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How Gender and Prior Disadvantage predict performance in College[*]

by

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Abstract

Much research has shown that having a better class of degree has significant payoff in the labour market. Using administrative data from Ireland, we explore the performance in college of different types of students. We find that post-primary school achievement is an important predictor: Its relationship with college performance is concave for college completion, approximately linear for the probability of obtaining at least second class honours, upper division, and convex for the probability of obtaining a first class honours degree. We find that females do better in college than males, even after we account for their greater prior achievement, and this is true in both non-STEM and STEM fields. Disabled students, students from disadvantaged schools, and students who qualify for means-tested financial aid are less likely to complete and less likely to obtain first class honours or a 2.1 degree. However, once we control for post-primary school achievement, these students actually perform better in college than others. We also find that, conditional on prior achievement, students from private exam-oriented "grind" schools and from Irish-medium schools are less likely to finish a degree and less likely to perform well in college, possibly because their school exam results are high relative to their abilities. Our results suggest that current college policies that lower entry requirements for disabled students and students from disadvantaged backgrounds may be justified on efficiency as well as equity grounds. They also suggest that college performance might be improved by increasing entry requirements for students who come from school types that convey advantages in the post-primary exams that determine college entry.

[*] We are grateful to the Higher Education Authority (HEA) for providing access to the data used in this paper. All the analyses and conclusions of the paper are those of the authors and do not represent the views of the HEA.

I. Introduction

Much research has shown that having a better class of degree has significant payoff in the labour market (Feng and Graetz, 2017; Freier et al., 2015). In most countries, the proportion of people going to college has increased in recent decades and this may have further increased the value of having a "good" degree.[1] However, relatively little is known about what factors have important effects on the class of degree obtained. In this paper, we use administrative data to study the relationship between student and post-primary school characteristics and degree performance in Irish colleges. We measure performance using college completion and two variables based on the class of degree obtained (whether the student obtained first class honours, and whether the student achieved at least second class honours, upper division). We relate these outcomes to student characteristics, including post-primary school achievement, gender, socio-economic-status (SES), disability status, and the type of post-primary school attended. Our sample includes students who enter an honours degree programme in an Irish university or Institute of Technology (IoT) between 2007 and 2013.

There are many motivations for studying these issues. First, it is well established that, certain groups, including women, people from poorer socio-economic backgrounds, and people with disabilities, earn less on average in the labour market. However, less is known about the role played by colleges in mediating these differences, so it is important to understand the determinants of college performance. Second, colleges invest heavily in recruiting and supporting students from groups that are underrepresented in college such as low-income students, students from disadvantaged schools, and disabled students. These students may face challenges in performing to their potential in school, so it is interesting to examine whether their performance in college is as strong as that of students from more advantaged backgrounds. The effect of group differences in attending college may be exacerbated if underrepresented groups are also less likely to complete their degree and less likely to achieve a top degree class if they complete. Third, our findings speak to the broader issue of the efficiency and fairness of the college admissions system. The centralized Irish college admissions system is almost entirely determined by performance in a single set of examinations (the Leaving Certificate) at the end of post-primary education. The system is simple and transparent and has many positives.[2] However, does it favour groups who have advantages that enable them to score better in the Leaving Certificate examinations than other equally able students? And does the system under-admit high ability children who do not perform as well on the state exams because they come from schools that are less focused on exam preparation? While we do not study college admissions directly, we argue that our results can speak to these issues.

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 post-primary school (the Leaving Certificate exams) and on the preference ranking over programs provided by the applicant.[4] Thus, we can compare college performance across

[1] Using UK administrative data, Naylor et al. (2016) show that the premium to a first-class degree or upper second class degree has increased as the relative supply of university graduates has increased.

[2] Advantages include a single application that covers all colleges and simply requires ranking college programmes in order of preference, and the lack of necessity to accumulate non-academic distinctions in order to successfully apply to heavily-demanded 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.

students who have equal college entry opportunities (equal points) but are from different backgrounds.

We begin by relating degree outcomes to individual and post-primary school characteristics. We find that Leaving Certificate performance is an important determinant of college achievement. This relationship between Leaving Certificate points and college performance is concave for college completion, approximately linear for the probability of obtaining at least second class honours, upper division, and convex for the probability of obtaining a first class honours degree. Females do better than males in college, even after we account for their greater points at entry, and this is true in both STEM and non-STEM fields. Disabled students tend to perform worse in college, but this can be entirely explained by lower post-primary achievement. Once we control for Leaving Certificate points, we find that this effect disappears, and disabled students do better in college. We find a similar relationship for a marker of socio-economic disadvantage – having means-tested financial aid. When we study post-primary school characteristics, we find that students from disadvantaged schools do worse in college but, once again, conditional on points, the effect reverses and being from a disadvantaged school predicts better performance. On the other hand, students from grind schools (private schools that have a strong emphasis on maximising Leaving Certificate performance) do less well in college, whether or not we control for points at entry. We also find that students from Irish-medium schools tend to do worse in college than one would expect given their points, possibly because their points are inflated due to grading bonuses from doing Leaving Certificate exams through Irish.

While our analysis looks at determinants of college performance, it has relevance to the college admissions system. If equally able children from different groups are treated equally by the admissions process and have equal opportunities while in college, we would expect that group identity should not predict college degree performance once one controls for the entry qualifications of students (their Leaving Certificate points). If, however, there are predictable differences in college degree performance amongst students who have the same points, this suggests that either the college entry rules favour groups that subsequently do worse in college (they have lower ability for any given level of entry points) or that the college environment is less favourable for these groups (they do worse in college despite having equal points and equal ability). Our finding that, conditional on entry points, disabled students and students from disadvantaged schools do better in college could arise either because these students underperform in the Leaving Certificate due to the extra challenges they face or because they receive preferential treatment in college that enables them to do better than suggested by their Leaving Certificate points. In contrast, our finding that, conditional on points, students from grind schools do worse in college is most likely explained by their points being inflated relative to their ability, providing them with an advantage in the college admissions process.

Our work builds on much previous literature. Research has shown that low SES students and students from disadvantaged schools are less likely to enrol in college in Ireland with the gaps largely due to differences in points across groups (Denny, 2014; Cullinan et al., 2013; Delaney and Devereux, 2020a). There is little work on determinants of degree quality in the Irish context but there have been studies on college progression. Most recently, McCoy and Byrne (2017) use administrative data to study progression from first to second year undergraduate for persons who entered college in 2007. They find that Leaving Certificate points are the biggest determinant of progression. Piggott and Frawley (2019) provide a wealth of descriptive evidence on college completion in Ireland using this same 2007 entry cohort.

In the UK, several papers have shown that higher A-level results are associated with lower dropout rates from college and better degree outcomes (for example, Smith and Naylor,

2001; Naylor and Smith, 2004, Arulampalam et al., 2005). Additionally, Smith and Naylor (2001) find that there is a monotonically positive relationship between social class and degree outcome. Crawford (2014) uses more recent matched administrative data from the UK to study the effect of SES on retention, degree completion within 5 years of starting, and on quality of degree obtained. She finds that lower-SES students score worse in all respects, but this is largely, but not fully, explained by lower A-level scores. Smith and Naylor (2001) find that students from "Independent Schools" (who attract relatively affluent students and are somewhat equivalent to fee-paying secondary schools in Ireland) have poorer degree performance than observationally equivalent students who went to state schools. Crawford (2014) finds a similar result using more recent UK data.

There is also some U.S. research on determinants of college performance. Conger and Mark (2010) use administrative data on enrolees in Florida and Texas and find that males are less likely to graduate from college and earn fewer cumulative credits and lower cumulative grades. Lower prior achievement of males explains approximately three-quarters of the gender differential in credits earned and grade point average in the first year of college. In earlier work, Betts and Morrell (1999) and Cohn et al. (2004) find that both standardised test (SAT) scores and high-school GPA are significant predictors of college performance.

Our study adds to this literature by studying recent administrative data from an interesting institutional context with a centralized admission system based on a single achievement measure.[5] Our rich data allow us to examine the relationships between gender and prior advantage, with and without controls for post-primary school achievement. They also allow us to study the extent to which the findings from the UK and other countries generalize to a somewhat different educational system.

The paper proceeds as follows: In Section 2, we describe the Irish educational system. In Section 3 we describe the data we use and outline our empirical approach. In Section 4, we report estimates of the effects of individual and post-primary school characteristics on college degree performance. Section 5 examines heterogeneous effects by college type (university versus institute of technology, by gender, by time period, and by college field of study). In Section 6, we analyse the relationship between Leaving Certificate points and college performance. In Section 7, we report our conclusions and discuss the relevance of our findings for policy.

II. The Irish Educational System

Students typically begin post-primary education in Ireland at age 12 or 13. The duration of post-primary schooling is 5/6 years with a state examination (the "Junior Certificate") after the first 3 years and another state examination (the "Leaving Certificate") at the end of the final 2 years. About 76% of schools offer a "transition year" after the third year of post-primary schooling. In some schools, participation in the transition year is voluntary so, overall, about 48% of students in our cohorts have a 6-year post-primary school programme.[6] Therefore, students usually sit the Leaving Certificate at ages 17-19. In this exam, they typically take 7 or 8 subjects and can choose to take each subject at either a higher level or at a lower level. Irish, English, and mathematics are compulsory and other subjects

[5] The UK system is more decentralized than in Ireland. In the UK, admission decisions may depend on a personal statement, a school reference, grades already attained, and predicted A-level grades.

[6] These figures correspond to 2004 to 2009. The proportion of schools offering transition year and the number of students taking it has risen steadily such that, in 2014, 89.1% of schools offered transition year with 65% of students participating (Clerkin, 2016).

are chosen from a menu that includes art, music, modern languages, sciences, business, economics, and other subjects.[7]

There are several different types of post-primary schools in Ireland including secondary schools (both non-fee-paying and fee-paying), vocational schools, community or comprehensive schools, and grind schools. Most students attend secondary schools. These are privately owned and managed but largely funded by the state. Most do not charge fees, but there is a set of secondary schools that are partially funded by student fees (typically €6,000 - €8,000 per year) and tend to attract students from disproportionately affluent backgrounds. We refer to these as fee-paying secondary schools. Many Irish secondary schools have a religious affiliation and most of these are Catholic. Vocational schools and community colleges are owned by the local Education and Training Board. They do not charge fees and tend to focus more on technical education than secondary schools. Community or comprehensive schools were often established through the amalgamation of secondary and vocational schools. These are all free, are fully funded by the state, and offer a wide range of academic and technical subjects. 'Grind schools' are private fee-paying schools that place strong emphasis on maximising the achievement of their students in the Leaving Certificate. They differ from fee-paying secondary schools in that they receive no government support, place little emphasis on extra-curriculars, and tend to enrol only those in the final 2 years of post-primary school (5th and 6th year students) as well as one-year repeat Leaving Certificate students.

