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Teacher Bias, Grade Inflation, and Gender Gaps in Achievement: Evidence from Ireland

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Abstract: Due to COVID-19, there was a series of changes to the terminal schooling assessments in Ireland (the Leaving Certificate) between 2019 and 2023. The traditional exams-based grading in 2019 switched to grades that were largely determined by teacher assessment in 2020 and 2021 before reverting to national exams in 2022. These changes were accompanied by grade inflation that did not disappear in 2022 and 2023 as inflated grade distributions were maintained by post-grading adjustments to student exam scores. We examine how changes over this period affected gender gaps in Leaving Certificate performance. While there are some differences across subjects, there are three robust findings: First, biases in teacher assessment modestly increased grades of females relative to males with effects throughout the grade distribution. Second, naïve estimates that do not account for grade inflation greatly exaggerate the effects of teacher bias on gender gaps at the very top of the distribution and misleadingly suggest that teacher biases favoured boys at the bottom of the distribution. Third, while the focus has been on teacher grading, grade inflation itself has important implications for gender gaps in achievement, benefiting girls at the top of the distribution and boys at the bottom. While our findings are specific to this period in Ireland, teacher assessment generally tends to be generous towards students and so leads to increases in grades. Therefore, the conflation of teacher bias effects with grade inflation effects may have broader relevance.

I INTRODUCTION

The COVID pandemic led to changes in assessments in many countries as national examinations were cancelled and replaced by some form of teacher assessment. Before 2020, grades in Ireland were based on performance in centrally

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and anonymously graded national examinations – the "Leaving Certificate" exams. These grades were then used by the centralised college applications system to determine the allocation of students to college programmes. This changed in 2020 with the national examinations cancelled and replaced by "calculated grades" which were predominantly based on teacher assessments. There was also a heavy reliance on teacher assessment in 2021.[1] Due to the changing processes, there was grade inflation between 2019 and 2020 and further inflation between 2020 and 2021. While 2022 and 2023 saw a return to grades being determined solely by national exams, a policy decision was made to adjust exam scores so that grade distributions were similar to the inflated 2021 grades. Using these sharp changes in grade distributions over a short period of time, we examine the effects of teacher assessment and grade inflation on gender differences in grade distributions.

The literature on teacher gender bias in assessment is mixed: Hinnerich *et al.* (2011) find no indications of gender bias in teacher grading in Swedish high schools when using assessments graded by the teacher as well as anonymously by another person.[2] Using Irish data, McCoy *et al.* (2021) find that teacher assessments of mathematical ability are relatively lower for girls than test scores would indicate. However, a common finding (Lavy, 2008; Lindahl, 2007; Breda and Ly, 2015; Terrier, 2020; Falch and Naper, 2013; Cornwall *et al*., 2013) is that teacher-assessed grades differ systematically by gender compared to grades from standardised tests or anonymous national examinations with differences tending to favour females. Therefore, we would expect females to do relatively better than males in 2020 and 2021 compared to 2019 and 2022.[3]

Grade inflation at high school/secondary school level has become increasingly documented internationally with an acceleration over the COVID period being particularly noted. In Sweden, at the upper secondary school level, grades increased by almost 10 percentage points between 1997 and 2003; this change was unaccompanied by an increase in standardised tests (Nordin *et al*., 2019). In the United States, the average high school Grade Point Average (GPA) of ACT test takers increased from 3.28 in 2018 to 3.39 in 2021 (Sanchez and Moore, 2022). In the UK between 2019 and 2021, the percentage of A* grades awarded in the

[1] In 2021, students could choose to take national exams in each subject or accept a teacher-assessed grade in the subject; if they did the exam, they were awarded the higher of the two grades in the subject. Many chose not to sit exams and, even amongst cases where exams were taken, the teacher-assessed grades were higher in most cases, so 2021 can be considered as a year where teacher assessments remained the primary determinant of Leaving Certificate grades.

[2] Avitzour *et al.* (2020) conducted an experiment in Israeli primary schools where teachers graded Mathematics exams, exploiting unique characteristics of Hebrew grammar to create "female" and "male" versions of each exam paper. The results showed that, although some teachers displayed preferences for boys and others for girls, there was no overall gender bias.

[3] Official reports have shown an increase in the grades of girls relative to boys in 2020 and 2021 in Ireland (State Examinations Commission, 2021a; Department of Education and Skills, 2020b). There are similar findings for the UK (Smithers, 2023).

A-Level exams increased from about 8 per cent to 19 per cent, and the proportion of A*/A grades nearly doubled from about 25 per cent to 45 per cent (Smithers, 2023).

The effect of grade inflation on gender differences is unclear as it depends on the underlying distribution of scores by gender in the base period before inflation occurs. Recent research has examined the effect of grade inflation on students later in the education system and on their subsequent earnings in the labour market (Hvidman and Sievertsen, 2021; Diamond and Persson, 2016; Nordin *et al*., 2019; Collins *et al*., 2024). Results suggest that school grade inflation can have welfare implications if some subgroups are relatively more affected by grade inflation than others (Nordin *et al*., 2019). Our work focuses on the effect of grade inflation on gender differences in exam grades; we are unaware of previous research on this specific question. Our main contributions to the literature are, first, to examine how grade inflation confounds estimation of gender biases in teacher assessment and, second, to evaluate how grade inflation itself affects gender gaps in achievement. To this end, one nice feature of the Irish case is that grade inflation in 2022 and 2023 predominantly arose through post-grading adjustments to percentage scores in each exam and implementation did not depend on the gender of the student (just on their pre-adjustment exam score).

We consider teacher assessments as potentially affecting gender gaps through two different channels. First, teachers may systematically over-predict the likely exam performance of one gender compared to the other – the literature suggests that they may tend to have more positive perspectives on females than on males. Consistent with the literature, we refer to this as gender bias.[4] Second, teachers are likely to be overly optimistic in general about student performance so that teacher assessment leads to grade inflation. Even if teachers have no gender bias as defined above, grade inflation may have differential effects by gender if, for example, females are initially closer to grade cut-offs. Empirically, we can separate out these two possibilities by comparing gender gaps in periods where there was teacher assessment and grade inflation (2020 and 2021) to periods in which there was only grade inflation (2022 and 2023).

We find that taking account of grade inflation matters for changes in the gender gap in the proportion achieving an H1 (the highest possible grade in the Leaving Certificate): two-thirds of the increase in the female advantage between 2019 and 2020/2021 was potentially due to grade inflation rather than teacher bias. Accounting for grade inflation also makes the effect of teacher bias more consistent across the grade distribution, moderately increasing the relative proportion of girls who get top grades and moderately reducing the relative proportion of girls who get very low grades. Interestingly, grade inflation itself has important implications

[4] Note that while we refer to this as bias, teacher over-prediction of female performance relative to males may simply relate to differences across gender in performance in high-stakes exams relative to schoolwork in general, or to greater engagement and better behaviour of females in class.

for gender gaps in achievement. Because girls are overrepresented near the top of the distribution, grade inflation increases the relative proportion of girls who get very high grades. Similarly, the preponderance of boys at the bottom of the distribution implies that grade inflation reduces the proportion of boys who obtain very low grades. Thus grade inflation has effects on gender gaps that differ across the distribution. Indeed, when we consider average grades (as measured by Leaving Certificate points), we find no discernible effect of grade inflation, suggesting that grade inflation effects on gender gaps average out over the distribution. Despite this, the effects on gender gaps in top grades may have meaningful effects on gender differences in college opportunities for certain subgroups of students.

