Appendix Table A3.

To examine whether preference over field of study can explain the findings, we create a variable that is equal to the median points of students by field of study (using 10 ISCED categories) and use it as a dependent variable. We find a small negative effect for advantaged

[25] While we include controls such as age and gender indicators in the regression, in practice, these have little effect. The only thing that matters much is having controls for points.
[26] As an example of how 26 points translates into access to specific programs, in 2017 the entry requirement for nursing in Letterkenny IT was 400 points while studying nursing at Trinity College Dublin required 425 points.

schools implying that students from advantaged schools do not choose more selective fields of study, ruling out the possibility that the selectivity results are due to field of study.[27]

We further exploit our ranking data in the following rows of Table 2 by examining the characteristics of the second and third ranked programs (93% report at least 3 preferences). First, we show that students from advantaged schools are more likely to list a second or third choice program.[28] When we compare characteristics of the second and third ranked programs to those for the first ranked program, we find similar but generally slightly smaller gaps by level of school advantage for university and median points.

In the remaining rows of Table 2, we study further characteristics of the top 3 programs. Consistent with our earlier findings, students from advantaged schools list top 3 programs with higher average median points and have a higher probability that each of the top 3 programs is in a university. Once again, these gaps are much smaller when comparing students from disadvantaged schools to students from other schools. Overall, the evidence suggests that, conditional on their college options, students from advantaged schools are more likely to list university programs and more selective programs as their top choices.[29]

[27] Consistent with this, we find that adding controls for field of study has little effect on the selectivity estimates. We do not report these estimates as field of study is endogenous. In Appendix Table A4, we show that students from advantaged schools are less likely to apply for STEM and for education and more likely to apply for arts and social sciences and for business administration and law. The field differences between disadvantaged and other schools are much smaller.

[28] In addition to being more likely to list a second and third choice, students from advantaged schools list approximately one extra program on their CAO form, conditional on points. However, the difference in number of programs listed between disadvantaged and other schools is small and statistically insignificant.

[29] As mentioned earlier, a small number of disadvantaged students can access programs with below minimum points at the discretion of individual colleges through the HEAR program. To examine how this might affect our estimates, we have re-estimated Table 2 after first excluding any person who enrolled in a program with lower than minimum points. This exercise produces similar but slightly larger gaps by level of advantage.

Table 2: Characteristics of College Programs Listed as Top Choices

	Other School	Advantaged School	R-squared	N
First preference				
University	0.029**	0.077**	0.272	125,236
	(0.009)	(0.012)		
Median Points	3.179*	26.440**	0.466	124,749
	(1.481)	(2.208)		
Median Points of students in field	-0.268	-2.591**	0.136	125,236
	(0.385)	(0.646)		
Second Preference				
List a 2nd preference	0.013**	0.025**	0.058	125,236
	(0.004)	(0.004)		
University	0.028**	0.077**	0.257	119,088
	(0.008)	(0.012)		
Median Points	0.633	24.565**	0.425	118,349
	(24.56)	(2.124)		
Third Preference				
List a 3rd preference	0.029**	0.061**	0.096	125,236
	(0.008)	(0.008)		
University	0.018*	0.065**	0.223	111,716
	(0.008)	(0.013)		
Median Points	-0.242	20.832**	0.387	110,855
	(1.169)	(1.900)		
Top 3 Preferences				
All university	0.029**	0.096**	0.290	115,908
	(0.007)	(0.014)		
Average Median Points	1.512	24.604**	0.527	113,923
	(1.332)	(2.073)		
All same college	-0.002	0.014	0.009	115,908
	(0.012)	(0.022)		
All same university	0.007	0.039	0.041	115,908
	(0.008)	(0.021)		
All same non-university	-0.009	-0.024**	0.087	115,908
	(0.008)	(0.008)		
All same field	-0.009	-0.054**	0.016	115,908
	(0.007)	(0.012)		
All similar points	0.021**	0.072**	0.015	113,923
	(0.006)	(0.011)		
All similar points but not all same field	0.011*	0.073**	0.004	113,923
	(0.004)	(0.009)		

Note: Robust standard errors clustered by school in parentheses. ** p<0.01; * p<0.05. The omitted category is disadvantaged school. Controls include indicators for gender, age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017), and indicator variables for whether the student satisfies several subject- and grade-specific requirements for common programs and colleges.

Whether choices cluster by institutions, fields, or points levels of programs

Students may have preferences for particular institutions, and we look at whether their top 3 preferences are all in the same college. Interestingly, we find that, conditional on Leaving Certificate points, there is no significant difference across groups in the probability of listing all 3 from the same college. We explore this further by studying whether all 3 top preferences are in the same university or in the same non-university. We find that students from advantaged schools are more likely to list their top 3 programs from the same university but less likely to list their top 3 all from the same non-university.

In a subsequent row, we find that, conditional on points, students from advantaged schools are about 5 percentage points less likely to list all 3 from the same field. Here we define field using 10 ISCED categories – despite the large number of categories, 44% of the sample have their first 3 preferences from the same field.[30] Students from advantaged schools are also 7 percentage points more likely to have the median points of all 3 top preferences be within 50 points of each other. A plausible explanation is that students from advantaged schools are attracted to selective programs even if they vary by field. In the next row, we explore the clustering of the top 3 preferences further and find that the advantaged group is more likely to have all 3 preferences within 50 points of each other but in different fields.[31] Once again, the differences between disadvantaged schools and other schools are much smaller than those between advantaged and other schools.

Heterogeneous Effects by Leaving Certificate Achievement of Students

In Figure 3, we show how the effects differ across the points distribution for selected outcomes. We split the sample by decile of the applicant points distribution and run separate

[30] The 10 ISCED fields include the following: Education; Arts and humanities; Social sciences, journalism and information; Business, administration and law; Natural sciences, Mathematics and Statistics; Information and communications technologies; Engineering, manufacturing and construction; Agriculture, forestry, fisheries and veterinary; Health and welfare; Services.

[31] We define the fields to be different if at least one of the 3 fields differs from another field. Likewise, we define the points levels to be different if the absolute value of the distance between the points for any two preferences is greater than 50.

regressions for each decile. Figure 3 shows the coefficients and 95% confidence intervals for each decile.

Figure 3: Characteristics of Top Choice Program by Deciles of Achievement Distribution

Note: Disadvantaged schools represent the reference category. Figures conditional on age, year, gender, Leaving Certificate points and program requirements. Deciles based on the applicant points distribution. Separate regressions are run for each decile.