Some post-primary schools are single-sex, and some are mixed-sex. Many schools that attract students from relatively deprived 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).[8] Irish-medium post-primary schools, "Gaelscoileanna", have become more common in recent years and teach all subjects through the Irish language. Same-sex, DEIS, and Irish-medium status differs across secondary schools, vocational schools, and across community schools. However, no grind school or fee-paying secondary school is DEIS or Irish-medium.

For school-leavers, entry to college is almost entirely dependent on Leaving Certificate performance. Students get grades in each subject and these grades are mapped into points. More points are awarded for subjects taken at higher level than at lower level. From 2012, entrants received 25 bonus points in mathematics if they obtained at least a D3 grade (40%) in higher level mathematics. The relationship between exam scores, exam grades, and Leaving Certificate points during our time-period is in Appendix Table 1. Points for a subject range from 0 to 100 (125 for mathematics from 2012). The total points obtained from the student's 6 best subjects are combined to form their total Leaving Certificate points and is used to determine third level placement, so the maximum total Leaving Certificate points is 600 (625 in 2012 and after).

Third-level institutions in Ireland include universities, teacher-training colleges, and institutes of technology (IoTs). Students apply for almost all full-time undergraduate courses through the Central Applications Office (CAO).[9] Prior to sitting the Leaving Certificate, each student ranks possible college programmes – they can rank up to 10 honours degree programmes and, in a separate list, up to 10 lower-level programmes (ordinary degrees and certificates). Most college programmes are over-subscribed and have minimum-points

[7] While Irish is compulsory, there are exemptions available for children who have lived for a sufficient time outside of Ireland or who have a learning disability (https://www.education.ie/en/Circulars-and-Forms/Active-Circulars/ppc10_94.pdf).

[8] DEIS denotes *Delivering Equality of Opportunity in Schools*.

[9] While there are no tuition fees in Ireland, all institutions charge an annual registration fee of €3,000. This fee was €825 in 2007, €1,500 in 2009, €2,000 in 2011, and rose steadily until it reached €3,000 in 2015.

requirements. The number of points needed for any course depends on the number of places and the number of applicants for those places and varies from year to year. Once the Leaving Certificate results are released, the student is offered their highest ranked programme for which they have sufficient points.[10]

There are two exceptions to the rule that only Leaving Certificate points matter for access to college courses.[11] First, there are a small number of college courses that do admissions based on information other than Leaving Certificate points. For example, music courses typically require an audition, and arts/architecture courses a portfolio. We remove these courses from our sample so as to limit our sample to courses in which admission is determined by Leaving Certificate performance.[12] Second, a small number of applicants get into courses 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 courses.[13] We cannot separately identify HEAR and DARE applicants but we show that our results are robust to removing persons who were admitted despite having points below the official minimum points for the course.

In Ireland, colleges grade degrees based on variants of the scale: First class honours, second class honours (upper division), second class honours (lower division), third class honours/pass. We use two different definitions of degree quality: *Good Degree* (first class honours or second class honours (upper division)) and *Great Degree* (first class honours). Typically, a first class honours degree is considered very high academic achievement. Getting at least second class honours (upper division) degree is often viewed by employers as a necessary requirement and is also a minimum standard for many master's degrees in Ireland and abroad.

III. Data and Methods

3.1 Data

Our data come from the Higher Education Authority (HEA) data registers that compile information on students in Irish third level institutions. We use the "New Entrant" file that contains information on new entrants to higher educational institutions from 2007 onwards and the "Graduate" file that contains information on students who graduate from these institutions by 2017. Both files are created from information provided by the third level institutions in annual transfers of information to the HEA.

The "New Entrants" file has information on post-primary school attended, Leaving Certificate results and points obtained, college institution and programme, gender, age, and whether the student receives a grant. It also provides information about parental SES that is created from a survey at registration where students report information about the occupations of their fathers. The parental SES data are quite imperfect as there is substantial non-response by students (about 30%) and a further 8% don't provide a response that enables an SES classification. Thus, we don't know SES for about 38% of our sample. We also have self-

[10] There are multiple rounds of offers so the points required in the first round may be higher than the final minimum points and students who do not get their first preference initially may get offered a choice they ranked higher later in the process.

[11] In addition to the minimum points, some courses have additional entry requirements such as needing to have done a science subject for Leaving Certificate or to have passed higher level mathematics.

[12] Results are very similar if we include these "portfolio" courses in our analysis.

[13] For example, approximately 5% of UCD places are reserved for HEAR applicants and 5% for DARE applicants. To be considered, applicants must have a minimum of 300 points, have met all of the entry requirements for the course, and be within 20% of the points required (e.g. if the cut-off is 500 they must have at least 400 points) https://www.ucd.ie/all/study/hearanddare/. Policies vary across institutions.

reported information on disability status from this survey, with a similar non-response problem. As a result, 23% of cases have missing values for disability.

The "Graduate" file has information on year of completion and the class of degree obtained. We merge the two files so that, for persons we see entering a college, we can determine if they obtain a degree, the year the degree is completed, and the class of degree obtained. Most students graduate from the programme to which they first register. However, there are various alternative possibilities. Some students transfer to a new programme and possibly a new institution either during or after the first year of studies and subsequently obtain a degree in that new programme/institution. Other students never finish a college degree as they drop out at some point and do not later finish another degree programme. We approach these complications by studying the outcome of the degree from the last institution into which the student enrols. We merge students to the graduation file by student identifier and by institution so that we restrict our sample to persons who graduate from the same institution in which they started.

The universities report the anticipated (normal) duration of each degree programme, usually 3 or 4 years. When looking at degree completion, we assign students who have graduated within one year of the anticipated length of the programme as degree completers while those who have not graduated within this time frame are denoted as non-completers. When looking at *Good* and *Great* degree outcomes, we restrict the sample to those who graduated within 1 year of the anticipated length of the programme.[14]

We match information about post-primary schools using the school identifiers. Information on whether they are secondary, vocational, comprehensive, fee-paying, DEIS, etc., comes from the Department of Education. We parameterise school type using the five main types of post-primary schools in Ireland – non-fee-paying secondary schools, fee-paying secondary schools, vocational school/community colleges, comprehensive/community schools, and grind schools. We also consider other key characteristics of the school (whether it is mixed-sex or same-sex, whether it is a disadvantaged (DEIS) school, and whether it is an Irish-medium school).

Leaving Certificate points are reported by the colleges, so we have a direct measure in the data. However, in some cases they use special codes rather than reporting the actual points and sometimes they report points that are infeasible. We can calculate the points ourselves using the individual exam subjects and scores in the data. Once we exclude reported points that are infeasible, the two methods produce the same number of points for about 94% of people in our sample (the correlation between the two measures is 0.98) and the differences are usually very small (the difference is greater than 10 points in only about 4% of cases). In the analysis, we use the reported points (provided they are not obviously wrong) and replace missing values with points calculated using the individual subject scores and grades.[15]

We create a sample of full-time undergraduate students who enter an honours degree programme at one of Ireland's universities or institutes of technology (we require the

[14] We restrict the sample to cases where we can see one year or more after the expected graduation. This is not an issue for 3-year degrees as their anticipated completion year is 2016 or earlier. However, we must remove 4-year degree courses that start in 2013. A small number of students do degree courses of 5 or 6 years anticipated duration, so we need to omit some of these courses starting in 2011 and 2012 (for example, students that start a 5-year degree programme in 2012).

[15] We use the reported points as our baseline as our constructed points could be incorrect if a Leaving Certificate recheck led to a grade change in a subject or, in the case of repeat students, if the Leaving Certificate scores we see are from a Leaving Certificate attempt that did not give the highest points. We delete a few cases with points less than 100 as this is almost certainly a reporting error.

anticipated length of the programme to be at least 3 years).[16] We restrict the sample to students who attended an Irish post-primary school because we require information on the school attended for our analysis. Using information on date of birth, we calculate age at entry assuming the programme begins on September 15. People generally sit the Leaving Certificate at ages 17-19 so, to focus on a relatively homogenous group of students who have recently taken the Leaving Certificate, we restrict the sample to persons aged at least 16 and less than 21 when starting their college programme.[17] As mentioned earlier, we remove a small number of college courses that do admissions based on information other than Leaving Certificate points. We also delete cases where we don't know the school attended or we don't know Leaving Certificate points (in some instances, institutions do not report the school attended by any students, so we have to drop that Institution/Year). Appendix Table 2 shows the institutions and starting years that are included in the analysis. We are missing several universities in 2007 and 2008 because they did not report either Leaving Certificate points or post-primary school information to the HEA. Several institutions are missing in 2013 because, as discussed earlier, we need to omit 4-year degree programmes that start in 2013.

3.2 Descriptive Statistics

We report descriptive statistics for key variables in Table 1. About 54% of those starting a college degree programme are female and the average age at entry is 18.7. About 76% of students graduate within one year of the scheduled completion date and, of those, 16% get a *great degree* (first-class honours) and 65% obtain a *good degree* (an upper second or first-class honours degree).[18] Average Leaving Certificate points are about 425 while the average minimum points for the course is 383. About 6% of college students have lower than the minimum points for the programme.[19] Most students attend Secondary schools – 53% attend non-fee-paying secondary schools and 12% attend fee-paying secondary schools. About 17% attend Vocational School/Community College and about 14% attend Community/Comprehensive School. Only about 5% attend grind schools.

There are 99,337 observations in total but there are fewer observations for certain variables. These include *Year Finished*, *Good Degree*, and *Great Degree*, as these variables exists only for persons who complete their degree. We also are missing CAO minimum points for a small number of courses, often because they are under-subscribed and have no required minimum points for admission.[20] Due to non-response in the student survey, disability status is missing for many students. In the later regressions, rather than induce selection problems by leaving out cases with missing disability status, we include two indicator variables – whether the student reports a disability, and whether disability status is

[16] Students can also study for honours degrees in teacher-training colleges. However, the data for these institutions were too incomplete to analyse.

[17] Mature students (entrants aged 23+) are a significant group but are difficult to study as many do not have information on Leaving Certificate grades and they face very different admission criteria to those faced by younger students. Also, for this group, school information is typically unavailable or irrelevant.

[18] There are a relatively small number of cases where the degree outcome is reported as "second class honours". As we don't know whether these are level 1 or level 2, we drop these cases when we study *good degree*. Hence, we have fewer observations for *good degree* than we have for *great degree*.

[19] The minimum points level in the sample is 100 points. While this may appear unreasonably low, we cannot be sure that such low points are due to measurement error as students can access some under-subscribed programmes with very low points. Therefore, we leave such low points levels in the sample. There are few cases with very low points (0.25% have points under 200, and 0.8% have points under 250) and removing them has no effect on our findings.

[20] Additionally, about 32% are missing because we have no information on the CAO code and 30% are missing because they are Two Subject Moderatorships in Trinity College Dublin – we don't have information on the individual combinations of subjects taken by students in these programmes and, so, cannot match to required points.

unknown due to non-response. We use a similar strategy for our SES indicators as SES is unknown for 38% of the sample due to survey or item non-response.