II INSTITUTIONAL BACKGROUND, DATA, AND DESCRIPTIVE STATISTICS

2.1 The Leaving Certificate Examination

Students typically begin post-primary education in Ireland at age 12 or 13. The duration of post-primary schooling is 5/6 years with State examinations (the "Junior Cycle" exams) after the first three years and further State examinations (the "Leaving Certificate") at the end of the final two years.[5] In the Leaving Certificate exams, students typically take seven or eight 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 are chosen from a menu that includes Art, Music, modern languages, Sciences, Business, Economics, and other subjects.[6]

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 per cent) 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). The total points obtained from the student's six best subjects are combined to form their total Leaving Certificate points, which are used to determine third-level placement, so the maximum total Leaving Certificate points is 625.

Most college programmes are over-subscribed and have minimum-points requirements. The number of points needed for any course depends on the number

[5] Most schools offer a "transition year" after the third year of post-primary schooling so typically students sit the Leaving Certificate in their sixth year of post-primary school at age 18 or 19.

[5] 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).

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 (see Delaney and Devereux, 2020 for further details).

2.2 Changes in Leaving Certificate Grading

The traditional sitting of the Leaving Certificate examinations did not occur in June 2020 and students were instead provided with a "calculated grade". This calculation used feedback from each subject teacher on likely performance of the student if the exams had taken place with subsequent school-level adjustment and oversight. Following this, there was a centralised national standardisation process that took no account of individual student characteristics or the achievement of prior cohorts from the school.[7]

The in-person Leaving Certificate resumed in June 2021 with students given the choice to sit the written exam in June or receive an "accredited grade" or both. In any subject in which a student chose both options, the better of the two grades (examination and accredited) was recorded as their Leaving Certificate grade. The process of calculating the "accredited grade" was similar to that in 2020, in that it was based on the assessment of each subject teacher of how the student would likely score if they sat a written exam in June 2021. As in 2020, there was then further school-level oversight and a national standardisation process. It is important to note that the final grades were much more influenced by the accredited grades than by grades achieved in the examination. In many subjects, close to 50 per cent of students did not take the examination (Appendix Table 2). Of those who took the examination, the examination grade was higher than the accredited grade in only 16 per cent of cases (Appendix Table 3). Therefore, it is reasonable to view the 2021 grade distribution as being overwhelmingly determined by teacher-assessed grades.

The years 2022 and 2023 saw a return to centralised examinations with no teacher input into the grading process. However, in both years it was decided at government level that average grades should be no lower than in 2021. This was achieved in part by some changes to the examination papers (less time pressure and greater choice of questions to answer) but mostly through adjustments to percentage scores in each exam. For example, in 2023, percentage scores were increased by an average of 7.9 percentage points leading to an increased letter grade (for example, H2 to H1) for about 70 per cent of cases. Adjustments were on a sliding scale, being larger for low scorers than for high scorers but were at least 5.5 percentage points even for the highest scoring exams in 2023.

[7] Students were given the opportunity to sit in-person exams in November 2020, but few availed of this opportunity. Further details about the "calculated grades" process are in the Appendix.

2.3 Data

Individual-level Leaving Certificate grade information is unavailable in Ireland, so we instead use grade distributions by gender, subject and year that are reported by the State Examinations Commission (SEC). The years we consider are 2015 to 2023. Because very different numbers of students take different subjects, we weight all analysis by the number of students taking the subject in the year.[8] This implies that each individual grade gets equal weighting and ensures that our estimates are more heavily impacted by subjects that many people take (such as English) than by subjects that few students take (such as Engineering).

We examine grades by gender for 21 Leaving Certificate subjects that are widely taken by students (the selection criterion is that at least 5,000 students took the subject in 2022). These are English, Mathematics, Irish, French, German, Spanish, Biology, Chemistry, Physics, Agricultural Science, Engineering, Construction, Business, Economics, Accounting, Music, Home Economics, Design and Communications Graphics, History, Art, and Geography. Students typically do seven subjects, with English, Mathematics, and Irish being compulsory and four other subjects also taken. These subjects can be studied at either higher or lower level with higher level material and examinations being more difficult. The grading system changed in 2017, so we map 2015 and 2016 grades into the post-2017 grading scheme using percentage scores and use the post-2017 grade categories in the analysis.[9]

2.4 Interpreting Trends

The following sections present a variety of descriptive evidence relating to grade inflation and teacher bias. For now, we will interpret the trends using a simple framework. Both 2019 and 2022 were years in which there was no teacher grading but the grades in 2022 are inflated relative to 2019 so comparing the outcomes in these two years provides evidence on grade inflation effects. On the other hand, 2020 and 2021 were years in which grades were primarily determined by teachers and in which grades were inflated relative to 2019. Comparing gender differences in 2019 to 2020/2021 gives a sense of the combined effects of teacher bias and grade inflation. Grade distributions in 2022 were similar to those in 2021 so the comparison of these two years provides information about teacher bias effects, abstracting from grade inflation.[10]

It is important to note that there are many limitations to this framework. First, COVID itself may have had heterogenous effects on students in different cohorts so that, even if there had been no change in grading methods or distributions over

[8] Appendix Table 4 shows the number of students who took each of the 21 subjects in 2022.

[9] The pre-2017 grades were more disaggregated, so it is possible to accurately map them to the 2017 grading system.

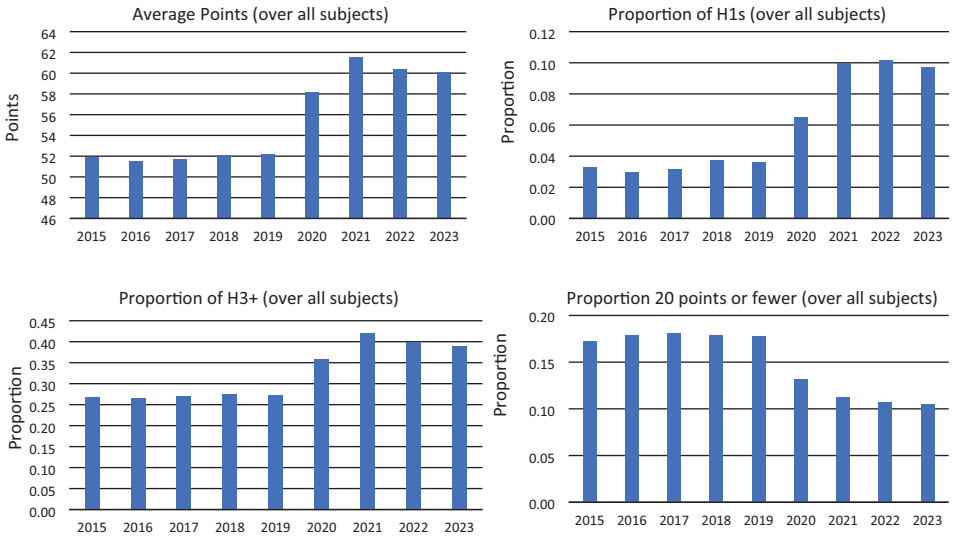
[10] We take a more nuanced approach to separating teacher bias effects from grade inflation effects in the regression analysis in Section III.

this period, there may have been changes in gender gaps. More indirectly, school closures, remote learning, and lockdowns may have had differential effects on boys and girls. Second, in response to COVID, there were changes to the examinations in 2022 involving less time pressure and greater choice. There is international evidence that assessment methods affect gender differences in performance with particularly large differences between written assessments and multiple choice tests (see Delaney and Devereux, 2021 for a review of this literature). While the changes in exam structure in the Leaving Certificate did not involve changes in the types of questions, there may still have been implications for gender gaps.[11]

2.5 Grade Inflation

Figure 1 shows average points (weighted by the number of students taking the subject) over the 21 subjects for each of the nine years.[12] Points increased significantly between 2019 and 2020 and again in 2021, before stabilising somewhat in 2022 and 2023.