Figure 3 shows that differences between students from advantaged and disadvantaged schools are present throughout the points distribution and not just for high or low achievers. The differences in probability of listing a university as first choice become smaller with higher points as the probability converges towards 1 for both groups. However, the gaps in median points between students from advantaged and disadvantaged schools get larger as points increase and this gap in median points is about 30 points for each of the top 6 deciles. As we saw in Table 2, differences between students from disadvantaged and other schools are smaller – the estimates are basically zero for the bottom 3 deciles and then increase to about

10 points in the top deciles. While the literature (Hoxby and Avery, 2013; Black et al., 2015) has emphasized SES gaps in application choices of high achieving students, there are large gaps throughout the achievement distribution and, especially throughout the top half of the distribution.

In Figure 3, we also show how clustering of the top 3 choices varies across the points distribution. Irrespective of decile, there are no significant differences across school types in the probability that the top 3 choices are for the same college. When we study whether all 3 top choices are in the same field, the main gap is in the top 3 achievement deciles. In these deciles, students from advantaged schools are about 7 percentage points less likely to list all 3 top choices in the same field. Another striking finding from these pictures is that the tendency of students from advantaged schools to cluster choices by points level rather than by field is only apparent for the top 4 achievement deciles. For the top two deciles, the effect is very large at about 15 percentage points. As before, disadvantaged schools and other schools look reasonably similar in terms of these outcomes.

Heterogeneous Effects by Gender

In Appendix Table A5, we examine differences in the effects by gender for selected outcomes. The gap in median points between advantaged and disadvantaged schools is slightly higher for boys than girls (29 versus 22) and this difference is statistically significant. However, gender differences in the coefficients for the other outcomes are smaller and not statistically significant. We conclude that the broad patterns of application behavior are similar for boys and girls.

5. Why do Choices differ by School Advantage?

There are many possible reasons why students from advantaged schools may be more likely to list selective college programs, such as different interests, greater ambition, and more information about options. We cannot distinguish between these possibilities, but here we explore two possible reasons for our finding. The first is that more advantaged students are more likely to list their most preferred college program even if they have no chance of being admitted to it. The second is that they are geographically closer to selective institutions.

Zero-probability choices

As shown by Svensson (1999), the allocation mechanism used for college applications would be strategy-proof and induce applicants to provide a ranking that reflects their preferences if additional choices were costless (which they are) and there were no limits on how many programs students could rank (there is a limit of 10 choices per list). Because students can only rank a finite number of programs, it may be optimal for them to include programs towards the end of the preference list that are less preferred than some omitted programs but for which there is a very high probability of admittance for the student. Indeed, it is even reasonable for students to not list their most-preferred program as first choice if they believe that they have zero probability of obtaining this program. In this section, we consider whether students differ in whether they list "zero-probability" programs as first choice.

We define zero-probability programs as ones where the required points in the previous year were over 100 points greater than the points achieved by the student.[32] 23% of applications have first choices that satisfy our definition of "zero probability" so clearly many students list their most-preferred option first, even if they are very unlikely to obtain it. Controlling for points, students from more advantaged schools are a statistically significant 8 percentage points more likely to list a zero-probability program as first choice. The difference between students from disadvantaged and other schools is small and statistically insignificant.

[32] We find similar effects if we define zero-probability programs to be programs with required points in the previous year that are 75, 100, 125 or 150 points greater than the points achieved by the student.

So, can a tendency of students from advantaged schools to list zero-probability programs explain our earlier findings for median points? To examine this, we eliminate all zero-probability choices and study the characteristics of the first listed choice that is not zero-probability.[33] The estimates are in the second panel of Table 3 – the first panel has the baseline estimates from Table 2. The estimates are quite similar to baseline, suggesting that the gaps we found earlier are not simply due to advantaged students listing programs that they have no hope of obtaining.[34]

Distance as a Mediator

Because disadvantaged schools are likely to be geographically more isolated from colleges, universities in particular, distance may be a mediating variable through which disadvantage correlates with college application behavior.[35] This is evident in Appendix Figure A1 which shows that advantaged schools are predominantly located in Dublin, home to many colleges and universities. We examine this issue by adding control variables for distance (as a quadratic) from the high school to the closest university and to the closest non-university.[36] We also add indicators for the county of residence of the applicant (there are 26 counties in the Republic of Ireland) to further control for locational factors.

The estimates are in the third panel of Table 3. We find that the distance controls affect our estimates for whether students list a university as first preference (the effect of coming from an advantaged school changes from 8 percentage points in Table 2 to 5

[33] The sample size is smaller here than earlier as we lose observations where we do not know the required points in the previous year because the program is new or because it is a portfolio/interview program.

[34] This finding is consistent with our earlier finding that the gaps for first preferences are also present for second and third preferences. Our results are not being driven by some students making one extremely unrealistic choice.

[35] On average, disadvantaged schools are 29km from the nearest non-university and 67km from the nearest university. The equivalent distances for the advantaged schools are 10km and 15km. Cullinan and Duggan (2016) and Flannery and Cullinan (2014) show that distance affects student college choices in Ireland.

[36] We calculate distance from each school to each college using the georoutei command in Stata (Weber and Peclat, 2017), which calculates the travel distance between two points defined by their geographical coordinates. Travel distance is defined as the number of kilometers necessary to drive by car in order to get from one point to another, in our case, from a particular school to a particular college both defined using geographical coordinates. This way of calculating distance is superior to using straight line distances given we are interested in how long it would take a student to get to a college from their locality.

percentage points). Also, the coefficient for median points of the top-ranked program falls from 26 to 17; however, the associations remain large and statistically significant. We conclude that advantaged schools are more likely to be close to a university and this accounts in part for the preference of their students for universities and for more selective programs. In contrast, the (small) gaps between disadvantaged and other schools are unchanged, reflecting the similarity in their distances from colleges and universities.[37]

Table 3: Characteristics of College Programs Listed as First Preference

	Other School	Advantaged School	R-squared	N
	Baseline			
First preference				
University	0.029**	0.077**	0.272	125,236
	(0.009)	(0.012)		
Median Points	3.179*	26.440**	0.466	124,749
	(1.481)	(2.208)		
	Excluding Zero-Probability Programs			
First preference				
University	0.041**	0.078**	0.390	99,634
	(0.008)	(0.013)		
Median Points	5.084**	23.580**	0.672	99,423
	(0.886)	(1.657)		
	Controlling for Distance			
First preference				
University	0.030**	0.046**	0.284	125,236
	(0.007)	(0.011)		
Median Points	3.246**	17.322**	0.477	124,749
	(1.004)	(1.781)		

Note: Robust standard errors clustered by school in parentheses. ** p<0.01; * p<0.05. The omitted category is disadvantaged school. Controls include indicators for gender, age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017), indicator variables for whether the student satisfies several subject- and grade-specific requirements for common programs and colleges, a quadratic function of distance to the nearest university and to the nearest non-university, and indicators for county of residence of the applicant.