Because we are missing certain institutions in certain years (Appendix Table 2), our sample is not completely nationally representative. Clancy (2015) reports that in 2012/13, 43% of higher education students attending publicly funded colleges were in receipt of a higher education grant (p. 244). He also reports that in 2008/09 a third of students were in receipt of a grant with the rapid increase to 2012 due to income falls during the recession. As such our proportion of 33% appears close to what one would expect.[21] We emphasise that, while there may be some misreporting in the data sent by institutions to the Higher Education Authority, the quality of the data is still likely to be very high relative to other potential sources.

[21] This figure can be expected to be below the proportion of all students who receive grants as our sample excludes students who enter a non-honours degree programme – these are in IoTs and tend to attract students from more disadvantaged backgrounds. We also exclude mature students who may be more likely to qualify for financial aid.

Table 1: Descriptive Statistics

	(1) N	(2) Mean	(3) Standard Deviation	(4) Minimum	(5) Maximum
Student Characteristics					
Year Started	99,337	2010	1.665	2007	2013
Leaving Certificate Points	99,337	425	76.39	100	625
Year Finished	77,969	2014	1.686	2009	2017
Age Started	99,337	18.69	0.682	16.24	20.99
Female	99,337	0.535	0.499	0	1
Disabled	76,960	0.067	0.250	0	1
Grant recipient	99,337	0.327	0.469	0	1
Below Minimum Points	99,337	0.063	0.242	0	1
Completed Degree on time	99,337	0.760	0.427	0	1
Good Degree (at least an upper second)	73,997	0.653	0.476	0	1
Great Degree (first-class honours)	75,479	0.156	0.363	0	1
Father Occupation					
Professional	99,337	0.092	0.289	0	1
Managerial and Technical	99,337	0.211	0.408	0	1
Non-manual	99,337	0.091	0.287	0	1
Manual	99,337	0.224	0.417	0	1
Unknown	99,337	0.382	0.486	0	1
Post-primary School Type					
Non-feepaying Secondary school	99,337	0.525	0.499	0	1
Fee-paying Secondary school	99,337	0.122	0.328	0	1
Vocational school/Community college	99,337	0.167	0.373	0	1
Community/Comprehensive school	99,337	0.141	0.348	0	1
Grind school	99,337	0.045	0.206	0	1
Post-primary School Characteristics					
Irish-medium school	99,337	0.064	0.244	0	1
DEIS school	99,337	0.083	0.276	0	1
Mixed-sex school	99,337	0.534	0.499	0	1
College Programme characteristics					
STEM	99,337	0.280	0.449	0	1
Non-STEM	99,337	0.720	0.449	0	1
Engineering, Manufacturing, and Construction	99,337	0.089	0.285	0	1
Science, Mathematics, and Computing	99,337	0.191	0.393	0	1
Arts and Humanities	99,337	0.125	0.330	0	1
Social Sciences, Business, and Law	99,337	0.280	0.449	0	1
University programme	99,337	0.704	0.457	0	1
Programme Length	99,337	3.758	0.461	3	6
CAO Minimum Points	95,015	382.7	72.25	170	580

3.3 Points and College Performance

In Figures 1-3, we plot the relationship between points levels and each of our three outcome variables (whether the student completes the degree, whether they get a *good degree*, and whether they get a *great degree*). For these pictures, we exclude observations

with fewer than 300 points (less than 4% of students in our sample have fewer than 300 points) and also exclude post-2012 observations so that there are no bonus points in mathematics and the maximum points are 600. As expected, we find an upward-sloping relationship between points and college performance. Interestingly, the relationship is concave for completion, approximately linear until about 550 points for *good degree* and then flattening out, and convex for *great degree*.[22] These patterns are consistent with the fact that these three thresholds map into increasing levels of the ability distribution and shows the value of having measures of degree performance in addition to the more commonly available measure of degree completion. The pictures also show the importance of controlling flexibly for points so, in the regression analysis, we will include fixed effects for each individual points level.

[22] The relationship between points and obtaining a *good degree* is approximately linear but actually declines at very high points. This decline occurs because these high-points students disproportionally enter more difficult and challenging courses where it is relatively difficult to obtain a *good degree* (an upper second or first-class honours degree). If we plot the relationship between points and *good degree* after conditioning out course-year indicators, we find the effect of points on *good degree* is upward-sloping throughout. Also, note that the curve declines at about 550 points and only about 5% of the sample have points above that level.

Figure 1: Leaving Certificate Points and Degree Completion

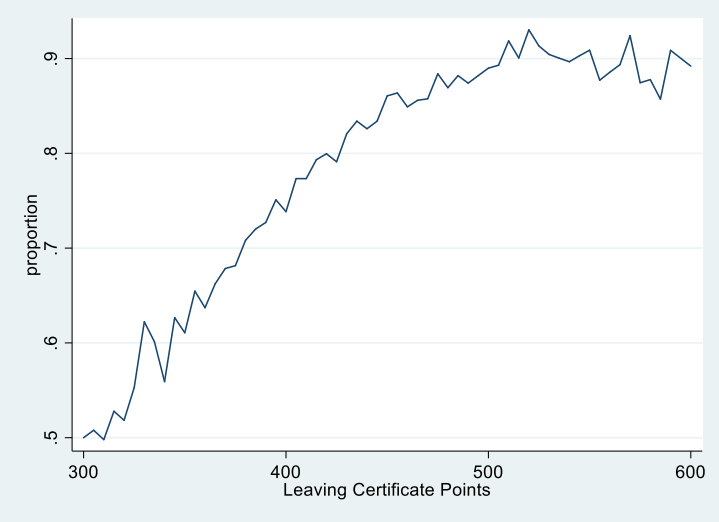


Figure 2: Leaving Certificate Points and Proportion of Completers Obtaining a Good Degree

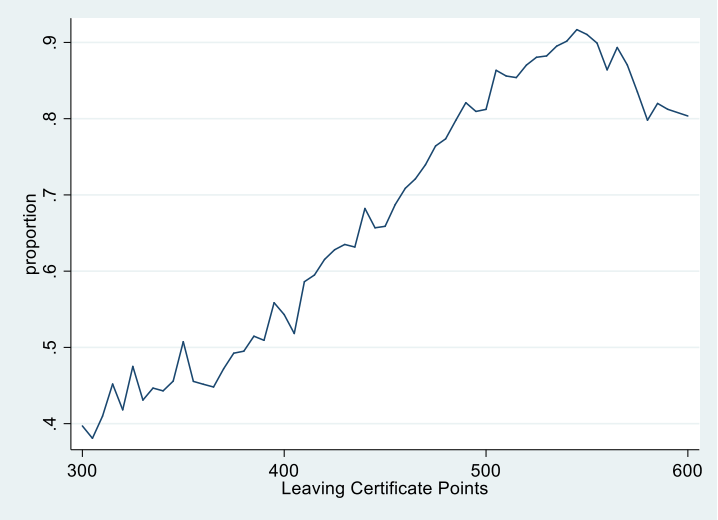
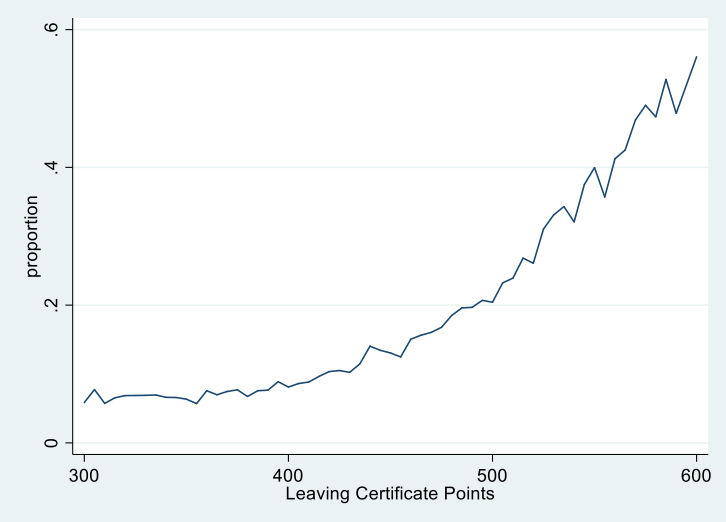


Figure 3: Leaving Certificate Points and Proportion of Completers Obtaining a Great Degree



We plot the relationship between each points level and each of our three outcome variables. We omit cases with points below 300 and restrict the sample to pre-2012 observations.

3.4 Raw Group Differences

In Table 2, we show mean differences between various groups. On average, males have lower points than females and are less likely to complete or obtain a *good degree* (but are slightly more likely to achieve a *great degree*). Disabled students and grant recipients average lower points and poorer college outcomes and there is also a clear SES gradient in completion and degree performance.

The differences between students from different types of schools are largely as expected based on the socio-economic composition of their students. However, it is notable that students from grind schools have higher points than students from other school types (except fee-paying secondary schools) but have poorer college performance than students from all other school types.

Table 2: Mean Differences by Group of College Students

Group	N	(1) Degree Completion	(2) *Good Degree*	(3) *Great Degree*	(4) Points
All	99337	0.76	0.65	0.16	425
Male	46224	0.71	0.62	0.16	421
Female	53113	0.81	0.68	0.15	429
Disabled	5175	0.71	0.62	0.13	404
Not disabled	71785	0.77	0.66	0.16	428
Grant recipient	32465	0.73	0.62	0.14	404
Not grant recipient	66872	0.77	0.67	0.16	435
Father SES: Professional	9118	0.81	0.71	0.20	462
Father SES: Managerial and Technical	21003	0.79	0.68	0.17	441
Father SES: Non-manual	8986	0.79	0.66	0.15	429
Father SES: Manual	22258	0.74	0.63	0.15	411
Secondary school (non-fee-paying)	52110	0.77	0.65	0.16	425
Vocational school/Community college	16623	0.73	0.63	0.15	411
Community/Comprehensive school	14035	0.74	0.65	0.16	415
Secondary school (fee-paying)	12144	0.79	0.71	0.16	450
Grind school	4425	0.71	0.61	0.12	444
Mixed-sex school	53064	0.74	0.64	0.15	420
Same-sex school	46273	0.78	0.67	0.16	431
DEIS school	8276	0.69	0.62	0.15	390
Non-DEIS school	91061	0.77	0.66	0.16	427
Irish-medium school	6331	0.75	0.65	0.16	438
Non-Irish-medium school	93006	0.76	0.65	0.16	424

3.5 Empirical Approach

We are interested in understanding differences in college performance by individual and post-primary school characteristics and by Leaving Certificate performance. The

dependent variables we study are (1) whether the student obtains a college degree, (2) whether, conditional on completion, the student obtains at least a 2.1 in the degree (a *Good Degree*), and (3) whether, again conditional on completion, the student obtains first class honours (a *Great Degree*). The raw group differences in Table 2 may be misleading as students from different groups have different average points levels and may enter very different types of college degree programmes. Therefore, we estimate multivariate models using regression.