Figure 1: Grades by Year



Source: Authors' calculations based on data from the State Examinations Commission.

[11] There is also evidence that the changes in the grading scheme in 2017 affected subject choices and performance in ways that differed by gender (McCoy et al., 2019). This is not an issue for us in our main analysis (as we do not compare pre-2017 outcomes to those that came after) but should be kept in mind in the figures in which we show outcomes for the full set of years from 2015 to 2023.

[12] For comparability across subjects, we calculate points for Mathematics based on the 0-100 scale used for all other subjects. In Appendix Table 5, we show the distribution of points (weighted by the number of students taking the subject) averaged over the 21 subjects and over the nine years.

Figure 1 also shows the proportion getting the maximum grade of H1 that provides 100 points (once again averaging over all 21 subjects and weighting by the number of students taking the subject). The grade inflation is very apparent here at the top of the distribution as this proportion increased from just less than 4 per cent pre-COVID to over 6 per cent in 2020, and to 10 per cent in the 2021-2023 period.

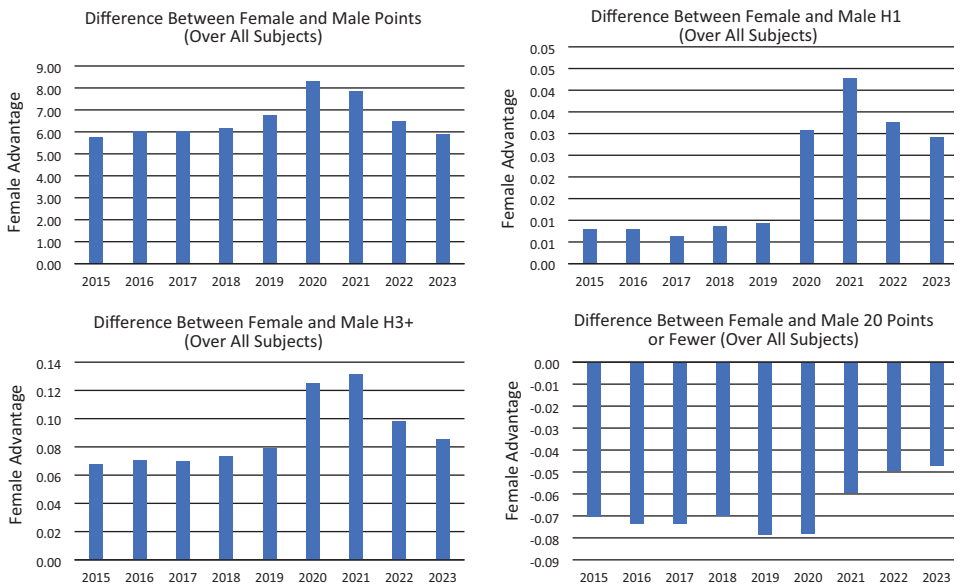
Grade inflation is apparent throughout the distribution. The remaining panels in Figure 1 show the proportion that obtain at least an H3 (77 points or more) and the proportion that achieve 20 points or fewer (either an H8, an O5 or lower, or Foundation Level in Mathematics or Irish).[13]

2.6 Female-Male Gaps

In general, females do better than males. Figure 2 shows the difference in average points between girls and boys over all 21 subjects by year, showing a female advantage that varies from about five points to seven points, with bigger gaps in 2020 and 2021 when grades were largely based on teacher assessments. After these two years, the gender gap in average points falls back to what it was in the pre-COVID years.

Figure 2 also shows male-female gaps in the proportion obtaining H1 grades. The gap favouring females increases from 1 percentage point pre-2020 to

Figure 2: Gender Differences in Grades by Year



Source: Authors' calculations based on data from the State Examinations Commission.

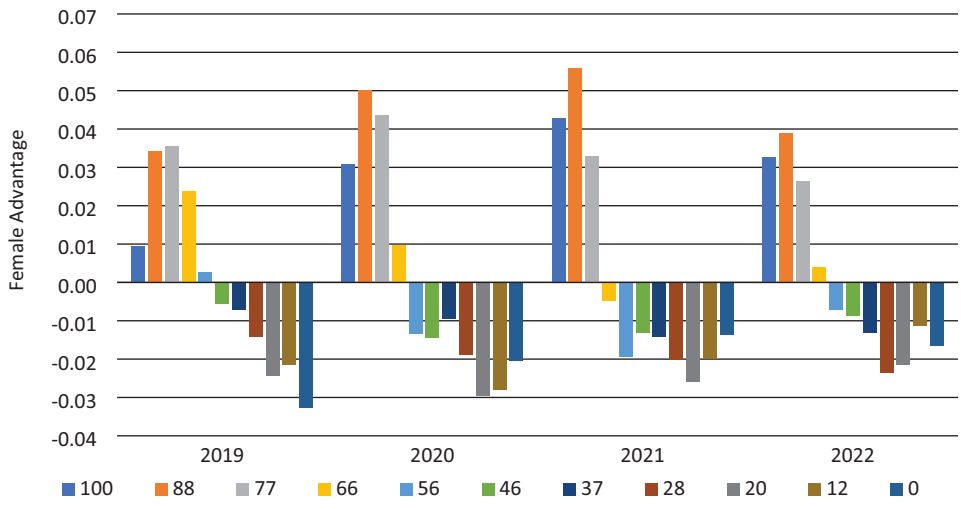
[13] Foundation Level is only available in Mathematics and Irish and is at a level below that of lower level.

3 percentage points in 2020, 4 percentage points in 2021 and then returns to about 3 percentage points in 2022 and 2023. Clearly gender differences in the proportion receiving H1 grades is more influenced by grade inflation (which affects the entire 2020 to 2023 period) than by teacher bias (which is a factor only in 2020 and 2021). The equivalent picture for the gender difference in the proportion receiving at least an H3 grade is also in Figure 2. Here, the gender gap falls after 2021 suggesting that teacher bias is relatively more important for gender differences in the proportion attaining H3+ than it is for the proportion of H1s.

Finally, Figure 2 also shows the gender gap in the proportion getting 20 points or fewer. Pre-2020, males were about 7 to 8 percentage points more likely to receive fewer than 20 points and this gap decreased to about 6 percentage points in 2021, and then to about five points in 2022 and 2023. The reduction in the gender gap between 2020 and later years is consistent with grade inflation favouring boys at the bottom of the distribution. If this is indeed the case, the stability of the gender gap at the bottom between 2019 and 2020 could be explained by grade inflation effects helping boys but being offset by teacher bias that favours girls.

Figure 3 shows the distribution of gender differences by points level, showing the negative female-male gap at low grades and positive female-male gap at high grades – females dominate at higher grades and males dominate at low grades.[14] The figure shows that in the years with teacher-assessed grades (2020 and 2021),

Figure 3: Difference Between Female and Male Distributions Over All Subjects



Source: Authors' calculations based on data from the State Examinations Commission.

[14] We show the years 2019 to 2022 so that the contents of the figure are more visible. Pre-2019 years are similar to 2019, and 2023 is similar to 2022.