[37] When we look across the achievement distribution, we find no evidence that controlling for distance reduces gaps disproportionally at high or low achievement levels.

6. Do different application patterns lead to different enrollment outcomes?

We have seen that there are systematic differences in application behavior across students in advantaged and disadvantaged schools. Conceptually, these may or may not lead to different outcomes across these groups for people with the same college options. For example, if all students aim very high with their first preference, differences in their exact level of ambition may not matter as the actual program they receive will be determined by their Leaving Certificate points.[38] Therefore, in this section, we use regression analysis to examine differences in college entry by level of school advantage, conditional on Leaving Certificate achievement.

Who goes to College?

First, we examine whether students enter any college program (71% of applicants do). In Figure 4, we show the estimates by achievement decile, controlling for Leaving Certificate points and program requirements. We find that, in contrast to the 26 percentage point raw enrolment gap between the advantaged and disadvantaged groups (shown in Table 1), there is no evidence of any gap in the top half of the achievement distribution; the gap in the bottom half is about 5 percentage points and statistically significant (if we pool all students, we get a statistically insignificant effect of 2 percentage points).[39] So, while there is little average difference in college attendance rates conditional on points, low-achieving students are more likely to go to college if coming from advantaged schools.[40]

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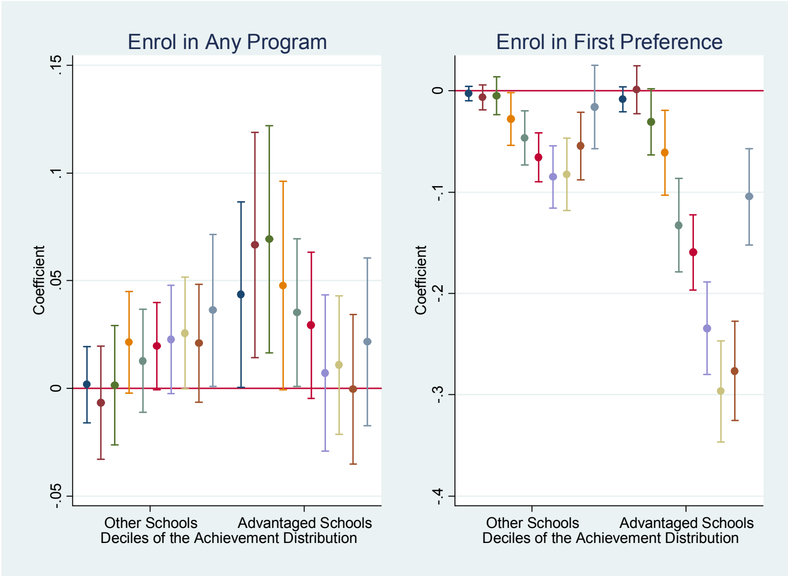
[38] Differences in the probability of accepting offers could also affect enrollment outcomes. However, we find that there is little systematic difference between groups in the tendency to accept programs conditional on having an offer -- the estimates are generally very small and statistically insignificant.

[39] These large falls are consistent with the findings of Denny (2014) and Cullinan et al. (2013) from a survey of Irish school leavers.

[40] We cannot observe enrollment of the relatively small number of students who move abroad to study. It is likely that students from advantaged schools are more likely to enroll abroad so the enrollment gap between students from advantaged and disadvantaged schools would be slightly higher if foreign enrollment were observed.

Figure 4: Enrolment Outcomes by Achievement Deciles



Note: Disadvantaged schools represent the reference category. Figures conditional on age, year, gender, Leaving Certificate points and program requirements. Deciles based on the applicant points distribution. Separate regressions are run for each decile.

Also, in Figure 4, we see that, conditional on points, students from advantaged schools are much less likely to enroll in their top ranked program (defined as their top level 8 if they list both level 6/7s and level 8s) than are students from disadvantaged schools. This is consistent with our earlier findings that they tend to list more selective programs as top choices, conditional on points. Interestingly, this follows a u-shaped pattern, with the gap being largest (over 30 percentage points) at about the 80^{th} percentile of achievement. This reflects the fact that students with low points are unlikely to obtain their first choice, irrespective of their level of ambition; students with very high points are likely to obtain their top choice even if very ambitious. So, the gaps across school advantage in whether students enter their first-choice program show up mostly between the 50^{th} and 90^{th} percentiles of achievement.

Match Quality

For comparison to the literature, we create a measure of "match quality" like that used by Campbell et al. (2019), Dillon and Smith (2017), and others. This is a continuous variable that represents the distance of each student's enrolled program from their ideally matched program (where a match is defined as ideal if the rank of the program in the program quality distribution, as measured by median Leaving Certificate points of program entrants, exactly matches the rank of the student in the overall Leaving Certificate points distribution).

We create the measure in three steps: First, we identify the percentile rank of each student in the distribution of Leaving Certificate points of enrolled students in that year. The rank is normalized to be between 0 and 1, where 1 is the highest and 0 is the lowest points. Second, we identify the percentile rank of each program in the (student-weighted) distribution of program quality, based on the median Leaving Certificate points of students who ultimately enroll in the program in that year. This rank is also normalized to be between 0 and 1, where 1 is the highest and 0 is the lowest median points. Third, we subtract the percentile rank of the student in the program quality distribution from the program's percentile rank in the exam results distribution.

The result is a continuous variable that represents the distance in rank of the program enrolled in by each student from their ideally matched program (that which would be attended by others in the same position of the ability distribution). If the student is at the median in terms of Leaving Certificate points of enrollees, match quality is zero if they enroll in a program that is at the median of the program quality distribution. If the student is at the 40th percentile of the enrollee Leaving Certificate points distribution, and they enroll in a program that is at the median of the program quality distribution, then their match quality is 0.1 percentile ranks.[41]

The Effect of the Centralized Admissions System

We now restrict the sample to enrollees and study whether they attend a university, and the selectivity of the program they enroll in. Figure 5 provides a graphical illustration of the extent to which the centralized system undoes the gap in application behavior, conditional on Leaving Certificate points. In each panel, the first bar shows the gaps in first preferences of applicants and the second bar shows the equivalent gaps for enrolled students. For university, the gap (between advantaged and disadvantaged schools) in first preferences of applicants is 8 percentage points while the gap in enrollment is 4 percentage points, considerable given that we are comparing students who have the same college options but much lower than the 32 percentage point raw gap (Table 1). For median program points, the analogous gaps are 26 and 10 points for first preferences and enrolment, respectively. This 10-point enrolment gap is about 12% of a standard deviation and is considerable smaller than the 84-point raw gap in Table 1. Relatedly, we find that, conditional on points, students from advantaged schools have 3 percentiles (about 20% of a standard deviation) higher match quality with their entry program (the gap in match quality based on their first preferences is 0.08 percentile ranks).[42] Another notable finding in Figure 5 is the lack of any difference in median program points or match quality between students from disadvantaged schools and from other schools.