We start with a specification with controls only for institution-by-year indicators, county of origin indicators (with a separate category for students from abroad), and a quadratic in age at entry. We include institution-by-year controls in this baseline specification to account for the fact that grading practices and reporting behaviour (to the Higher Education Authority) can differ across institutions and over time.

Our second regression specification replaces the institution-by-year indicators with course-by-year indicators. Since programmes are institution-specific, this specification has a more detailed set of controls than the first specification. By including course-by-year indicators, we control for differing levels of difficulty or varying grading standards across college programmes. This is important as the type of programmes entered may differ across groups. For example, in Ireland, males are much more likely than females to do STEM programmes (Delaney and Devereux, 2019) and the degree of difficulty and grading standards may vary between STEM and non-STEM programmes. When course-by-year indicators are included, we are effectively comparing the outcomes of students relative to other persons in the same entering class. The number of people in a course varies from fewer than 10 up to hundreds, depending on the course. On average, in our sample, there are 32 people in a course-year cell (actual course sizes are larger as we exclude entrants aged 21 or older and foreign students who did not do the Leaving Certificate).[23]

Our third regression specification augments the second specification with an additional set of fixed effects for Leaving Certificate points. When we add Leaving Certificate points fixed effects (an indicator variable for each individual level of points), one can then think of the analysis as comparing the performance of people who are in the same college class and have the same points.

In our fourth and final specification, we add post-primary school fixed effects. This allows us to compare students who attended the same post-primary school (in this specification, the effects of school types and characteristics are not identified). In all specifications we estimate linear probability models and report robust standard errors clustered at the level of the post-primary school attended.

IV. Results for Individual and School Characteristics

We present the regression results in Tables 3 and 4. Columns 1-3 of Table 3 shows the estimates for the three outcomes with controls for institution-by-year indicators, county indicators, and a quadratic in age at entry. Columns 4-6 show estimates when we include controls for course-by-year indicators and, so, compare students to others in the same entry course and year. In Table 4, we further add indicator variables for Leaving Certificate points; these are exhaustive so there is an indicator for every reported Leaving Certificate point total. In columns 4-6 of Table 4, we add school fixed effects to verify that this has little effect on the estimates for the individual characteristics (the school characteristics are unidentified in

[23] In most institutions, courses equate to CAO entry programmes. However, there are exceptions. In UCD, courses are more disaggregated than CAO entry codes. In TCD, all Two Subject Moderatorship (TSM) entry routes are contained in a single course code as the HEA data does not include the detailed TSM CAO entry codes prior to 2012. TSM is a two subject undergraduate arts degree course with over 25 diverse subjects and over 180 possible combinations so the numbers entering each combination tend to be very small.

this specification). As described earlier, we define a *good degree* as first class honours or a 2.1 degree and a *great degree* as first class honours.

Males versus Females

Women do better in the Leaving Certificate and are more likely to go to college than men, but do they achieve more when they are there? The estimates in Table 3 show that women are 10 percentage points more likely to finish than men, 7 percentage points more likely to obtain a *good degree*, but 1 percentage point *less* likely to obtain a *great degree*. However, the effect for *great degree* becomes positive once we control for course-year indicators in column 6. This sign switch probably reflects the fact that STEM courses, which have a high proportion of men, tend to give out more first class honours degrees (21% compared to 13% in non-STEM courses). Overall, once we include course-year indicators, women perform better in college than men in all respects. In Table 4, we examine whether this is due to women having higher points than men. Adding points controls reduces the female coefficients somewhat so they are 5 percentage points more likely to finish, 4 percentage points more likely to get a *good degree*, and 1 percentage point more likely to get a *great degree*. So, only a small part of the female advantage in college performance results from their higher Leaving Certificate points.[24] The persistence of substantial male educational under-performance, even after accounting for prior achievement and college programme choice, highlights the need for further policy attention to determine and address the underlying cause of these gender gaps.

Disabled Students

Students with disabilities may face challenges in performing to their potential in school, so it is interesting to examine performance in college. Our expectation is that the broad array of supports for disabled students in college may imply that they are relatively less disadvantaged in college than in post-primary school. Thus, while they may be expected to perform worse on average than other students, they may perform better than other students who have similar Leaving Certificate performance.

A limitation of our analysis of disability is that disability status is missing for 23% of observations as this variable comes from a student survey that is subject to non-response. Rather than drop observations with missing disability status, we include two indicators for disabled: the first indicator (*Disabled*) equals 1 if we know the student has a disability and equals 0 otherwise; the second indicator equals 1 if disability status is unknown and 0 if disability status is known. The coefficient on *Disabled* can be interpreted as the effect of being disabled, conditional on disability status being known.

About 7% of our sample are disabled and, without controls for course-year fixed effects or for points, we see in Table 3 that disabled students are 4 percentage points less likely to finish, 4 percentage points less likely to get a *good degree*, and 3 percentage points less likely to get a *great degree*. With course-year fixed effects, the magnitudes become a bit smaller but largely remain. Once we add controls for Leaving Certificate points (Table 4), the story changes considerably. Conditional on points, disabled students are equally likely to finish and are over 2 percentage points *more* likely to get a *good* or a *great degree*. A plausible interpretation is that disabled students face barriers in post-primary schooling that

[24] These findings contrast with previous work on college progression in Ireland (McCoy and Byrne, 2017) who find that gender differences disappear once controls are included for points and field of study. However, their estimates relate to a single entry cohort (2007) and to a broader set of students including older entrants and entrants to non-degree programmes. Our estimates are, however, consistent with those studying college completion of the 2007 entry cohort (Piggott and Frawley, 2019). Using U.S. data, Conger and Mark (2010) show that prior achievement can explain most of the female advantage in college performance.

lead them to under-perform in the Leaving Certificate but the supports available in university enable them to do relatively better than other students in college.

Table 3: Relationship between Individual and School Characteristics and College Performance (no control for points)

	(1) Finish	(2) *Good Degree*	(3) *Great Degree*	(4) Finish	(5) *Good Degree*	(6) *Great Degree*
Female	0.095***	0.071***	-0.006*	0.057***	0.062***	0.022***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
Disabled	-0.041***	-0.044***	-0.025***	-0.030***	-0.032***	-0.020***
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)
Grant recipient	-0.022***	-0.025***	-0.016***	-0.013***	-0.012***	-0.009***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
Father Occupation (reference: Professional)						
Managerial and Technical	-0.015***	-0.015**	-0.028***	-0.012**	-0.005	-0.020***
	(0.005)	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)
Non-manual	-0.008	-0.021***	-0.039***	-0.005	-0.006	-0.026***
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)
Manual	-0.039***	-0.039***	-0.040***	-0.028***	-0.018***	-0.025***
	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.001	0.004	-0.000	-0.002	0.001	-0.000
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)
Community/Comprehensive school	0.001	0.007	0.004	0.002	0.005	0.002
	(0.005)	(0.008)	(0.006)	(0.005)	(0.008)	(0.006)
Fee-paying school	0.012**	0.017**	-0.009	-0.006	-0.007	-0.007
	(0.006)	(0.008)	(0.007)	(0.006)	(0.008)	(0.006)
Grind school	-0.067***	-0.067***	-0.057***	-0.081***	-0.076***	-0.056***
	(0.014)	(0.026)	(0.008)	(0.015)	(0.023)	(0.007)

School Characteristics						
Irish-medium school	-0.016**	-0.007	-0.010	-0.024***	-0.017*	-0.015**
	(0.008)	(0.008)	(0.006)	(0.007)	(0.009)	(0.006)
DEIS school	-0.031***	-0.009	-0.003	-0.025***	-0.005	-0.001
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)
Mixed-sex school	-0.011**	-0.003	0.005	-0.004	0.011*	0.009*
	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)
Observations	99,337	73,997	75,479	99,337	73,997	75,479
R-squared	0.057	0.050	0.016	0.156	0.194	0.136
School FE	No	No	No	No	No	No
Course-by-year FE	No	No	No	Yes	Yes	Yes
Leaving Certificate points FE	No	No	No	No	No	No

All regressions include indicators for county of origin, institution-by-year indicators, and a quadratic in age when starting the college programme. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Table 4: Relationship between Individual and School Characteristics and College Performance (control for points)

	(1) Finish	(2) Good Degree	(3) Great Degree	(4) Finish	(5) Good Degree	(6) Great Degree
Female	0.046***	0.045***	0.009***	0.051***	0.043***	0.006
	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)	(0.004)
Disabled	-0.001	0.021***	0.024***	0.000	0.022***	0.025***
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)
Grant recipient	0.002	0.013***	0.011***	0.002	0.013***	0.011***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
Father Occupation (reference: Professional)						
Managerial and Technical	-0.008*	0.002	-0.009	-0.006	0.002	-0.008
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
Non-manual	0.002	0.008	-0.009	0.004	0.009	-0.008
	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)
Manual	-0.016***	0.004	-0.001	-0.014***	0.005	-0.002
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.003	-0.001	0.000			
	(0.006)	(0.008)	(0.006)			
Community/Comprehensive school	0.002	0.006	0.003			
	(0.006)	(0.008)	(0.005)			
Fee-paying school	-0.008	-0.007	-0.004			
	(0.006)	(0.007)	(0.006)			
Grind school	-0.075***	-0.061***	-0.041***			
	(0.014)	(0.020)	(0.006)			

School Characteristics						
Irish-medium school	-0.034***	-0.038***	-0.032***			
	(0.007)	(0.011)	(0.008)			
DEIS school	-0.004	0.033***	0.024***			
	(0.006)	(0.008)	(0.006)			
Mixed-sex school	-0.002	0.014**	0.014***			
	(0.004)	(0.006)	(0.004)			
Observations	99,337	73,997	75,479	99,337	73,997	75,479
R-squared	0.185	0.266	0.240	0.195	0.279	0.251
School FE	No	No	No	Yes	Yes	Yes
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Leaving Certificate points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college programme. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Socio-economic Status (SES)

Students from socially disadvantaged backgrounds do worse on average in the Leaving Certificate (Cullinan et al., 2018). There are many possible reasons for this and one of them may be a relatively difficult home environment for studying and related stresses that affect exam performance (Heissel et al., 2018). Overall, they are less likely to attend college but how do they fare once there? We might expect that college provides a more "level playing field" for students from disadvantaged backgrounds as they receive the same instruction as other students and may be eligible for extra supports provided by the colleges.

We have a range of (imperfect) measures of disadvantage including occupational status of the father, whether the student receives a means-tested grant, and characteristics of the post-primary school (in particular, whether it is a disadvantaged (DEIS) school).[25] Because of non-response due to the father occupational status variable coming from the same student survey as disability status, and because some student replies in the survey were inadequate to allow classification of father occupation, father occupation is unknown for 38% of the sample. As with disability, rather than drop observations from the regression, we include an indicator variable for father occupation being unknown. The effects of each father occupational category can be interpreted as being relative to the omitted category, professional.