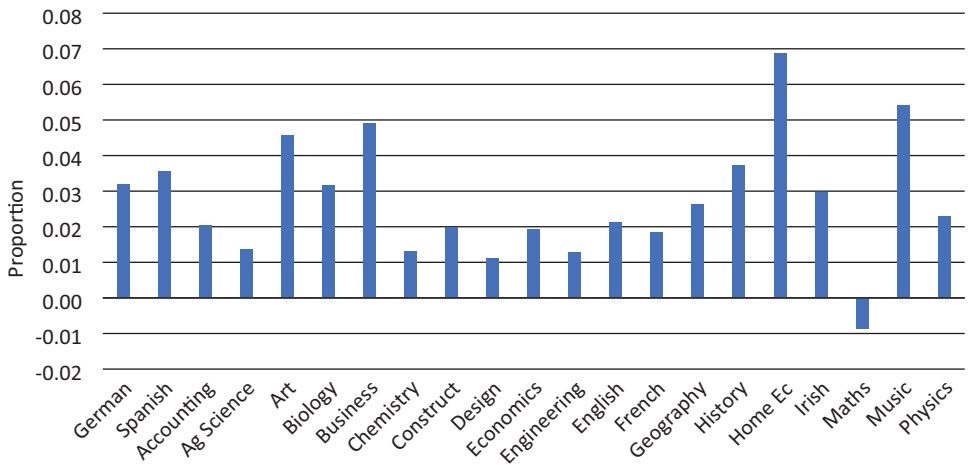
there are a higher proportion of females relative to males at the top of the distribution. Comparing 2019 grades to 2022 (both years in which grades were based solely on centralised examinations), we see clear evidence of relative gains to males at the bottom of the distribution and to females at the top, particularly in the top two grades.

We can also examine gender differences across subjects. To do this parsimoniously, we draw on the findings from Figure 2 that grade inflation effects (as proxied by the changes between 2019 and 2022) are concentrated at the very top of the distribution (proportion of H1s) and at the bottom (20 points or fewer) while teacher bias effects (comparisons of 2019 to 2020 or 2021 to 2022) are more broadly concentrated in the top three grades (H1 to H3).

2.7 Grade Inflation (Comparing 2019 to 2022)

Figure 4 shows the changes in the gender gap in the proportion of H1s between 2019 and 2022. In all subjects except Mathematics, there are substantial changes favouring females, typically of about 2 to 4 percentage points.[15] The biggest effects are in Home Economics, Music, Business, Art and History. The findings in Figure 4 are consistent with grade inflation favouring females at the very top of the distribution.

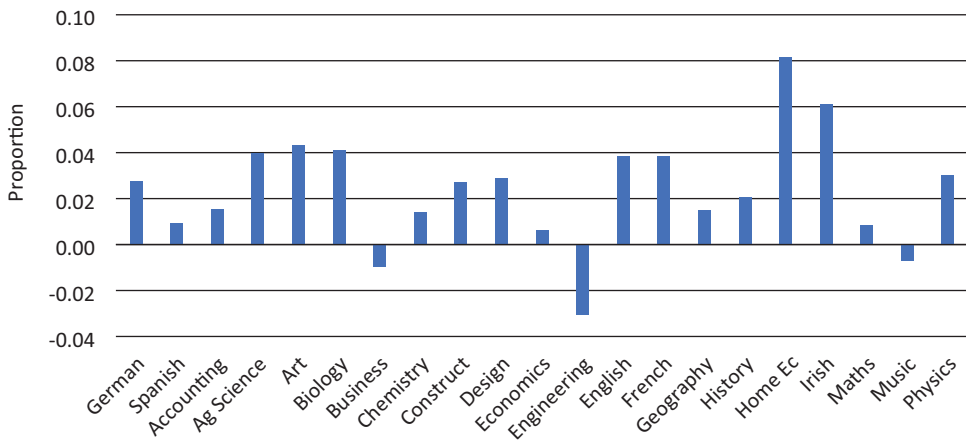
Figure 4a: Change in Gender Difference: Proportion H1, 2019 to 2022: Female minus Male



Source: Authors' calculations based on data from the State Examinations Commission.

[15] We believe that the bigger increase in H1s for girls compared to boys between 2019 and 2022 occurs because, as can be seen in Figure 3, there is a sizeable female advantage at H2 and H3 level in 2019. Grade inflation causes many females who would have received an H2 or H3 in 2019 to attain an H1 in 2022. Mathematics differs in that, in 2019, the proportion of males receiving H2 and H3 grades exceeded the proportion of females that did.

Figure 4b: Change in Gender Difference: Proportion 0-20 points, 2019 to 2022: Female minus Male



Source: Authors' calculations based on data from the State Examinations Commission.

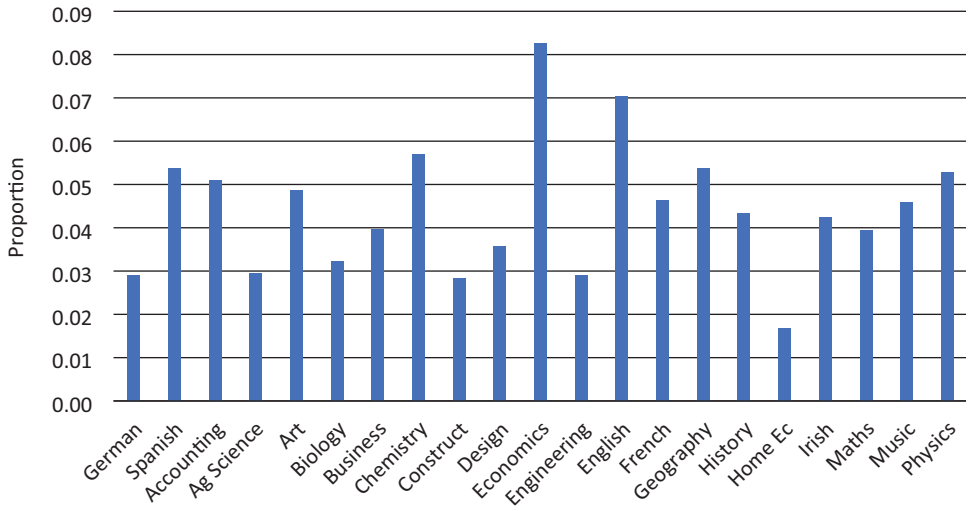
Figure 4 also shows the equivalent figure for the gender difference in the proportion getting very low grades (defined as receiving 20 points or fewer). With three exceptions, the proportion of males receiving very low points falls relative to females as grade inflation reduces the proportion of students at the very bottom of the distribution, an area previously dominated by males.[16] The findings in Figure 4 are consistent with grade inflation favouring males at the very bottom of the distribution.

2.8 Teacher Bias Effects (Comparing 2019 to 2020 and 2021 to 2022)

Figure 5 shows changes in the gender difference in the proportion earning an H3 grade or better by subject from 2019 to 2020. There are increases favouring females for all subjects with magnitudes generally about 2 to 6 percentage points. The largest effects are for Economics and English. Figure 5 also shows the equivalent figure for changes between 2021 and 2022. Here, the changes favour boys in almost all subjects with typical effect sizes of about 2 to 5 percentage points. Figure 5 provides suggestive evidence that teacher assessments favoured females in almost all subjects, as 2020 and 2021 were the two years in which they were used. However, because there was some difference in grade inflation across 2019-2020 and 2021-2022, it is possible that grade inflation is partly responsible for these effects. Therefore, in the next section, we use regression analysis to try to separate out these two effects more precisely.