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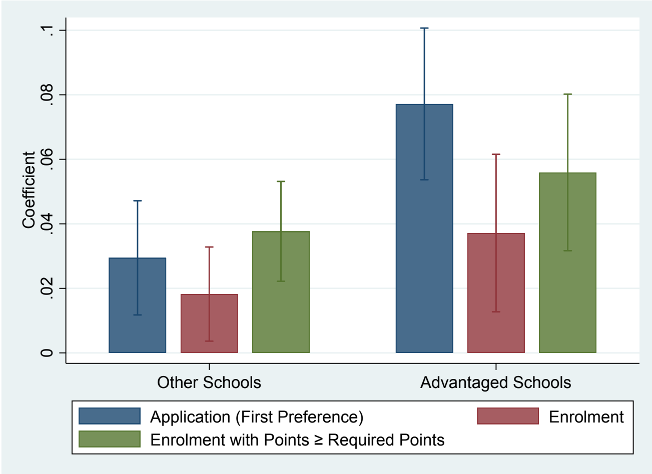
[41] By construction, the mean of match quality is zero. If like Campbell et al. (2019) and Dillon and Smith (2017), we define match quality greater than 0.2 as overmatch and match quality less than -0.2 as undermatch, we find that 6% of enrollees are overmatched and 8% are undermatched. These compare to about 16% of each type in the UK study of Campbell et al. (2019), and about 25% of each type in the U.S. study of Dillon and Smith (2017). The differences may reflect differences in the admissions systems across countries. It is also likely that the direct link between our measure of achievement and admission decisions leads to lower deviations in measured match quality in the Irish data. Figure A2 in the appendix shows the distribution of match quality by school type.

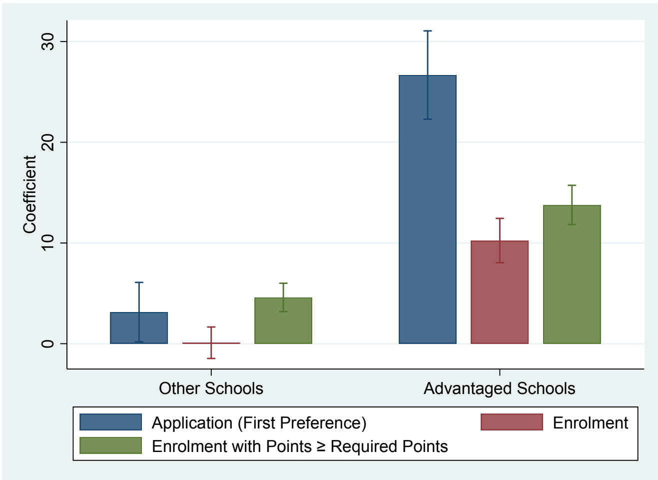
[42] If we add controls for distance, the match quality effects get smaller, falling to 2 percentiles, with the median points effect falling to 7 points.

Figure 5: How the Centralized Admissions System Reduces School Advantage Gaps

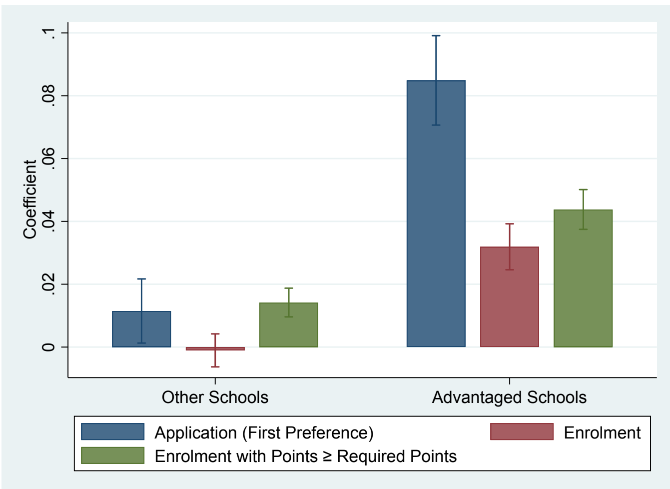
University Application versus Enrolment



Median Points Application versus Enrolment



Match Quality Application versus Enrolment



Disadvantaged schools represent the reference category. Figures conditional on age, year, gender, Leaving Certificate points and program requirements.

We conclude that the points system used to allocate college places reduces but does not eliminate the differences that exist in application behavior between students from advantaged and disadvantaged schools. Our findings also suggest that data on enrolled students, in the absence of applications data, may not provide an accurate indication of differences in application behavior by level of advantage.

Conceptually, the "undoing" effect may partly arise because of the HEAR program that enables some disadvantaged students to enter college programs with lower points than the minimum required for other students. As Table 1 shows, 4% of applicants (6% of enrollees) enter a program despite having points below what is officially required. The third bar in Figure 5 assesses the importance of this factor by omitting all observations where we observe students accepting a program despite having less than the required points. Omitting these students increases the university enrollment gap substantially, increasing the gap between disadvantaged schools and all other schools by about 2 percentage points. However, for median points and match quality, we find that the enrollment gaps are now only slightly larger – the favorable treatment of disadvantaged students in admissions plays little role in reducing enrollment gaps in selectivity. These findings suggest that the HEAR program has been successful in increasing university enrollment of students from disadvantaged schools but has had less impact on the selectivity of the programs that they attend.

Effect of the Admissions System by Achievement

In Figure 6, we split the sample of enrollees into quartiles based on their points to examine whether the admissions system has differing effects for students with different levels of achievement.[43] In the left panels of the figure, we show the gaps in first preferences by school advantage as estimated separately for each quartile of the Leaving Certificate points distribution of enrollees. Then, in the right panel, we show the equivalent gaps in enrollment