In Table 3, we see a general pattern of poorer performance for lower SES students. For father occupational status, the omitted category is professionals and we see that the other groups, particularly children of manual workers, do worse in general. Grant recipients also perform slightly worse by all measures; once we control for class-year indicators, they are about 1 percentage points less likely to finish and 1 percentage point less likely to obtain a *good* or *great degree*. The DEIS school indicator has the expected effects for college completion; however, otherwise there is no evidence that coming from a DEIS school is related to college performance. Overall, the evidence suggests that disadvantaged students do worse in college. Interestingly, these groups have also been found to be the least likely to successfully transition from school to college (Chowdry et al., 2013; Denny and Flannery, 2017; Flannery and Cullinan, 2014) so it appears that the patterns of disadvantage continue from school to college.

As before, once we add controls for Leaving Certificate points (Table 4), the story changes. Having a grant and coming from a DEIS school are now associated with *better* performance in terms of getting a *good* or a *great degree*. The positive effect of having a grant may indicate that financial support plays an important role in enabling students to do better, perhaps due to greater financial security that reduces the likelihood of working while in university.[26] Also, students with grants may study harder as they may lose eligibility for their grants if they fail and need to repeat a year (McCoy and Byrne, 2010).[27] Likewise, the positive DEIS effect may be related to college support programmes that are often targeted to students from DEIS schools. An alternative interpretation of these findings is that DEIS school and grant-eligible students have less opportunity to reach their potential in post-primary school and, therefore, perform better in college than one would expect based on Leaving Certificate points. However, the father's occupation variables have generally small

[25] Grants are provided by local authorities and are entirely need-based, with eligibility depending on parental income and number of siblings. Typically, grants cover the registration fee and provide a stipend to partially cover living expenses.

[26] Harmon and Erskine (2016) show that grant-aided students are less likely to work during term-time in Ireland.

[27] Previous research has found that financial support plays an important role in improving college outcomes in Spain (Lassibille and Gomez, 2008), in the U.S. (Dynarski, 2003 and Bettinger, 2004), and in the UK (Murphy and Wyness, 2015). Using Irish data, McCoy and Byrne (2017) show that grant recipients are less likely to drop out of college after first year, conditional on Leaving Certificate points.

and statistically insignificant effects once we control for points, so we cannot draw a broad conclusion that more disadvantaged students do better in college, conditional on points.[28]

Fee-paying Secondary Schools and Grind Schools

Research from the UK has found that students in independent schools (somewhat equivalent to fee-paying secondary schools in Ireland) do worse in university relative to other students, conditional on A-level achievement (Smith and Naylor, 2001; Crawford, 2014). A similar process may occur in Ireland: If fee-paying schools provide advantages that enable better performance in the Leaving Certificate, non-fee-paying students with the same Leaving Certificate achievement as fee-paying school students may be more talented, on average. In Ireland, fee-paying schools tend to emphasise sports and extra-curricular activities so it is less clear that we should see this effect. Also, prior Irish research (Cullinan et al., 2018; Doris et al. 2019) finds no evidence that attending a fee-paying school has a positive effect on post-primary school exam performance – if fee-paying schools don't boost points attainment, then it is unlikely that the points obtained by students from fee-paying schools overstate their abilities. Consistent with this hypothesis, there is no evidence in Table 4 that, conditional on points, students from fee-paying schools do worse in college.

However, we might expect that grind schools, which are heavily focused on achieving high Leaving Certificate points, may have students that do worse in college, conditional on points. Indeed, an interesting finding in Tables 3 and 4 is that students from grind schools perform less well in college in all respects. Without controls for points but with controls for course-year indicators (Table 3), they are 8 percentage points less likely to finish, 8 percentage points less likely to get a *good degree*, and 6 percentage points less likely to get a *great degree* (compared to the excluded category of non-fee-paying secondary schools). With controls for Leaving Certificate points, these effects fall slightly to 8, 6, and 4 percentage points respectively but they are still very large. The estimates imply that students from grind schools come to college with slightly lower points on average than other persons in their class, but even allowing for points, they still do significantly worse in college. As mentioned before, this may not be surprising as there are reasons to believe that their Leaving Certificate points attainment may overstate their preparedness for college. For policy makers, these results question the equity of the current access system that is almost entirely dependent on Leaving Certificate points and takes no account of the school attended if the student does not qualify through the HEAR or DARE scheme.

Irish-medium schools

We also hypothesize that students in Irish-medium schools may do worse in college, conditional on prior achievement, as they may have more difficulty adjusting to English-language instruction and are likely to have benefited from the Leaving Certificate grading system that gives higher grades in most subjects to students who do the Leaving Certificate through the Irish language.[29]

We see in Table 3 that, once we include course-year indicators, students from Irish-medium schools are about 2 percentage points less likely to finish or to obtain a *good* or a *great degree*. Once we control for Leaving Certificate points in Table 4, they are 3

[28] The failure to find effects for father occupational status may be due to the large number of missing values for this variable or potential mismeasurement due to the replies being provided by the child rather than the parent, so we are reluctant to draw strong conclusions about the role of this variable.

[29] In most subjects, students who sit the exam through Irish get bonus marks of 10 per cent of the marks obtained if they obtain less than 75 per cent (in some subjects, the bonus is 5% and in Irish and English it is zero). Above 75 per cent the bonus is progressively reduced until the candidate who scores 100 per cent gets no bonus. https://www.examinations.ie/?l=en&mc=ca&sc=im

percentage points less likely to finish, 4 percentage points less likely to get a *good degree*, and 3 percentage points less likely to obtain a *great degree*. Our interpretation is that students from Irish-medium schools have higher points than average persons in their college class, and conditional on points, do worse in college.

Mixed-sex versus same-sex schools

In Tables 3 and 4, we also find that, once we control for course-year indicators, students who went to mixed-sex schools tend to do slightly better in college, with or without controls for points. They are about 1 percentage points more likely to get a *good* or *great degree*. A possible explanation is that students from these schools assimilate better into the mixed-sex college environment. Another explanation is that single-sex schools in Ireland are typically more-advantaged than mixed-sex schools and, similar to previous explanations, if single-sex schools are more-advantaged they will tend to boost Leaving Certificate scores of students relative to their mixed-sex school counterparts.

Points Equivalence

One way to understand the magnitudes of the coefficients is to compare them to the relationship between Leaving Certificate points and degree outcomes. If we use Figures 1 to 3 to calculate the change in average outcomes as points go from 300 to 550 (a points range that includes almost 91% of students), we find that an extra 10 points increases the probability of completion by 1.64 percentage points, *good degree* by 2.04 percentage points, and *great degree* by 1.36 percentage points. We focus on *good degree* as its relationship with points is approximately linear between 300 and 550 points.[30] Using our estimates from Column 2 of Table 4, for *good degree*, being female rather than male equivalizes to 22 extra points; being disabled 10 extra points; being a grant recipient 6 extra points; being from a DEIS school (rather than a non-fee-paying secondary school) 16 extra points; being from a mixed-sex school 7 extra points. On the other hand, compared to a school that teaches through English, being from an Irish-medium school is equivalent to having 18 fewer points.[31] Also, compared to a non-fee-paying secondary school, being from a grind school is equivalent to having 29 fewer points. While these are simple summary statistics, they suggest that many of our findings are quantitatively meaningful.

Excluding Students with Below-Minimum Points

In Table 5, we repeat the analysis on a sample that excludes persons with Leaving Certificate points that are below the official minimum level for their programme (for brevity we just report estimates equivalent to Columns 1-3 of Table 4). The rationale for this exclusion is that these people are most likely HEAR/DARE applicants who received entry despite having points below the minimum level. Our concern is that the presence of these lower-points people may affect coefficient estimates. Reassuringly, we find that removing these cases has little effect on the coefficients.

[30] The points equivalences for the effects on *great degree* are fairly similar with the exception that the equivalence is very small for females. However, since the relationship between points and great degree is non-linear, simple summary measures of points equivalence are less reliable for this outcome.

[31] A recent Irish Times article (https://www.irishtimes.com/news/education/study-into-impact-of-bonus-for-irish-on-cao-points-questions-fairness-1.4167127) quotes an unpublished report from the State Examinations Committee that found that, in two Irish-medium schools, the bonus for doing exams through Irish delivered an average gain of 12 points to students, with larger benefits for higher-scoring students. This finding is quite consistent with our finding that students from Irish-Language schools perform worse in college than would be expected based on their points.

Table 5: Relationship between Individual and School Characteristics and College Performance (all students have at least the CAO minimum points)

	(1) *Completed Degree*	(2) *Good Degree*	(3) *Great Degree*
Female	0.044***	0.044***	0.009***
	(0.003)	(0.004)	(0.003)
Disabled	-0.003	0.020**	0.017***
	(0.007)	(0.009)	(0.006)
Grant recipient	-0.002	0.011***	0.008**
	(0.003)	(0.004)	(0.003)
Father Occupation (reference: Professional)			
Managerial and Technical	-0.007	0.001	-0.010*
	(0.005)	(0.006)	(0.005)
Nonmanual	0.001	0.005	-0.009
	(0.005)	(0.007)	(0.006)
Manual	-0.017***	0.003	-0.003
	(0.005)	(0.006)	(0.005)
School Type (reference: non-fee-paying secondary school)			
Vocational school/Community college	-0.005	0.000	0.002
	(0.006)	(0.008)	(0.006)
Community/Comprehensive school	0.001	0.009	0.003
	(0.006)	(0.008)	(0.006)
Fee-paying school	-0.008	-0.002	-0.003
	(0.006)	(0.007)	(0.006)
Grind school	-0.073***	-0.058***	-0.040***
	(0.013)	(0.019)	(0.006)
School Characteristics			
Irish-medium school	-0.033***	-0.035***	-0.033***
	(0.007)	(0.011)	(0.009)
DEIS school	-0.007	0.027***	0.020***
	(0.007)	(0.008)	(0.006)
Mixed-sex school	-0.003	0.012**	0.013***
	(0.005)	(0.006)	(0.005)
Observations	92,975	69,593	70,836
R-squared	0.190	0.269	0.245
School FE	No	No	No
Course-by-year FE	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

V. Heterogeneous Effects

In this section, we examine whether the relationships between student and post-primary school characteristics and college performance differ by type of institution (university versus institute of technology), by student gender, by field of the college programme, or over time. For parsimony, we focus on the specification in Columns 1-3 of Table 4 that includes course-by-year indicators and indicators for Leaving Certificate points. First, we report estimates by gender, by institution type, and by time period. We report the estimates for each outcome in separate tables (Tables 6 – 8).