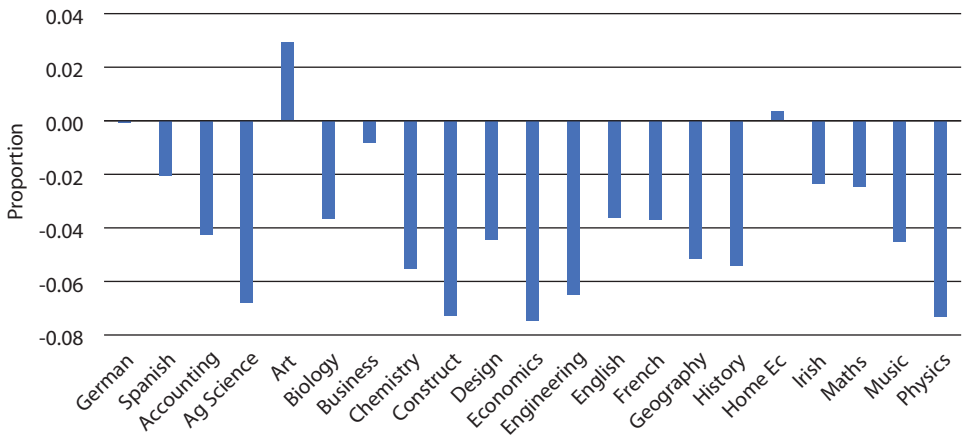
[16] Engineering is an outlier here, perhaps because it is a very male-dominated subject.

Figure 5a: Change in Gender Difference: Proportion H3+, 2019 to 2020: Female minus Male



Source: Authors' calculations based on data from the State Examinations Commission.

Figure 5b: Change in Gender Difference: Proportion H3+, 2021 to 2022: Female minus Male



Source: Authors' calculations based on data from the State Examinations Commission.

III REGRESSION ANALYSIS

To show average effects somewhat more precisely, we estimate a regression using information from all 21 subjects over the period 2017 to 2023.[17] The dependent variables are the differences in the average value of each particular outcome between females and males in each subject in each year. The outcomes considered are the proportion of each gender that received an H1 (100 points), the proportion of each gender that received an H1 or H2 (88+ points), the proportion of each gender that received an H3 or better (77+ points), the proportion of each gender that received 37 points or fewer (level 7 or worse at higher level or level 3 or worse at lower level), the proportion of each gender that received 20 points or fewer (H8 or O5 or lower), and the proportion of each gender that received 0 points. As a summary measure, we also study the average points obtained in the subject by each gender.

Our first specification estimates the effect of teacher bias ignoring grade inflation by simply comparing 2020 and 2021 outcomes to those in 2017 to 2019. The specification has the form:

$$Y_{jt} = \beta_0 + \beta_1 y20,21 + \beta_2 y22,23 + \delta_j' J + u_{jt} \quad (1)$$

where Y is a measure of the female-male gap in the relevant outcome, *y20,21* is equal to 1 if the year is 2020 or 2021 and 0 otherwise and indicates the use of teacher assessments, *y22,23* is an indicator variable for the year being 2022 or 2023, and J is a vector of indicator variables for each of the 21 subjects. There are 147 observations with each observation being at the subject-year level (21 subjects over seven years). Each subject-year observation is weighted by the number of students who took that subject in that year.[18]

The estimates are reported in Table 1. As we saw in the earlier figures, the gender gap favouring females is higher in 2020 and 2021. Compared to 2017-2019, the proportion of females getting high grades relative to the proportion of males increased considerably. Counteracting this somewhat, the gender gap in the proportion receiving 0 points narrows as in these years relatively more females than males attained 0 points. Table 1 also provides an approximation of how much teacher bias effects are confounded by the effects of grade inflation in 2020 and 2021 as it provides a comparison between 2022 and 2023 and the pre-2020 period. The effects of grade inflation (as measured by the comparisons of 2022 and 2023 to 2017-2019) on gender gaps are considerable. For the proportion of H1s, the

[17] We start the analysis with 2017 data because, as mentioned above, the grading system was somewhat different prior to 2017.

[18] We report robust standard errors. An alternative would be to cluster standard errors by subject. We have not done so as there are too few subjects (21) for this approach to provide reliable estimates. Clustering by subject leads to standard errors that are higher, but not sufficiently so as to change the substantive findings.

2022/2023 effect of 2.3 percentage points is almost as large as the 2020/2021 effect of 2.9 percentage points, suggesting that most of the apparent teacher bias effect is due to grade inflation. Similarly, the estimates suggest that about half the 2020/2021 effect for H2+ and a third of the effect for H3+ is due to grade inflation. Also interesting is the implication that the apparent effect of teacher bias in reducing the relative proportion of boys with 0 points may be entirely due to grade inflation. On the other hand, the effect of 2020/2021 on average points differences by gender does not appear to be an artifact of grade inflation as there is no meaningful change in this gender difference between 2017-2019 and 2022/2023.

While Table 1 provides suggestive evidence that naïve estimates of teacher bias effects may be confounded by grade inflation, it does not account for the fact that grades were somewhat lower in 2020 compared to 2021/2023. Also, it does not allow for differential grade inflation by subject, which is apparent in Appendix Figures 1 and 2.[19] Therefore, we now estimate a specification with the form:

$$Y_{jt} = \beta_0 + \beta_1 y20,21 + \beta_2 GI + \delta_j' J + u_{jt} \quad (2)$$

where Y is a measure of the female-male gap in the relevant outcome, *y20,21* is equal to 1 if the year is 2020 or 2021 and 0 otherwise and indicates the use of teacher assessments, *GI* is a measure of subject-specific grade inflation, and J is a vector of indicator variables for each of the 21 subjects. *GI* is measured as the average value of the outcome variable in each subject in each year. For example, if the dependent variable is the difference in average points between females and males in each subject-year, *GI* equals the average points in that subject in that year. Note that the *y22,23* indicator is excluded from specification (2) as we instead include the *GI* variable as a more precise measure of grade inflation. As before, each subject-year observation is weighted by the number of students who took that subject in that year.

Estimates for this specification are in Table 2. Compared to Table 1, the coefficients on *y20,21* for the top part of the distribution are attenuated, implying that naïve estimates of teacher bias are exaggerated as they do not account for grade inflation. The impact is particularly large for gender differences in the proportion receiving an H1 for which the *y20,21* coefficient falls from 3 percentage points in Table 1 to 1 percentage point in Table 2. Lesser attenuation is found for the proportion attaining an H2 or better and the proportion obtaining an H3 or better. There are also interesting differences at the bottom of the distribution. The naïve estimates in Table 1 suggest that teacher bias has no effect on the gender difference in the proportion obtaining 37 points or fewer, or 20 points or fewer, and reduces

[19] An official document about the 2021 results makes this clear: "In the system of Accredited Grades, the school estimates were higher than in 2020 particularly at the upper end of the grade distribution at Higher level. The extent to which the estimates were higher varied considerably across subjects and levels." (State Examinations Commission, 2021b).