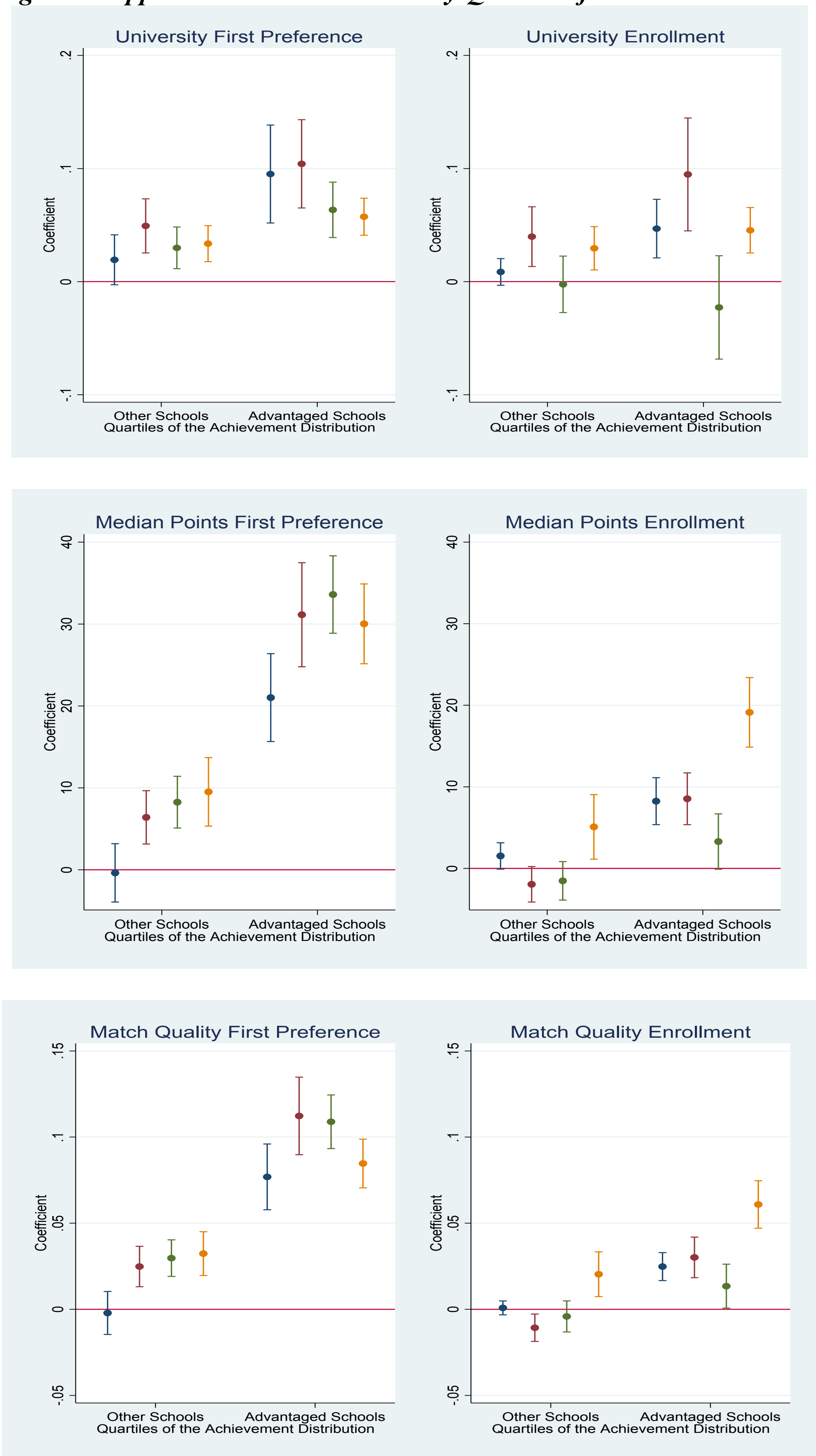
[43] In Appendix Table A6, we show how enrollment effects differ by gender. We find somewhat larger school advantage gaps in selectivity for boys and the differences are at the margin of statistical significance.

outcomes by achievement quartile. Thus, a comparison of the left and right panels shows how the first preferences differ from actual outcomes for each quartile of the enrollee points distribution.

For university, with the clear exception of the 3rd quartile of achievement, there is not much difference in the school advantage gaps between first preferences and enrollment. The lack of an enrollment gap in the 3rd quartile may arise because, at these achievement levels, students from advantaged schools are very likely to list a university as first choice but may not obtain sufficient points to enroll. The findings for program selectivity (as measured by median points or match quality) are quite different. Here we see large enrollment effects only for the top quartile of achievement – while advantaged students throughout the points distribution are more likely to list highly selective programs as first choice, only the high achievers end up with a large school advantage gap in selectivity.[44] Greater ambition in application translates into program selectivity differences primarily for persons who have high points and can access the most selective programs.

[44] The most comparable findings to ours are those of Campbell et al. (2019) from the UK who find differences in match quality between the highest and lowest SES groups of 2.5 percentiles for the lowest achievement quintile and 8.3 percentiles for the highest achievement quintile. These are reasonably similar to our findings of 3 percentiles for the lowest achievement quartile and 6 percentiles for the highest achievement quartile.

Figure 6: Application and Enrollment by Quartile of Achievement



Note: Disadvantaged schools represent the reference category. Figures conditional on age, year, gender, Leaving Certificate points and program requirements. Quartiles based on Leaving Certificate points of sample who enroll in college. Separate regressions run for each achievement quartile.

7. Conclusions

In this paper, we have compared the application behavior of students who have the same college opportunities but who are in high schools with different levels of advantage. Our main finding is that, even controlling for college opportunities, students from advantaged schools are more likely to list selective programs as their first ranked preference and top three preferences and are more likely to list university programs. They are also less likely to enroll in their first ranked college program and more likely to enter programs that they ranked lower, demonstrating the greater selectivity of their first preference program. We also find that students from advantaged schools are more likely to list programs with similar median entry points (similar levels of selectivity), regardless of the field of study. In contrast, students from disadvantaged schools are more likely to list multiple programs in the same field of study.

We find that application differences are present throughout the achievement distribution and are visible for both low- and high-achievers. However, students from disadvantaged schools behave quite similarly to students from other schools – most of the differences we find relate to students from advantaged schools behaving differently to other students.

It is difficult to determine the underlying mechanisms that lead students in advantaged schools to list more selective programs, conditional on achievement. We show that it does not arise from the greater tendency of advantaged students to list programs for which they have no chance of admission. It is also unrelated to differences in field of study preferences. One partial explanation is geographic location; advantaged schools are more likely to be located close to universities. Taking account of this factor reduces the size of the effects of school advantage on college choice rankings but they remain large. We can conclude that, while geography matters, it is not just geography that determines gaps in college choice behavior between students in advantaged and disadvantaged schools.

There are many possible reasons for our findings. They could reflect that students from advantaged schools are more ambitious, perhaps because they are encouraged by parents, teachers, or peers to aim high. More advantaged students may also have more confidence in their ability to fit in and succeed in selective college programs or in the careers to which they later lead. Another possibility is information differences – students in more advantaged schools may be aware of a wider range of selective college programs. Whatever the reason, even conditional on college opportunities, students from more advantaged schools are more likely to list selective college programs when applying for college.