Heterogeneous Effects by Gender

We have seen that females typically do better in college than males, so it is interesting to see whether other coefficients differ systematically by gender. We might expect, for example, that attending a mixed-sex post-primary school may have differential effects for boys and girls. While there are gender differences, these do not appear to be systematic; the findings for men and women are generally quite similar with few differences that appear for all three outcomes. There is some indication that school characteristics are more predictive of outcomes for boys than for girls, particularly for completion and achieving a *great degree*. Perhaps surprisingly, the mixed-sex school coefficient is similar for both genders.

Heterogeneous Effects by Institution Type

The mix of students differs substantially between universities and institutes of technology (IoTs) so we might expect there to be differences in the coefficient estimates. The universities we include are 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). The IoTs include institutions in Athlone, Blanchardstown, Cork, Carlow, Dundalk, Dun Laoghaire, Dublin, Galway-Mayo, Limerick, Letterkenny, Sligo, Tallaght, Tralee, Tipperary, and Waterford.[32]

We find that the female coefficient is larger for the IoTs for all three outcomes, indicating that the relative disadvantage of boys is less in the universities. Beyond this, we do not see much systematic difference between the coefficients across the two types of institutions.

Heterogeneous Effects by Entry Year

There has been ongoing expansion of the college sector over time, so it is interesting to see whether relationships are different for students who entered college at different times in our sample period. Given we have a relatively short time period (entry years 2007-2013), we limit our investigation to a single sample split between entry years 2007-2010 and entry years 2011-2013. We find that the estimates are generally stable across the two periods, suggesting little change in the underlying relationships across time.

[32] Since January 2019, there is an additional Irish university (Technological University Dublin). As it was an IoT during our analysis period, we include it with the IoTs.

Table 6: Relationship between Individual and School Characteristics and College Completion

	(1) Male	(2) Female	(3) University	(4) IoT	(5) 2007-10	(6) 2011-13
Female			0.041***	0.061***	0.047***	0.046***
			(0.004)	(0.007)	(0.004)	(0.005)
Disabled	0.008	-0.005	-0.002	0.003	0.006	-0.007
	(0.010)	(0.008)	(0.007)	(0.013)	(0.009)	(0.009)
Grant recipient	0.002	0.002	-0.004	0.014**	0.001	0.003
	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)	(0.005)
Father Occupation						
(reference: Professional)						
Managerial and Technical	-0.013*	-0.005	-0.002	-0.034***	-0.018***	0.003
	(0.007)	(0.006)	(0.005)	(0.012)	(0.006)	(0.007)
Non-manual	-0.004	0.004	0.005	-0.016	-0.002	0.005
	(0.009)	(0.007)	(0.006)	(0.014)	(0.007)	(0.009)
Manual	-0.028***	-0.006	-0.012**	-0.036***	-0.023***	-0.009
	(0.008)	(0.006)	(0.005)	(0.013)	(0.007)	(0.008)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.008	0.001	-0.002	-0.005	-0.007	0.001
	(0.008)	(0.007)	(0.006)	(0.011)	(0.007)	(0.008)
Community/Comprehensive school	-0.006	0.009	0.002	0.002	-0.007	0.014*
	(0.008)	(0.007)	(0.006)	(0.010)	(0.006)	(0.008)
Fee-paying school	-0.020**	0.002	-0.005	-0.015	-0.009	-0.005
	(0.008)	(0.007)	(0.006)	(0.012)	(0.006)	(0.008)
Grind school	-0.106***	-0.051***	-0.067***	-0.101***	-0.079***	-0.071***
	(0.020)	(0.011)	(0.015)	(0.021)	(0.015)	(0.015)
School Characteristics						
Irish-medium school	-0.047***	-0.022**	-0.021***	-0.080***	-0.035***	-0.031***
	(0.010)	(0.009)	(0.008)	(0.016)	(0.008)	(0.010)
DEIS school	0.003	-0.010	0.002	-0.015	0.002	-0.009
	(0.009)	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)

Mixed-sex school	-0.000	-0.007	-0.002	-0.003	0.002	-0.008
	(0.007)	(0.005)	(0.005)	(0.009)	(0.005)	(0.006)
Observations	45,921	52,790	69,819	29,392	55,530	43,684
R-squared	0.213	0.181	0.143	0.215	0.192	0.179
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Table 7: Relationship between Individual and School Characteristics and Good Degree

	(1) Male	(2) Female	(3) University	(4) IoT	(5) 2007-10	(6) 2011-13
Female			0.039***	0.069***	0.041***	0.050***
			(0.005)	(0.009)	(0.005)	(0.006)
Disabled	0.018	0.022**	0.026***	0.005	0.016	0.024**
	(0.012)	(0.010)	(0.009)	(0.016)	(0.012)	(0.011)
Grant recipient	0.022***	0.010*	0.013***	0.010	0.015***	0.011**
	(0.007)	(0.005)	(0.004)	(0.008)	(0.005)	(0.006)
Father Occupation						
(reference: Professional)						
Managerial and Technical	0.013	-0.011	-0.001	0.020	-0.003	0.008
	(0.009)	(0.008)	(0.006)	(0.015)	(0.009)	(0.008)
Non-manual	0.016	-0.004	0.005	0.026	0.007	0.009
	(0.011)	(0.010)	(0.008)	(0.018)	(0.010)	(0.011)
Manual	0.022**	-0.009	0.005	0.011	0.005	0.004
	(0.010)	(0.008)	(0.007)	(0.015)	(0.009)	(0.009)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	0.001	-0.005	0.001	-0.008	0.001	-0.003
	(0.010)	(0.010)	(0.009)	(0.012)	(0.009)	(0.011)
Community/Comprehensive school	-0.004	0.013	0.009	-0.006	0.004	0.007
	(0.010)	(0.009)	(0.009)	(0.012)	(0.010)	(0.011)
Fee-paying school	-0.013	-0.000	-0.002	-0.028**	-0.006	-0.007
	(0.009)	(0.010)	(0.008)	(0.013)	(0.009)	(0.009)
Grind school	-0.071***	-0.052**	-0.061***	-0.058***	-0.066***	-0.050*
	(0.022)	(0.022)	(0.022)	(0.021)	(0.018)	(0.027)
School Characteristics						
Irish-medium school	-0.036**	-0.038***	-0.040***	-0.033**	-0.034***	-0.043***
	(0.015)	(0.012)	(0.012)	(0.016)	(0.011)	(0.016)
DEIS school	0.025**	0.040***	0.042***	0.017	0.037***	0.028**
	(0.010)	(0.010)	(0.009)	(0.012)	(0.009)	(0.011)

Mixed-sex school	0.019**	0.011	0.015**	0.012	0.014*	0.014*
	(0.008)	(0.007)	(0.006)	(0.011)	(0.008)	(0.008)
Observations	31,877	41,331	54,353	19,450	41,574	32,225
R-squared	0.276	0.293	0.266	0.260	0.270	0.261
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Table 8: Relationship between Individual and School Characteristics and Great Degree

	(1) Male	(2) Female	(3) University	(4) IoT	(5) 2007-10	(6) 2011-13
Female			0.004	0.024***	0.006*	0.011**
			(0.003)	(0.006)	(0.004)	(0.004)
Disabled	0.021**	0.029***	0.026***	0.015	0.021***	0.025***
	(0.009)	(0.008)	(0.006)	(0.011)	(0.008)	(0.008)
Grant recipient	0.011**	0.010***	0.008**	0.015**	0.013***	0.008*
	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)	(0.005)
Father Occupation						
(reference: Professional)						
Managerial and Technical	-0.006	-0.012	-0.008	-0.013	-0.012	-0.005
	(0.008)	(0.008)	(0.006)	(0.012)	(0.007)	(0.008)
Non-manual	-0.006	-0.013	-0.012*	-0.003	-0.011	-0.007
	(0.009)	(0.008)	(0.006)	(0.015)	(0.008)	(0.009)
Manual	0.010	-0.009	-0.001	-0.002	-0.005	0.004
	(0.008)	(0.008)	(0.006)	(0.012)	(0.007)	(0.008)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.007	0.005	0.002	-0.005	-0.001	0.002
	(0.007)	(0.007)	(0.006)	(0.009)	(0.007)	(0.007)
Community/Comprehensive school	0.006	0.002	0.002	0.003	0.002	0.004
	(0.008)	(0.006)	(0.006)	(0.009)	(0.007)	(0.008)
Fee-paying school	-0.016***	0.009	-0.003	-0.008	-0.002	-0.006
	(0.006)	(0.008)	(0.006)	(0.011)	(0.007)	(0.007)
Grind school	-0.051***	-0.030***	-0.048***	0.006	-0.044***	-0.033***
	(0.010)	(0.010)	(0.006)	(0.017)	(0.008)	(0.012)
School Characteristics						
Irish-medium school	-0.021*	-0.037***	-0.033***	-0.025*	-0.033***	-0.030***
	(0.011)	(0.010)	(0.009)	(0.013)	(0.009)	(0.010)
DEIS school	0.040***	0.013	0.027***	0.016*	0.017**	0.032***
	(0.008)	(0.008)	(0.007)	(0.009)	(0.007)	(0.008)

Mixed-sex school	0.014***	0.012**	0.015***	0.011	0.015***	0.012**
	(0.006)	(0.005)	(0.005)	(0.008)	(0.006)	(0.006)
Observations	32,279	42,431	55,837	19,452	42,247	33,038
R-squared	0.279	0.259	0.248	0.228	0.239	0.243
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Heterogeneous Effects by Course Field

In Tables 9-11, we look for differences in estimates between STEM and non-STEM courses. We define STEM courses as being those included in broad ISCED categories "Engineering, Manufacturing and Construction" and "Science, Mathematics and Computing".

Internationally, there is a large gender gap in STEM and the gap in Ireland is similar to that in many other countries (Delaney and Devereux, 2019). Interestingly, despite the STEM courses being male-dominated (67% male), there is no evidence that female advantage in finishing and getting a *good or great degree* is any less in STEM than in non-STEM – while the coefficients on female are slightly lower in STEM, none of the gender differences are statistically significant. This finding suggests that the large gender disparity in STEM enrolment does not result from a lack of talent for STEM fields amongst females. We also find few clear patterns in the relative effect of individual and school characteristics between STEM and non-STEM courses.

We also look at field of study in more detail by showing estimates for four more detailed fields – Engineering, Manufacturing and Construction (column 3), Science, Mathematics and Computing (column 4), Social Sciences, Business, and Law (column 5), and Arts and Humanities (column 6). Interestingly, the stronger female performance in completion and *good degree* is evident in all four of these fields. However, an unexpected finding is that females are less likely to get first class honours in Arts and Humanities than equivalent males.