Table 1: Gender Differences by Year

	(1) *H1*	*(2)* *H1 or H2*	*(3)* *H3+*	*(4)* *0-37 points*	*(5)* *0-20 points*	*(6)* *0 points*	*(7)* *Points*
y20,21	0.029***	0.049***	0.054***	–0.006	0.005	0.013***	1.786***
	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)	(0.003)	(0.204)
y22,23	0.023***	0.027***	0.018***	0.011***	0.026***	0.013***	–0.087
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.185)
Constant	0.014***	0.050***	0.086***	–0.100***	–0.070***	–0.027***	6.828***
	(0.004)	(0.007)	(0.008)	(0.009)	(0.006)	(0.003)	(0.558)
Obs	147	147	147	147	147	147	147
R-squared	0.794	0.906	0.957	0.956	0.936	0.855	0.975

Source: Authors' calculations based on data from the State Examinations Commission.
Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject. Years 2017 to 2023 included. Robust standard errors in parentheses *** $p<0.01$ ** $p<0.05$ * $p<0.1$.

the relative proportion of boys achieving 0 points. However, once account is taken of grade inflation in Table 2, teacher bias now reduces the relative proportion of girls at the bottom of the grade distribution (except at the very bottom, 0 points, in which there is no effect of teacher bias). These differences arise because reductions in the proportion of students with very low grades disproportionately benefit boys, as is indicated by the negative coefficients on the grade inflation controls in columns (4) to (6) in Table 2. Our interpretation for the change in these coefficients is that grade inflation increases the relative proportion of females who achieve very high and very low grades and, so, taking account of the grade inflation in 2020 and 2021, relative to 2019, changes the estimated effect of teacher bias on these gender gaps.

The grade inflation estimates in Table 2 are not directly comparable to those in Table 1. The H1 coefficient implies that if the proportion of students who obtain an H1 increases by 0.1 percentage points, the proportion of females who obtain an H1 increases by 0.035 more than the proportion of males who achieve an H1.[20] These effects are focussed at the very top of the distribution and are reversed at the bottom with a similar sized coefficient favouring males when there is a drop in the proportion of 0 points due to grade inflation.

IV ROBUSTNESS CHECKS

We now show some robustness checks that involve variations on the specification outlined in Equation (2). The first four checks aim to see how robust the year 2020 and 2021 effects are to various changes to the specification.

4.1 Allowing the Effect of 2020 and 2021 to Differ

As discussed earlier (and outlined in detail in the Appendix), the way in which teacher assessments were incorporated into grading differed between 2020 and 2021. Therefore, it is plausible that the gender gaps differed across these two years. Table 3a shows little evidence for this as the coefficient on an indicator for 2020 (*y20*) is never statistically different to the coefficient of the indicator for 2021 (*y21*).

4.2 Adding a Subject-Specific Trend

There may have been trends in male/female performance differences over this period and these may have differed across subject. Over such a short period, it is difficult to rule out this possibility, but it is reassuring that the estimates (Table 3b) are quite robust to allowing for a linear time trend that differs by subject.

[20] This estimate is consistent with a comparison of Figure 2 to Figure 6. Figure 2 shows that the proportion of H1s rose by about 0.06 between 2019 and 2022. Multiplying this change by 0.354, we get about 0.02 which is the actual change in the gender gap in the proportion achieving H1s between 2019 and 2022.

Table 2: Gender Differences, Teacher Assessment, and Grade Inflation

	(1) *H1*	*(2)* *H2+*	*(3)* *H3+*	*(4)* *0-37 points*	*(5)* *0-20 points*	*(6)* *0 points*	*(7)* *Points*
y20,21	0.012***	0.027***	0.037***	–0.017***	–0.013***	0.001	1.885***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.002)	(0.208)
Prop H1	0.354***						
	(0.032)						
Prop H2+		0.268***					
		(0.029)					
Prop H3+			0.147***				
			(0.026)				
Prop<=37				–0.111**			
				(0.044)			
Prop<=20					–0.270***		
					(0.065)		
Prop 0						–0.255***	
						(0.066)	
Average points							–0.014
							(0.021)
Constant	–0.001	0.009	0.043***	–0.066***	–0.029***	–0.013***	7.613***
	(0.004)	(0.008)	(0.011)	(0.014)	(0.009)	(0.003)	(1.305)
Obs	147	147	147	147	147	147	147
R-squared	0.856	0.930	0.960	0.957	0.932	0.844	0.975

Source: Authors' calculations based on data from the State Examinations Commission.

Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject. Years 2017 to 2023 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

Table 3a: Gender Differences, Teacher Assessment, and Grade Inflation

	(1) H1	(2) H2+	(3) H3+	(4) 0-37 points	(5) 0-20 points	(6) 0 points	(7) Points
y20	0.012***	0.026***	0.038***	–0.021***	–0.019***	–0.002	2.059***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.230)
y21	0.012***	0.028***	0.035***	–0.011	–0.006	0.005	1.647***
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.003)	(0.295)
Observations	147	147	147	147	147	147	147
R-squared	0.856	0.930	0.961	0.958	0.936	0.850	0.976

Source: Authors' calculations based on data from the State Examinations Commission.
Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject and the grade inflation variables. Years 2017 to 2023 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

Table 3b: Gender Differences, Teacher Assessment, and Grade Inflation

Variables	(1) H1	(2) H2+	(3) H3+	(4) 0-37 points	(5) 0-20 points	(6) 0 points	(7) Points
y20,21	0.011***	0.026***	0.038***	–0.023***	–0.015***	0.001	1.991***
	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.002)	(0.247)
Constant	5.611	8.656*	5.731	–6.257	–4.280	–4.576*	447.606
	(3.490)	(4.521)	(8.045)	(8.551)	(4.937)	(2.687)	(623.343)
Observations	147	147	147	147	147	147	147
R-squared	0.929	0.966	0.977	0.975	0.967	0.904	0.981

Source: Authors' calculations based on data from the State Examinations Commission.
Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject and the grade inflation variables and a subject-specific trend. Years 2017 to 2023 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

Table 3c: Gender Differences, Teacher Assessment, and Grade Inflation (2023 Omitted)

	(1) *H1*	*(2)* *H2+*	*(3)* *H3+*	*(4)* *0-37 points*	*(5)* *0-20 points*	*(6)* *0 points*	*(7)* *Points*
y20,21	0.012***	0.025***	0.034***	–0.014***	–0.011***	0.003	1.735***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.210)
Constant	0.001	0.010	0.043***	–0.079***	–0.033***	–0.015***	7.146***
	(0.003)	(0.008)	(0.012)	(0.017)	(0.010)	(0.004)	(1.388)
Obs	126	126	126	126	126	126	126
R-squared	0.877	0.943	0.966	0.954	0.931	0.837	0.977

Source: Authors' calculations based on data from the State Examinations Commission.
Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject and the grade inflation variables. Years 2017 to 2022 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

Table 3d: Gender Differences, Teacher Assessment, and Grade Inflation (Omitting Mathematics)

	(1) *H1*	*(2)* *H2+*	*(3)* *H3+*	*(4)* *0-37 points*	*(5)* *0-20 points*	*(6)* *0 points*	*(7)* *Points*
y20,21	0.013***	0.028***	0.038***	–0.016***	–0.011***	–0.000	1.755***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)	(0.210)
Constant	–0.004	0.007	0.044***	–0.042***	–0.008	–0.006**	8.506***
	(0.004)	(0.008)	(0.012)	(0.012)	(0.006)	(0.003)	(1.372)
Obs	140	140	140	140	140	140	140
R-squared	0.811	0.880	0.929	0.967	0.966	0.896	0.968

Source: Authors' calculations based on data from the State Examinations Commission.
Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject and the grade inflation variables. Years 2017 to 2023 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

4.3 Omitting the 2023 Data

The 2023 data are provisional and will change somewhat due to (successful) student appeals. This is unlikely to have a large effect on male/female gaps but, as a check, we omit 2023 data. The estimates (Table 3c) are little changed.