The gaps we find in enrollment are smaller than those for applications as, fundamentally, programs are allocated based on points. Once one takes account of points and whether students satisfy program requirements, there is only evidence of a gap between students from advantaged and disadvantaged schools in college entry for the bottom half of the achievement distribution; there is no evidence of a college entry gap for students with above-median achievement. However, conditional on entering college, students from advantaged schools are likely to enter more selective programs and are less likely to be undermatched with their program. These differences are largest for high achievers.

Overall, we conclude that despite the relative simplicity and transparency of the centralized application process, there are meaningful differences in application behavior across students who have similar college opportunities but come from schools with different levels of advantage. The centralized admissions system undoes some, but not all, of these effects, so differences in application behavior translate into substantial differences in enrollment patterns. These enrollment differences have implications for intergenerational inequality in educational outcomes and for subsequent labor market earnings. The findings also suggest that, while lower entry standards for disadvantaged students can lead to greater access to more selective programs, there is also a potential role for policy interventions (such as information provision (Oreopoulos and Dunn, 2013; Hoxby and Turner, 2015) and application assistance (Ye, 2018b)) that encourage students from disadvantaged schools to aim higher when applying for college.

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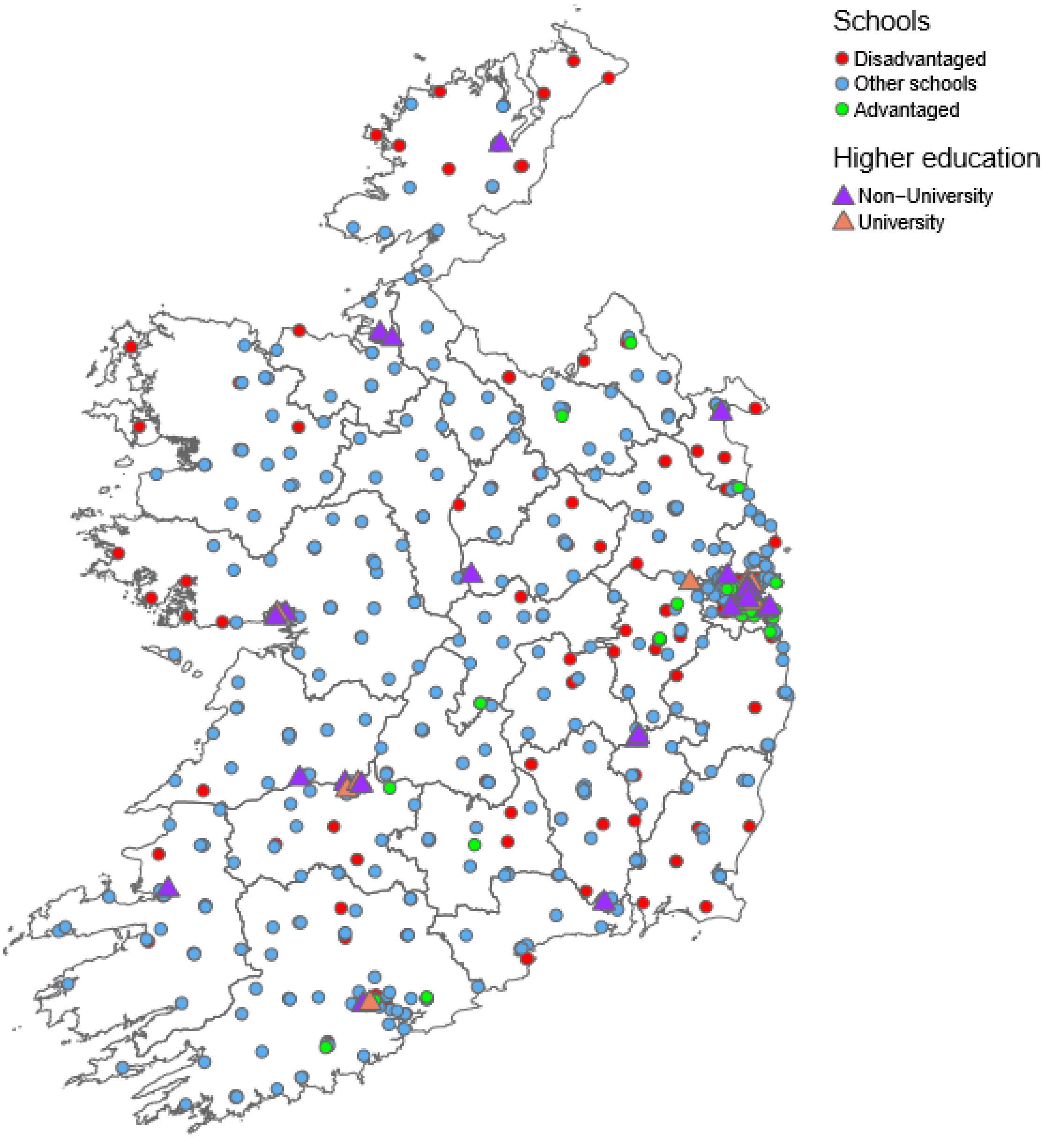
Appendix: Extra Figures and Tables