Table 9: Relationship between Individual and School Characteristics and College Completion

	(1) STEM	(2) Non-STEM	(3) Engineering, Manufacturing, and Construction	(4) Science, Mathematics, and Computing	(5) Arts and Humanities	(6) Social Sciences, Business, and Law
Female	0.042***	0.048***	0.029**	0.045***	0.024***	0.044***
	(0.007)	(0.004)	(0.012)	(0.008)	(0.009)	(0.005)
Disabled	0.003	-0.004	-0.001	0.007	0.006	-0.003
	(0.012)	(0.008)	(0.022)	(0.015)	(0.017)	(0.012)
Grant recipient	-0.000	0.003	-0.020*	0.008	0.015	0.004
	(0.006)	(0.004)	(0.012)	(0.007)	(0.010)	(0.006)
Father Occupation (reference: Professional)						
Managerial and Technical	-0.013	-0.007	-0.006	-0.016	-0.008	-0.008
	(0.009)	(0.005)	(0.017)	(0.011)	(0.014)	(0.008)
Non-manual	-0.019*	0.008	-0.025	-0.015	0.016	0.002
	(0.011)	(0.006)	(0.022)	(0.014)	(0.018)	(0.010)
Manual	-0.030***	-0.012**	-0.038**	-0.026**	-0.027	-0.003
	(0.010)	(0.006)	(0.018)	(0.012)	(0.017)	(0.009)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.003	-0.004	-0.016	0.003	-0.007	0.006
	(0.010)	(0.006)	(0.017)	(0.011)	(0.015)	(0.010)
Community/Comprehensive school	0.007	-0.000	0.011	0.004	0.007	0.001
	(0.010)	(0.006)	(0.014)	(0.011)	(0.014)	(0.010)
Fee-paying school	-0.003	-0.010	-0.015	0.003	-0.015	-0.004
	(0.009)	(0.006)	(0.015)	(0.011)	(0.014)	(0.007)
Grind school	-0.106***	-0.067***	-0.103***	-0.106***	-0.097***	-0.068***

	(0.021)	(0.013)	(0.028)	(0.022)	(0.022)	(0.018)
School Characteristics						
Irish-medium school	-0.033***	-0.033***	0.010	-0.054***	-0.020	-0.055***
	(0.012)	(0.008)	(0.020)	(0.016)	(0.016)	(0.013)
DEIS school	0.004	-0.008	0.026	-0.005	0.015	-0.024**
	(0.011)	(0.007)	(0.018)	(0.013)	(0.018)	(0.011)
Mixed-sex school	-0.001	-0.002	-0.004	-0.000	-0.004	-0.005
	(0.008)	(0.005)	(0.012)	(0.009)	(0.011)	(0.007)
Observations	27,764	71,445	8,808	18,950	12,314	27,791
R-squared	0.221	0.162	0.206	0.234	0.158	0.194
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Table 10: Relationship between Individual and School Characteristics and Good Degree

	(1) STEM	(2) Non-STEM	(3) Engineering, Manufacturing, and Construction	(4) Science, Mathematics, and Computing	(5) Arts and Humanities	(6) Social Sciences, Business, and Law
Female	0.041***	0.046***	0.026*	0.044***	0.025**	0.061***
	(0.008)	(0.005)	(0.015)	(0.009)	(0.010)	(0.006)
Disabled	-0.019	0.034***	-0.027	-0.016	0.051**	0.019
	(0.016)	(0.009)	(0.028)	(0.018)	(0.020)	(0.014)
Grant recipient	0.006	0.016***	0.021	-0.000	0.009	0.013*
	(0.008)	(0.005)	(0.015)	(0.009)	(0.012)	(0.007)
Father Occupation (reference: Professional)						
Managerial and Technical	0.003	0.001	-0.005	0.009	-0.016	0.013
	(0.011)	(0.007)	(0.019)	(0.015)	(0.017)	(0.009)
Non-manual	0.012	0.006	0.007	0.016	0.010	0.025*
	(0.014)	(0.009)	(0.026)	(0.018)	(0.021)	(0.013)
Manual	0.014	0.000	0.008	0.017	-0.005	0.011
	(0.012)	(0.007)	(0.022)	(0.015)	(0.018)	(0.010)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.002	0.000	0.004	-0.004	-0.006	-0.004
	(0.013)	(0.009)	(0.021)	(0.017)	(0.018)	(0.012)
Community/Comprehensive school	0.002	0.008	0.013	-0.006	0.004	-0.006
	(0.013)	(0.009)	(0.022)	(0.015)	(0.019)	(0.012)
Fee-paying school	-0.005	-0.008	-0.006	-0.007	-0.028*	-0.014
	(0.012)	(0.009)	(0.021)	(0.014)	(0.017)	(0.009)

Grind school	-0.058**	-0.061***	-0.056	-0.061***	-0.045	-0.052***
	(0.023)	(0.021)	(0.042)	(0.022)	(0.046)	(0.015)
School Characteristics						
Irish-medium school	-0.014	-0.046***	-0.007	-0.019	-0.018	-0.053***
	(0.015)	(0.011)	(0.019)	(0.021)	(0.022)	(0.016)
DEIS school	0.031**	0.033***	0.039	0.025	0.027	0.039***
	(0.013)	(0.009)	(0.025)	(0.016)	(0.021)	(0.013)
Mixed-sex school	0.021**	0.011	-0.008	0.034***	0.020	0.017**
	(0.009)	(0.007)	(0.016)	(0.011)	(0.013)	(0.009)
Observations	19,240	54,556	6,239	12,991	8,926	21,648
R-squared	0.261	0.271	0.286	0.247	0.272	0.290
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Table 11: Relationship between Individual and School Characteristics and Great Degree

	(1) STEM	(2) Non-STEM	(3) Engineering, Manufacturing, and Construction	(4) Science, Mathematics, and Computing	(5) Arts and Humanities	(6) Social Sciences, Business, and Law
Female	0.004	0.011***	0.013	0.001	-0.016**	0.019***
	(0.007)	(0.003)	(0.014)	(0.008)	(0.006)	(0.005)
Disabled	0.020	0.026***	-0.009	0.034**	0.010	0.018
	(0.013)	(0.006)	(0.020)	(0.016)	(0.011)	(0.011)
Grant recipient	0.009	0.012***	0.016	0.007	0.016**	0.013**
	(0.007)	(0.003)	(0.012)	(0.008)	(0.008)	(0.006)
Father Occupation (reference: Professional)						
Managerial and Technical	-0.006	-0.011*	-0.002	-0.006	-0.019	-0.011
	(0.011)	(0.006)	(0.016)	(0.013)	(0.012)	(0.010)
Non-manual	-0.007	-0.011	0.000	-0.008	-0.004	-0.010
	(0.013)	(0.007)	(0.020)	(0.017)	(0.015)	(0.011)
Manual	0.010	-0.006	0.013	0.011	-0.013	-0.006
	(0.011)	(0.006)	(0.018)	(0.014)	(0.013)	(0.010)
School Type (reference: non-fee-paying secondary school)						
Vocational school/Community college	-0.003	0.000	-0.004	-0.001	0.015	-0.003
	(0.010)	(0.006)	(0.017)	(0.012)	(0.012)	(0.009)
Community/Comprehensive school	0.002	0.002	0.010	-0.001	-0.003	0.006
	(0.011)	(0.006)	(0.016)	(0.013)	(0.013)	(0.008)
Fee-paying school	-0.019**	0.001	-0.003	-0.027**	0.013	-0.010
	(0.009)	(0.007)	(0.017)	(0.012)	(0.011)	(0.009)

Grind school	-0.064***	-0.035***	-0.044*	-0.072***	-0.039***	-0.030***
	(0.015)	(0.006)	(0.023)	(0.018)	(0.013)	(0.009)
School Characteristics						
Irish-medium school	-0.027*	-0.033***	-0.015	-0.030*	-0.034**	-0.041***
	(0.014)	(0.008)	(0.023)	(0.017)	(0.016)	(0.014)
DEIS school	0.043***	0.018***	0.045**	0.042***	0.007	0.027**
	(0.011)	(0.006)	(0.019)	(0.013)	(0.013)	(0.012)
Mixed-sex school	0.014*	0.014***	-0.002	0.020**	0.021**	0.018***
	(0.008)	(0.005)	(0.014)	(0.010)	(0.009)	(0.007)
Observations	19,280	56,002	6,274	12,996	8,950	22,103
R-squared	0.264	0.221	0.304	0.252	0.247	0.233
School FE	No	No	No	No	No	No
Course-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
LC points FE	Yes	Yes	Yes	Yes	Yes	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

VI. Effects of Leaving Certificate Points

Our regressions have included indicators for each individual points level to control flexibly for post-primary school achievement. To assess the role of Leaving Certificate points, we now report estimates where we replace the points indicators with a standardized measure of points, where the standardization implies that the variable has mean zero and standard deviation of 1.[33] We report one set of estimates with just the basic controls (equivalent to Columns (1) – (3) of Table 3), and a second set with controls for course-by-year indicators and student and school characteristics (equivalent to Columns (1)-(3) of Table 4).

The results are in Table 12. We find that points are more predictive of the type of degree obtained than they are for college completion. Also, adding the controls for course-by-year indicators and the student and school characteristics increases the coefficients on standardised points for both *good degree* and *great degree*, probably reflecting the fact that higher-scoring students are more likely to enter challenging college courses where obtaining a good degree is harder.

Table 12: Relationship between Standardised Leaving Certificate Points and College Performance (2007-2011 entrants)

	(1) Finish	(2) Finish	(3) Good Degree	(4) Good Degree	(5) Great Degree	(6) Great Degree
Standardised Points	0.122***	0.121***	0.190***	0.229***	0.144***	0.187***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Observations	73,696	73,636	55,190	55,080	56,215	56,106
R-squared	0.095	0.184	0.135	0.265	0.105	0.213
School FE	No	No	No	No	No	No
Course-by-year FE	No	Yes	No	Yes	No	Yes
Student and School Characteristics	No	Yes	No	Yes	No	Yes

All regressions include indicators for county of origin and a quadratic in age when starting the college course. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1

We also assess whether there are heterogeneous relationships between standardised points and degree outcomes by splitting the sample by gender, by institution type, and by programme type. Additionally, we address the issue of whether having greater points is particularly important for low SES students by splitting the sample by grant status.[34] We report the estimates in Appendix Table 4. We find that points are more predictive of college completion in IoTs than in universities but are more predictive of degree performance in universities. Points are also generally more important in STEM programmes.[35] Interestingly,

[33] Also, for comparability with previous work, we have split points into categories and report the coefficients on the resultant indicator variables, with having points less than or equal to 300 being the omitted category. These estimates are in Appendix Table 3.

[34] Too few of the sample go to DEIS schools to split the sample by this variable.

[35] Delaney and Devereux (2020b) show, using the Irish HEA data, that points in mathematics are more predictive of good college performance than points in English, particularly for the probability of obtaining a first-class honours degree. They also find that the relative importance of mathematics points is greater for performance in STEM programmes than in other college programmes.

there is no evidence that higher points are particularly important for disadvantaged students as the relationship between points and performance is weaker for recipients of need-based financial aid than it is for other students.