4.4 Leave out Mathematics Grades

There are two reasons why it is worth checking whether estimates are robust to excluding Mathematics grades. First, as we saw in the descriptives, the effects of grade inflation seem quite different for Mathematics compared to other subjects. Second, in 2023, the Mathematics distribution was somewhat different to previous years due to one of the two exam papers being unusually challenging. Despite these two issues, omitting Mathematics grades has little effect on the estimates (Table 3d).

4.5 Estimating Grade Inflation Effects Prior to 2020

Are the grade inflation effects that are estimated in Table 2 plausible? To evaluate this, we study the effects of subject-specific grade inflation over the period 2015 to 2019. This exercise has several limitations. First, there is no systematic grade inflation prior to 2020 so we are relying on idiosyncratic variation in grade distributions by subject and year and the effects of these changes may differ from the effects of the across-the-board increases in grade distributions that have been seen between the pre-2020 and post-2020 period. Second, because we need more than three years prior to 2020 to estimate the effects somewhat precisely, we have added the years 2015 and 2016 in which there was a different grading system and so, as described above, requires conversion of the 2015 and 2016 grades into the coarser post-2017 system. Keeping these caveats in mind, we regress each outcome on the grade inflation variables plus subject indicators and year indicators for the period 2015 to 2019. As before, in each regression, the dependent variable is the proportion of girls who get the particular result in the subject in the year minus the proportion of boys that do. While there are differences in the estimates relative to those in Table 2, reassuringly the coefficients on the grade inflation variables from this regression (Table 4) are quite consistent with those in Table 2.

Table 4: Effects of Grade Inflation on Gender Gaps Prior to 2020 (Years 2015 to 2019)

	(1) H1	*(2) H2+*	*(3) H3+*	*(4) 0-37 points*	*(5) 0-20 points*	*(6) 0 points*	*(7) Points*
Prop H1	0.376***						
	(0.043)						
Prop H2+		0.333***					
		(0.078)					
Prop H3+			0.067				
			(0.119)				
Prop <=37				–0.354***			
				(0.073)			
Prop<=20					–0.289***		
					(0.106)		
Prop 0						–0.117	
						(0.081)	
Average points							–0.285**
							(0.118)
Constant	0.003	0.002	0.067**	0.008	–0.029**	–0.019***	22.573***
	(0.002)	(0.012)	(0.033)	(0.022)	(0.014)	(0.004)	(6.465)
Obs	105	105	105	105	105	105	105
R-squared	0.918	0.953	0.975	0.990	0.987	0.962	0.990

Source: Authors' calculations based on data from the State Examinations Commission.

Note: Each column is a separate regression, and the dependent variable is the average value for females minus the average value for males. All regressions include indicators for subject. Years 2015 to 2019 included. Robust standard errors in parentheses *** p<0.01 ** p<0.05 * p<0.1.

V CONCLUSIONS

There are several limitations to the analysis that we have presented in this paper. While our analysis focuses on the differential effect of teacher assessment and grade inflation on males versus females, COVID may be associated with other changes as well; school closures, remote learning, and social isolation may affect the gender gap.[21] Furthermore, changes made to examination papers over this period (less time pressure and greater choice of questions to answer) may also have effects that could be misinterpreted as an effect of teacher assessment or grade inflation. However, keeping this caveat in mind, there are some interesting conclusions.

First, while there was much Irish media interest in how teacher bias favoured girls in 2020 and particularly in 2021, conclusions at that point may have been distorted by a failure to take account of grade inflation.[22] This may have led to an overstatement of the effects of teacher bias on gender differences at the top of the distribution. Adjustment for grade inflation makes a significant difference with two-thirds of the increase in the female advantage in the proportion achieving H1s potentially due to grade inflation rather than teacher bias. Accounting for grade inflation also makes the effect of teacher bias more consistent across the grade distribution, moderately increasing the relative proportion of girls who get top grades and moderately reducing the relative proportion of girls who get very low grades. While our findings are specific to this period in Ireland, teacher assessment generally tends to be generous towards students and so leads to increases in grades. Therefore, the conflation of teacher bias effects with grade inflation effects may have broader relevance.

Second, while the focus has been on teacher bias, grade inflation itself has important implications for gender gaps in achievement. Because girls are overrepresented near the top of the distribution, grade inflation increases the relative proportion of girls who get very high grades. Similarly, the preponderance of boys at the bottom of the distribution implies that grade inflation reduces the proportion of boys who obtain very low grades. So, grade inflation has effects on gender gaps that differ across the distribution. Indeed, when we consider average grades (as measured by points), we find no discernible effect of grade inflation, suggesting that grade inflation effects on gender gaps average out over the distribution. Despite this, the effects on gender gaps in top grades may have meaningful effects on gender differences in college opportunities for certain subgroups of students.

Currently, Irish policymakers are facing the decision of whether to unwind the grade inflation that occurred between 2019 and 2023 and how quickly to do so. While the current policy discussion tends to focus on how such changes would

[21] See for example Liu *et al.* (2021); Flor *et al.* (2022).

[22] Some of the media coverage: https://www.irishexaminer.com/opinion/commentanalysis/arid-40045100.html; https://www.breakingnews.ie/ireland/unconscious-bias-boosted-leaving-cert-results-of-girls-says-report-1180583.html.

affect relative advantages across cohorts, our findings suggest that they would also impact gender gaps in educational achievement and opportunities within cohorts. Recent research suggests that grade inflation can have long-term effects on students later in the education system and on their subsequent earnings in the labour market (Hvidman and Sievertsen, 2021; Diamond and Persson, 2016; Nordin *et al*., 2019). Examining the effects of the Irish Leaving Certificate grade inflation on these types of outcomes will be an interesting avenue for future research.

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APPENDIX

Assessment in 2020

Leaving Certificate students in 2020 could not sit the written exam in June and were instead provided with a "calculated grade". There were a number of steps involved in creating the calculated grade:

First, teachers provided an estimate of the student's likely performance if they had been given the opportunity to sit the 2020 Leaving Certificate exam under normal conditions.[23] The teacher of each Leaving Certificate class was asked to provide (Department of Education and Skills, 2020a):

1. His/her estimate of the percentage mark for his/her subject that each candidate is most likely to have achieved, had he/she sat a Leaving Certificate examination in 2020 as normal.
2. A class rank order – that is, a list of all the candidates in a class for his/her particular class group in the subject in order of the predicted level of achievement of each candidate.

Second, all teachers of a particular subject in a school reviewed these estimated marks and some alignment may have been effected. Third, the school principal reviewed and approved the estimated percentage marks for each student in each subject.

Subsequent to this a central standardisation process was used to determine the calculated grades for each student in each subject. This process took no account of any individual student characteristic or the achievement of prior cohorts from the school. For further information, see Department of Education and Skills, 2020b.

Assessment in 2021

Leaving Certificate students in 2021 could choose to sit the written exam in June or get an "accredited grade" or both. In any subject that a student chose both options, the better of the two grades (examination and accredited) was recorded as their Leaving Certificate grade. There were a number of steps involved in creating the accredited grade:

First, teachers provided an estimate of the student's likely performance if they were to sit the 2021 Leaving Certificate exam. They were advised to do so using records of classwork, homework, class assessments, and other coursework over the two years of the Leaving Certificate cycle.

Second, all teachers of a particular subject in a school reviewed these estimated marks and some alignment may have been effected. Third, the school principal reviewed and approved the estimated percentage marks for each student in each subject.

[23] Survey evidence from Doyle et al. (2021) suggests that the approaches used by teachers to estimate likely performance differed widely and included relying on assessments over the previous two years, results on "mock" examinations, student attitudes and engagement, and performance of prior cohorts in the school.