Figure A1: Map of Ireland and Dublin showing location of Schools and Colleges



Map of Dublin showing location of Schools and Colleges

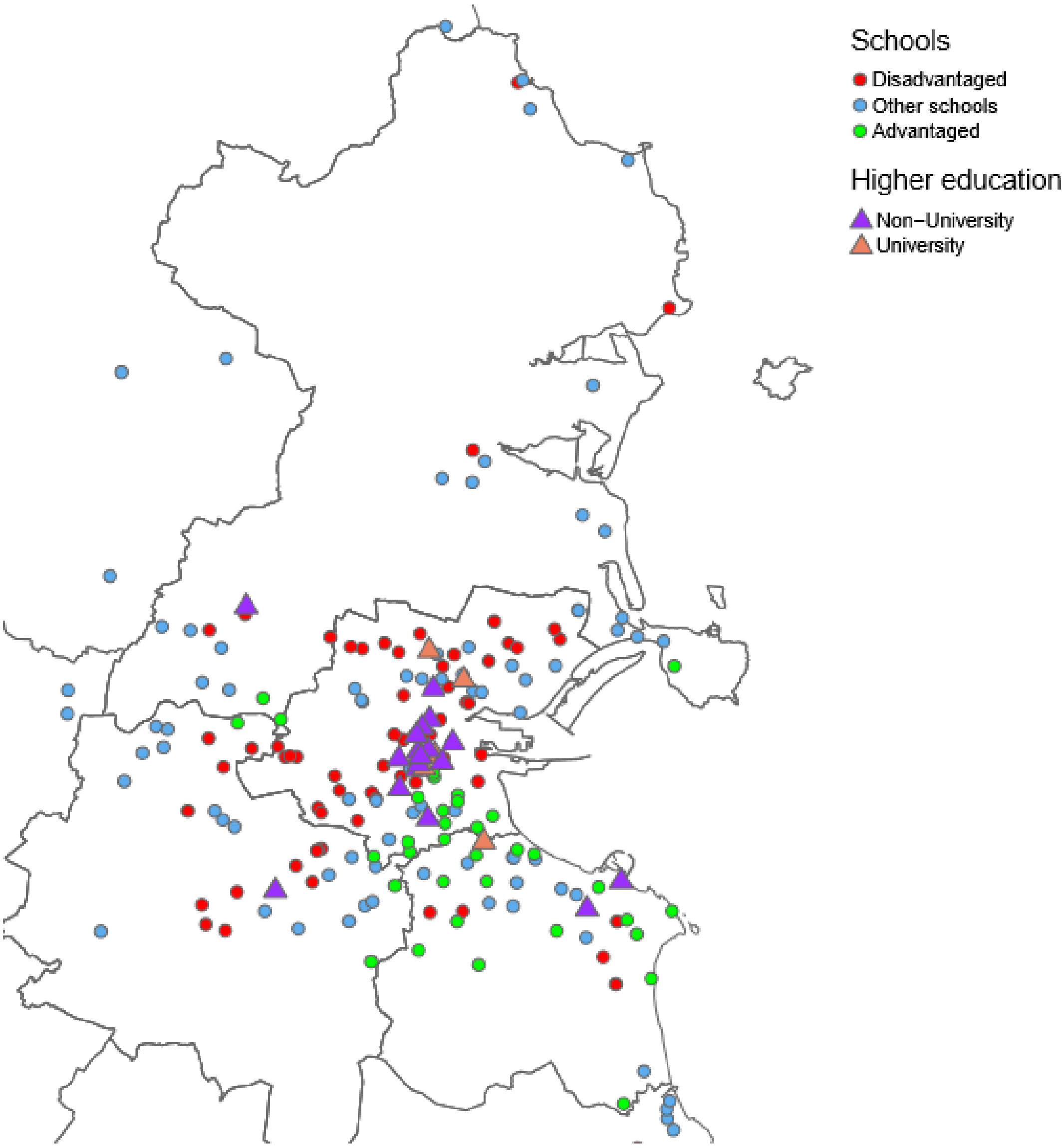
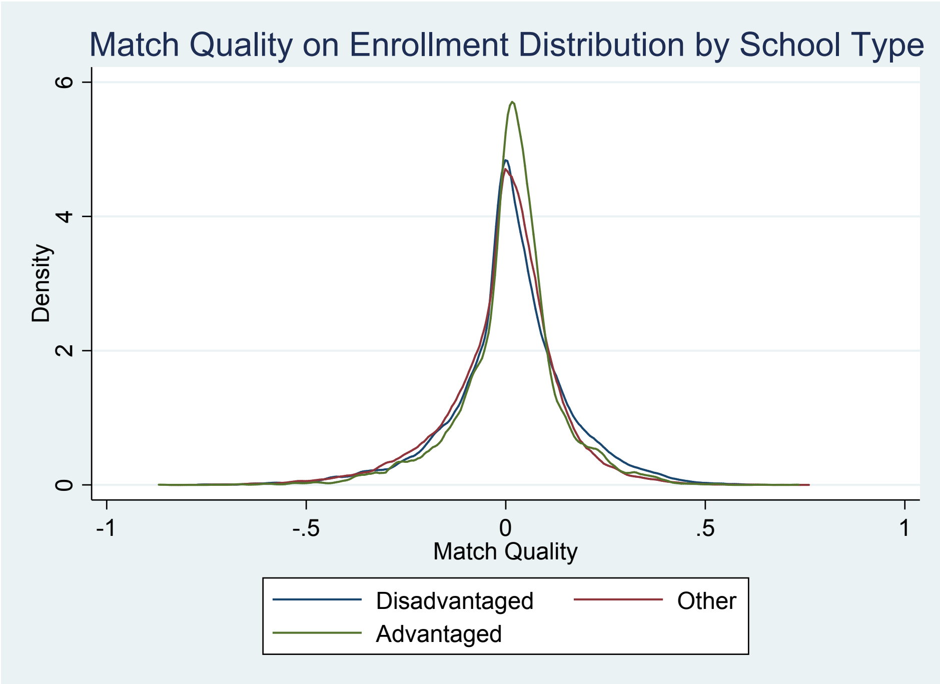


Figure A2: The Distribution of Match Quality by School Type



Appendix Table A1: Mapping from Grades to Leaving Certificate Points

2015 and 2016

Grade	Marks (%)	Points	Points (Math)
Higher Level			
A1	90% to 100%	100	125
A2	85% to 89%	90	115
B1	80% to 84%	85	110
B2	75% to 79%	80	105
B3	70% to 74%	75	100
C1	65% to 69%	70	95
C2	60% to 64%	65	90
C3	55% to 59%	60	85
D1	50% to 54%	55	80
D2	45% to 49%	50	75
D3	40% to 44%	45	70
E	25% to 39%	0	0
F	10% to 24%	0	0
NG	0% to 9%	0	0
Lower Level			
A1	90% to 100%	60	60
A2	85% to 89%	50	50
B1	80% to 84%	45	45
B2	75% to 79%	40	40
B3	70% to 74%	35	35
C1	65% to 69%	30	30
C2	60% to 64%	25	25
C3	55% to 59%	20	20
D1	50% to 54%	15	15
D2	45% to 49%	10	10
D3	40% to 44%	5	5
E	25% to 39%	0	0
F	10% to 24%	0	0
NG	0% to 9%	0	0

2017

Grade	Marks (%)	Points	Points (Math)
Higher Level			
H1	90% to 100%	100	125
H2	80% to 89%	88	113
H3	70% to 79%	77	102
H4	60% to 69%	66	91
H5	50% to 59%	56	81
H6	40% to 49%	46	71
H7	30% to 39%	37	37
H8	0 to 29%	0	0
Lower Level			
O1	90% to 100%	56	56
O2	80% to 89%	46	46
O3	70% to 79%	37	37
O4	60% to 69%	28	28
O5	50% to 59%	20	20
O6	40% to 49%	12	12
O7	30% to 39%	0	0
O8	0 to 29%	0	0