VII. Discussion and Conclusions

We have analysed the relationship between college degree outcomes and a set of student and post-primary school characteristics. There are several substantial results. We find that Leaving Certificate performance is an important determinant of college achievement. The relationship between Leaving Certificate points and college performance is concave for college completion, approximately linear for the probability of obtaining at least second class honours, upper division, and convex for the probability of obtaining a first class honours degree.

We find that females do better in college than males, even after we account for their greater prior achievement, and this is true in both non-STEM and STEM fields. However, females are only marginally more likely than males to achieve first-class honours. We also find that groups that tend to do worse in the Leaving Certificate and are less likely to attend college (disabled students, students from disadvantaged schools, and students who qualify for means-tested financial aid) also do relatively worse in college, even when we control for course-by-year indicators and so allow for the possibility that the distribution of grades differs across college programmes and entry years. However, once we control for Leaving Certificate points, this effect disappears and disabled students, students from disadvantaged schools, and grant-aided students do better in college than other groups.[36] On the other hand, students from grind schools, which have a strong emphasis on maximising Leaving Certificate performance, do less well in college, whether or not we control for points at entry. We also find that students from Irish-medium schools tend to do worse in college than one would expect given their points, possibly because their points are inflated due to grading bonuses from doing Leaving Certificate exams through Irish.

While the Irish admissions system has advantages of simplicity and transparency, our findings suggest that the currency in the present system, Leaving Certificate points, is not a sufficient statistic for predicting performance in college. Conditional on points, certain individual and school characteristics systematically predict better performance, and these are all observable at the time of college entry. This suggests that the current access system may be sub-optimal. Albaek (2017) shows that, under certain assumptions, an optimal admissions system would imply that differences in the performance of students who enter programmes with the minimum entry qualification could not be predicted by student characteristics such as the type of school they attended. In order words, it should not be predictable which of the last admitted students into any programme will do well. Unfortunately, many of the groups of interest (disabled, grind schools, Irish-medium schools) have small sample sizes and we do not have the statistical power to look for differences in performance at the minimum points margin. However, the differences we find in average performance by group, conditional on points, are suggestive that there may be inefficiencies in the current admissions system.[37]

Apart from efficiency, there are also potential equity issues. When there are predictable differences in college degree performance amongst students who have the same points, this suggests that either the college entry rules favour groups that subsequently do worse in college (they have lower ability for any given level of entry points) or that the

[36] As discussed earlier, the finding of a positive effect of financial aid could reflect a causal effect of financial aid or could result from grant-eligible students having less opportunity to reach their potential in post-primary school and, therefore, performing better in college than one would expect based on Leaving Certificate points.
[37] We have verified, however, that points have far greater explanatory power for college performance than do individual and school characteristics, so the degree of inefficiency is likely to be very small.

college environment is less favourable for these groups (they do worse in college despite having equal points and equal ability). Our finding that students from grind schools do worse in college than other students with the same points suggests that they overperform in the Leaving Certificate relative to their ability. It may not be fair that this enables them to enter higher points programmes than equally able students from less advantaged schools (or less exam-oriented schools). On the other hand, our finding that, conditional on points, disabled students, students eligible for need-based grant aid, and students from DEIS schools typically do better in college than others may reflect the efforts made by colleges to provide supports to these groups and suggest that they face less disadvantage in college than they did in post-primary school. Interestingly, despite the policy interest in Ireland about the provision of state-funding to fee-paying schools, students from these schools do not perform systematically better or worse in college, conditional on points. Indeed, the two types of schools that have students that tend to underperform in college, conditional on points, are either completely non-state funded (grind schools) or non-fee-paying (Gaelscoileanna).

Our findings are generally supportive of the HEAR and DARE schemes that provide lower entry requirements to economically disadvantaged students and disabled students, respectively. Eligibility for the HEAR scheme requires low family income plus satisfying a combination of other criteria than can include having a medical card (or having the parent who has a medical card), being from a family that receives means-tested welfare payments, being from a low SES family (as defined by parental occupation), coming from a DEIS school, and/or living in a disadvantaged area. To be eligible for the DARE scheme, a student must have a disability that had a negative impact on their post-primary education. HEAR students receive a variety of academic, personal and social supports throughout their time in college while DARE students can avail of learning support, assistive technology, and exam accommodations. As such, our findings that, conditional on entry points, disabled students, students who qualify for means-tested grants, and students from DEIS schools generally do better in college suggests that these programmes may be levelling the playing field for disadvantaged students rather than reducing the level of college performance by letting in weaker students.[38]

However, our results also suggest that, when making admissions decisions, colleges might benefit from using further information about the type of post-primary school attended, such as whether students are coming from a grind school or from an Irish-language school. Students from an Irish-medium school are as likely to obtain a 2.1 degree or better as an equivalent student from a non-fee-paying secondary school who has 18 fewer points; similarly, being from a grind school is equivalent to having 29 fewer points. Thus, it might be appropriate to consider higher points requirements for students from these schools (or to reconsider the grading bonuses available for doing Leaving Certificate exams through Irish). Overall, while the college entry system is simple and transparent, there may be considerable equity and efficiency grounds for considering further information about the schools attended by prospective students.

[38] These types of programmes are common internationally. In the UK it is common for colleges to use "contextualised admissions" in which they lower entry requirements for students from certain schools or local areas. In the U.S., some states, such as Texas, guarantee admission to state colleges to students who are in the top 10% of their high school cohort. This naturally leads to lower entry requirements for students in disadvantaged schools. Pastine and Pastine (2012) show theoretically that these types of schemes can have complicated effects on student effort in post-primary school.

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Appendix Table 1: Mapping from Leaving Certificate Subject Grades to Points (2007-2013)

Grade	Marks (%)	Points (Lower Level)	Points (Higher Level)	Points (Higher Level Mathematics, 2012-2013)
A1	90% to 100%	60	100	125
A2	85% to 89%	50	90	115
B1	80% to 84%	45	85	110
B2	75% to 79%	40	80	105
B3	70% to 74%	35	75	100
C1	65% to 69%	30	70	95
C2	60% to 64%	25	65	90
C3	55% to 59%	20	60	85
D1	50% to 54%	15	55	80
D2	45% to 49%	10	50	75
D3	40% to 44%	5	45	70
E	25% to 39%	0	0	0
F	10% to 24%	0	0	0
NG	0% to 9%	0	0	0

Appendix Table 2: Included Institutions and Starting Years

	2007	2008	2009	2010	2011	2012	2013
Universities							
University College Cork	x	x	x	x	x	x	x
Dublin City University			x	x	x	x	x
University College Dublin				x	x	x	x
National University of Ireland, Galway			x	x		x	x
University of Limerick		x	x	x	x	x	
Maynooth University			x	x	x	x	x
Trinity College Dublin	x	x	x	x	x	x	
Institutes of Technology							
Athlone	x	x	x	x	x	x	x
Blanchardstown	x	x	x	x	x	x	
Cork	x	x	x	x	x	x	
Carlow	x	x	x	x	x	x	x
Dundalk	x	x	x	x	x	x	x
Dun Laoghaire	x	x	x	x	x	x	
Dublin	x	x	x	x	x	x	x
Galway-Mayo	x	x	x	x	x	x	x
Limerick	x	x	x	x	x	x	x
Letterkenny	x	x	x	x	x	x	x
Sligo	x	x	x	x	x	x	x
Tallaght	x	x	x	x	x	x	
Tipperary	x	x	x	x			
Tralee	x	x	x	x	x	x	
Waterford	x	x	x	x	x	x	x

x: Some students in the entry year included in the sample

Appendix Table 3: Relationship between Leaving Certificate Points Categories and College Performance (2007-2011 entrants)

	(1) *Finish*	(2) *Finish*	(3) *Good Degree*	(4) *Good Degree*	(5) *Great Degree*	(6) *Great Degree*
301-350 points	0.080***	0.070***	0.068***	0.083***	0.030***	0.039***
	(0.010)	(0.010)	(0.015)	(0.015)	(0.007)	(0.008)
351-400 points	0.208***	0.170***	0.153***	0.183***	0.072***	0.093***
	(0.010)	(0.010)	(0.014)	(0.015)	(0.007)	(0.008)
401-450 points	0.324***	0.274***	0.297***	0.339***	0.131***	0.170***
	(0.010)	(0.011)	(0.014)	(0.015)	(0.008)	(0.009)
451-500 points	0.389***	0.338***	0.459***	0.506***	0.220***	0.283***
	(0.010)	(0.011)	(0.015)	(0.016)	(0.009)	(0.010)
501-550 points	0.432***	0.390***	0.590***	0.654***	0.365***	0.465***
	(0.011)	(0.012)	(0.015)	(0.016)	(0.011)	(0.012)
551-600 points	0.419***	0.388***	0.573***	0.745***	0.531***	0.723***
	(0.011)	(0.014)	(0.021)	(0.017)	(0.019)	(0.018)
Observations	73,696	73,636	55,190	55,080	56,215	56,106
R-squared	0.100	0.185	0.135	0.260	0.112	0.221
School FE	No	No	No	No	No	No
Course-by-year FE	No	Yes	No	Yes	No	Yes
Student and School Characteristics	No	Yes	No	Yes	No	Yes

All regressions include indicators for county of origin, institution-by-year indicators, and a quadratic in age when starting the university programme. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. Omitted category is points of 300 or fewer.
*** p<0.01 ** p<0.05 * p<0.1

Appendix Table 4: Relationship between Standardized Points and College Performance (2007-2011 entrants)

VARIABLES	(1) *Completed Degree*	(2) *Good Degree*	(3) *Great Degree*
All	0.121***	0.229***	0.187***
	(0.003)	(0.003)	(0.004)
Gender			
Male	0.143***	0.228***	0.200***
	(0.004)	(0.006)	(0.006)
Female	0.102***	0.232***	0.174***
	(0.004)	(0.004)	(0.005)
Institution Type			
University	0.112***	0.243***	0.201***
	(0.004)	(0.004)	(0.005)
Institute of Technology	0.140***	0.196***	0.150***
	(0.005)	(0.006)	(0.006)
Grant Status			
No Grant	0.119***	0.239***	0.212***
	(0.004)	(0.004)	(0.005)
Grant	0.119***	0.215***	0.142***
	(0.005)	(0.006)	(0.005)
Programme Type			
STEM	0.157***	0.228***	0.230***
	(0.005)	(0.006)	(0.006)
Non-STEM	0.103***	0.230***	0.169***
	(0.003)	(0.004)	(0.004)
School FE	No	No	No
Course-by-year FE	Yes	Yes	Yes
Student and School Characteristics	Yes	Yes	Yes

All regressions include indicators for county of origin, institution-by-year indicators, and a quadratic in age when starting the college programme. We also include a missing dummy for father occupation and disabled status. *Good degree* is 1 if the student achieved a 2.1 degree or better and 0 otherwise. *Great degree* is 1 if the student achieved first-class honours and 0 otherwise. Robust standard errors clustered by school in parentheses. *** p<0.01 ** p<0.05 * p<0.1.

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