Officially, the role of the school was to provide:

> *a single estimate of the percentage mark in the subject that each candidate is likely to achieve if they sit the Leaving Certificate examination in 2021 (reflecting the changes to the examinations in 2021 and taking into account the students' likely performance in all examination components – such as coursework, oral examinations, practical examinations, project work performance tests, etc.).*[24]

After the school provided a percentage score for each student in each subject, there was a further national standardisation process which did not take account of any individual student characteristics. The resultant marks were then converted into accredited grades.

It is important to note that the final grades were much more influenced by the accredited grades than by grades achieved in the examination. In many subjects, close to 50 per cent of students did not take the examination (Appendix Table 2). Of those who took the examination, the examination grade was higher than the accredited grade in only 16 per cent of cases (Appendix Table 3). Therefore, it is reasonable to view the 2021 grade distribution as being overwhelmingly determined by teacher-assessed grades.

Assessment in 2022 and 2023

These years saw a return to centralised examinations with no teacher input into the grading process. However, in both years, it was decided at government level that average grades should be no lower than in 2021. This was achieved in part by some changes to the examination papers (less time pressure and greater choice of questions to answer) but mostly through adjustments to percentage scores in each exam. For example, in 2023, percentage scores were increased by an average of 7.9 percentage points leading to an increased letter grade (for example, H2 to H1) for about 70 per cent of cases. Adjustments were on a sliding scale, being larger for low scorers than for high scorers but were at least 5.5 percentage points even for the highest scoring exams in 2023.

[24] State Examinations Commission (2021a).

APPENDIX TABLES AND FIGURES

Appendix Table 1: Mapping from Leaving Certificate Subject Grades to Points (2005-2023)

2015-2016				
Grade	*Marks (%)*	*Points (Lower Level)*	*Points (Higher Level)*	*Points (Higher Level Mathematics)*
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
2017-2023				
Grade	*Marks (%)*	*Points (Lower Level)*	*Points (Higher Level)*	*Points (Higher Level Mathematics)*
1	90% to 100%	56	100	125
2	80% to 89%	46	88	113
3	70% to 79%	37	77	102
4	60% to 69%	28	66	91
5	50% to 59%	20	56	81
6	40% to 49%	12	46	71
7	30% to 39%	0	37	37
8	0% to 29%	0	0	0

Source: Central Applications Office.

Appendix Table 2: Percentage Who Chose Accredited Grades Only in 2021

	%
Irish*	52
English	47
Mathematics	41
Biology	32
Geography	46
French	46
Business	38
History	47
Chemistry	25
Accounting	37
Physics	31
Economics	39
Home Economics	35
Construction*	36
Art*	35
Spanish	41
German	44
Agricultural Science	56
Music*	15
Engineering	32
Design and Communications Graphics	11

Source: State Examinations Commission (2021b).
Note: In subjects marked with an asterisk, the count of Accredited Grades excludes candidates who presented coursework for assessment, presented for the oral test in Irish or the practical test in Music and did not subsequently sit the written examination.

Appendix Table 3: Relationship between Accredited and Examination grades in 2021 (cases where the student did the exam AND received an accredited grade)

	No. of Grades	*%*
Examination Grade equal to Accredited Grade	77,001	31.3%
Examination Grade higher than Accredited Grade	39,659	16.1%
Accredited Grade higher than Examination Grade	129,190	52.5%
Total	245,850	

Source: State Examinations Commission (2021b) Table 4.

Appendix Table 4: Subject Counts in 2022

Music	6,719
Agricultural Science	7,414
Engineering	6,030
Physics	7,767
Spanish	9,540
Construction	9,959
Biology	34,080
Design and Communications Graphics	5,770
Irish	49,899
Business	19,462
History	12,067
Art	9,249
Geography	21,867
Chemistry	9,679
English	57,239
Accounting	7,735
Economics	5,733
French	21,150
German	8,127
Mathematics	57,348
Home Economics	12,132

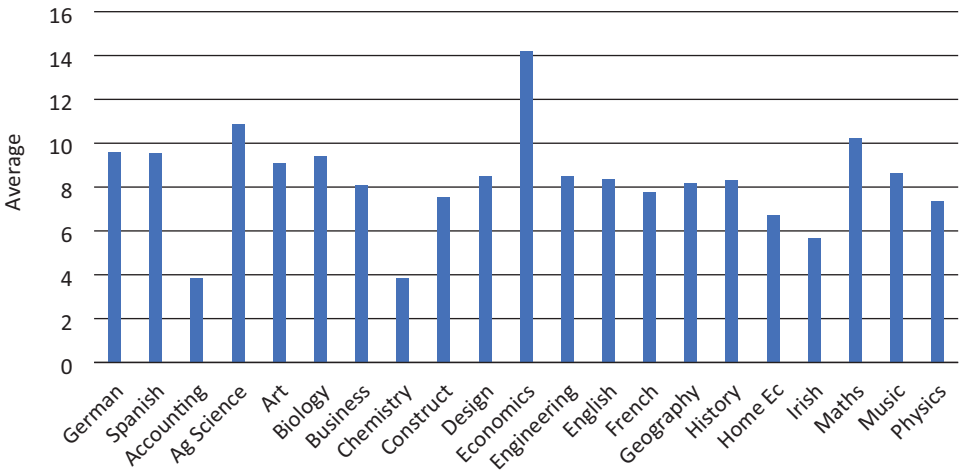
Source: Authors' calculations based on data from the State Examinations Commission.

Appendix Table 5: Distribution of Points Levels (over years 2015-2023)

Points Level	*Percentage*
100	6
88	12
77	15
66	15
56	12
46	10
37	9
28	8
20	6
12	4
0	5

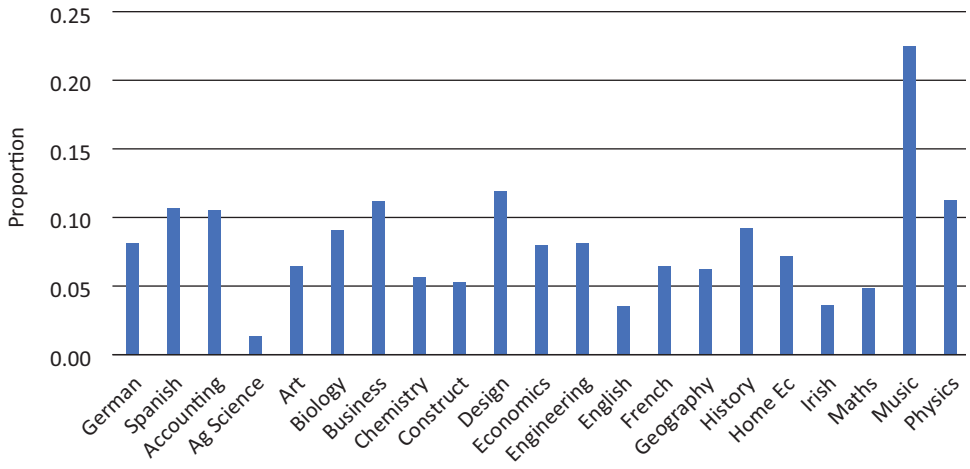
Source: Authors' calculations based on data from the State Examinations Commission.

Appendix Figure 1: Change in Average Points, 2019 to 2022



Source Authors' calculations based on data from the State Examinations Commission.

Appendix Figure 2: Change in proportion of H1s, 2019 to 2022



Source: Authors' calculations based on data from the State Examinations Commission.