Table A2: Distribution of SES Measures using GUI Survey Data

	Disadvantaged School	Other School	Advantaged School
Equivalized Household Income			
≤ €10000	0.38	0.19	0.03
€10000 - €15000	0.27	0.26	0.11
€15000 - €20000	0.16	0.21	0.20
€20000 - €25000	0.07	0.13	0.15
€25000 - €30000	0.01	0.06	0.12
€30000 - €35000	0.01	0.02	0.09
€35000 - €40000	0.01	0.01	0.05
≥ €40000	0.09	0.12	0.25
Occupational Class of Head of Household			
Professional	0.06	0.13	0.33
Managerial/Technical	0.25	0.37	0.45
Non-manual	0.21	0.20	0.10
Skilled Manual	0.13	0.09	0.02
Semi-Skilled/Unskilled	0.15	0.09	0.02
Unknown	0.20	0.11	0.09
Highest Education Level of Primary Caregiver			
Primary School/ Lower Secondary	0.24	0.11	0.02
Higher Sec/Vocational	0.45	0.38	0.20
Non-Degree	0.13	0.21	0.19
Primary Degree	0.12	0.18	0.32
Postgraduate Degree	0.06	0.11	0.26

Note: This information uses the third wave of the *Growing Up in Ireland (GUI)* child cohort study which took place in 2017 when the child was aged 17 years old.

Table A3: Means of Selected Dependent Variables

	Full Sample	Disadvantaged School	Other School	Advantaged School	N Full Sample
University First Preference	0.67	0.52	0.68	0.84	125236
Median Points First Preference	444	412	444	497	124749
Enroll in Top Choice	0.32	0.25	0.33	0.35	125236
List a 2nd Choice	0.95	0.91	0.95	0.98	125236
University listed for 2nd Choice	0.65	0.50	0.66	0.81	119088
Median Points on 2nd Choice	437	410	436	486	118349
List a 3rd Choice	0.89	0.82	0.90	0.97	125236
University listed for 3rd Choice	0.64	0.51	0.64	0.79	111716
Median Points on 3rd Choice	430	410	432	476	110855
Top 3 Choices University	0.49	0.34	0.50	0.70	115908
Top 3 Choices Average Median Points	438	409	438	488	113923
Top 3 Choices Same College	0.23	0.24	0.23	0.25	115908
Top 3 Choices Same University	0.15	0.10	0.15	0.22	115908
Top 3 Choices Same Non-University	0.09	0.13	0.08	0.04	115908
Top 3 Choices Same Field	0.44	0.43	0.44	0.43	115908
Top 3 Choices Similar Points	0.36	0.31	0.36	0.44	113923
Top 3 Choices Similar Points but not all Same Field	0.17	0.15	0.17	0.24	113923
List a Zero-Probability First Choice	0.23	0.31	0.21	0.17	106641
STEM First Choice	0.31	0.33	0.31	0.29	125236
Business Administration and Law First Choice	0.21	0.19	0.21	0.31	125236
Arts and Social Sciences First Choice	0.19	0.18	0.19	0.25	125236
Education First Choice	0.08	0.07	0.09	0.03	125236
Other field First Choice	0.20	0.23	0.21	0.11	125236

Note: 16% of the sample come from disadvantaged schools, 9% come from advantaged schools, and 75% come from other schools.

Table A4: Field of First Preference Program

	Other School	**Advantaged School**	**R-squared**	**N**
STEM	-0.040**	-0.121**	0.137	125,236
	(0.006)	(0.014)		
Business, Administration and Law	0.014*	0.110**	0.027	125,236
	(0.006)	(0.015)		
Arts and Social Sciences	0.016**	0.096**	0.038	125,236
	(0.006)	(0.011)		
Education	0.006*	-0.051**	0.037	125,236
	(0.003)	(0.004)		
Other	0.017*	-0.018	0.084	125,236
	(0.007)	(0.010)		

Note: Robust standard errors clustered by school in parentheses. ** p<0.01; * p<0.05. The omitted category is disadvantaged school. Controls include indicators for gender, age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017), and indicator variables for whether the student satisfies several subject- and grade-specific requirements for common programs and colleges.

Table A5: Characteristics of Preferences Listed as Top Choices
Estimates by Gender

	Other School	Advantaged School	R-squared	N
Female				
University first choice	0.022	0.056**	0.220	63,681
	(0.011)	(0.015)		
Median Points first choice	2.710	22.018**	0.433	63,439
	(1.707)	(2.394)		
Top 3 choices all same field	-0.000	-0.051**	0.017	59,876
	(0.009)	(0.016)		
Top 3 choices all similar points	0.023**	0.065**	0.017	58,829
	(0.008)	(0.015)		
Top 3 choices all similar points but not all same field	0.009	0.068**	0.004	58,829
	(0.006)	(0.014)		
Male				
University first choice	0.038**	0.088**	0.308	61,555
	(0.011)	(0.014)		
Median Points first choice	3.686*	29.082**	0.490	61,310
	(1.804)	(2.563)		
Top 3 choices all same field	-0.018	-0.057**	0.014	56,032
	(0.010)	(0.016)		
Top 3 choices all similar points	0.019*	0.078**	0.011	55,094
	(0.008)	(0.014)		
Top 3 choices all similar points but not all same field	0.013*	0.078**	0.004	55,094
	(0.006)	(0.011)		

Note: Robust standard errors clustered by school in parentheses. ** $p<0.01$; * $p<0.05$. The omitted category is disadvantaged school. Controls include indicators for age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017), and indicator variables for whether the student satisfies several subject- and grade-specific requirements for common programs and colleges.

Table A6: Characteristics of Enrolled College Programs

	Other Schools	Advantaged Schools	R-squared	N
		Female		
Enroll in any program	0.018*	0.022	0.308	63,681
	(0.008)	(0.014)		
University	0.015	0.026	0.353	45,445
	(0.009)	(0.016)		
Median Points	-0.614	6.847**	0.774	45,445
	(1.082)	(1.327)		
Match Quality	-0.002	0.023**	0.082	45,445
	(0.004)	(0.004)		
		Male		
Enroll in any program	0.007	0.012	0.334	61,555
	(0.008)	(0.012)		
University	0.023*	0.044**	0.453	43,304
	(0.009)	(0.016)		
Median Points	0.993	12.692**	0.813	43,304
	(0.858)	(1.260)		
Match Quality	-0.000	0.039**	0.068	43,304
	(0.003)	(0.004)		

Note: Robust standard errors clustered by school in parentheses. ** p<0.01; * p<0.05. The omitted category is disadvantaged school. Controls include indicators for gender, age, and year, a quartic function of Leaving Certificate points (interacted with an indicator variable for 2017), and indicator variables for whether the student satisfies several subject- and grade-specific requirements for common programs and colleges. Sample restricted to persons who accept a college place in rows 2 – 4.