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ABSTRACT

Public and Private School Grade Inflations Patterns in Secondary Education

Grade inflation in high schools is potentially problematic for students, education institutions, and society. We examine the extent of potential grading inflation in courses taken during high school and how such differences vary across student and school characteristics. Utilizing longitudinal, administrative data for the population of high school students in an entire country (Portugal) over ten years, we develop a measure of grade inflation using the position of the student's high school grade relative to their score on the national standardized admission exam. We analyze differences in this measure across four types of high schools: TEIP schools (public schools located in disadvantaged areas that include children at-risk of social exclusion), public schools (state-funded schools), private schools, and private association schools (owned by private entities but publicly funded). We find that private association schools exhibit a lower probability of grade inflation when compared to public schools. Additionally, TEIP schools tend to have a higher probability of inflation for students with high grades. Implications for policy and practice are discussed.

JEL Classification: I21, I23, I24

Keywords: grade inflation, grading standards, high school grading, postsecondary access equity, upper secondary education

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I. INTRODUCTION

Grade inflation is generally defined as an increase in grades, over time, that do not correspond to gains in student achievement or academic attainment (Eiszler, 2002; Kostal et al., 2016; Rosovsky & Hartley, 2002) that may result in "the deterioration of the external validity of grades given to students" (Oleinik, 2009, p. 157). Grade inflation in high schools is potentially problematic for students, education institutions, and society. Grade inflation may "encourage students to select subjects or majors where they can easily obtain higher grades" (Chowdhury, 2018, p. 88), reducing academic and professional opportunities. Awarding similar grades to highly qualified and less-qualified students can result in lower effort and achievement among students (DeFraja & Landeras, 2006), especially high-achieving students (Lackey & Lackey, 2006; Pressman, 2007). Inflating grades may also be unfair to high-performing students, as their grades diminish in value relative to their lower-performing peers (Chan et al., 2007; Finefter-Rosenbluh & Levinson, 2015). Student learning and lenient grading may be negatively related (Johnson, 2003), and inflated grades may send inaccurate signals about a student's readiness for further education, which may result in students overestimating their chances of accessing postsecondary education and being successful if they gain entry (Gershenson, 2018).

Education institutions may also be affected by inflated high school grades. In high schools in which grades are inflated, it is difficult to determine how effective the school is in imparting knowledge and developing student skills, thereby preventing actions that may be needed to improve student and school performance. National education agencies and postsecondary institutions use high school grades to decide admissions and place students into courses. If grades are not valid and reliable measures of ability or predictive of college

success, or if they exhibit less variation over time, colleges' ability to discriminate among prospective students using grades is diminished. Such skill-knowledge mismatches increase the chances of poor academic performance or non-completion, often used as indicators of institutional quality.

From an equity perspective, high school grade inflation may benefit students differently. Individuals from high socio-economic status families and students attending private high schools are more likely than their peers to be the recipients of inflated grades (Gershenson, 2018; Nata et al., 2014; Neves et al., 2017; Smith & Naylor, 2005), which may reinforce education stratification and impede policy efforts to improve social mobility and reduce socio-economic inequalities (Bleemer, 2020).

Temporal increases in grades may happen for multiple reasons, of which "grade inflation is only one of them" (Johnes, 2007, p. 476) and "(t)he burden rests with critics to…cite any number of alternative explanations" (Kohn, 2002, para. 7). For example, compositional changes in high schools, student time spent studying, and changes in the courses students take may lead to variation in grades over time. Higher grades may be due to improvements in pedagogy or teaching practices, increased student effort, or technological improvements in schools (Bracey, 1994; Winzer, 2002). School reforms, infrastructure improvements, increases in parental encouragement, and schools becoming more efficient may also lead to grade increases (Johnes, 2007). Given these different possible mechanisms, it is difficult to isolate grade inflation as the sole or dominant explanation for rising grades.

Notwithstanding such difficulties, we examine the extent of potential grade inflation in courses taken during high school and how such differences vary across student

and school characteristics. We utilize longitudinal, administrative data for high school students in an entire country (Portugal) over a relatively long observation period (10 years, from 2010 to 2019). Longitudinal data is necessary to study changes in grades, and using administrative data improves studies that use self-reported grade measures (Hurwitz & Lee, 2018; Ziomek & Svec, 1997). Using population-level administrative data also improves research using relatively small samples of students or schools, and remedies respondent recall issues when studies use questionnaires or surveys to collect grade information. Using short observation periods also may mask longitudinal variations in grades, and power and statistical problems often arise when using small samples of students or schools (Pattison et al., 2013). Our study remedies such problems.

We develop a measure of grading inflation using the position of the student's high school grade relative to their score on the national standardized postsecondary admission exam. Having a high school grade higher in relative position compared to that on the national standardized admissions exam is indicative of secondary school grading inflation. Once constructed, this measure is used as the dependent variable in a regression to assess whether any relative differences in grades are related to the high school type attended - after controlling for a large set of possible confounding factors - as different high school types have varying behavioral incentives for grading. Four types of high schools are considered: TEIP schools, which are public schools located in disadvantaged areas and include children at risk of social exclusion; public schools, which are the majority group and refer to the other state-funded schools; private schools, whose activities are fully funded by private entities; and private association schools, owned by private entities but publicly funded because they are located in areas lacking public high school supply.

The main result of the paper is that, compared to their public school peers, private association schools exhibit a lower probability of grade inflation in secondary education grades. We find that all schools tend to have a higher probability of inflation in high-achieving students' grades, and this effect is more pronounced for TEIP and public schools. These results suggest that different school types may have different grading practices depending on the quality of the student being evaluated. This is particularly relevant given the expected goals of each type of high school. Parents often pressure private schools to place their students into the most competitive higher education programs. In contrast, TEIP schools were created with the explicit objective of reducing secondary school dropout and improving completion. We also examine location patterns in grading practices and find that grade inflation is more common in schools in the north of the country. We provide some possible reasons for the observed geospatial differences in grading behavior.

The remainder of the paper is organized as follows: The next section briefly discusses the prior research on grade inflation. Section III provides the concepts used to frame the analysis. Section IV presents the Portuguese social and educational context relevant to the study, and Section V describes the data and empirical methods employed. Section VI details the results, and the final section concludes the paper.

II. PRIOR RESEARCH

Walsh (2010) notes that "research on grade inflation has focused primarily on the college level" with much less attention "given to grade inflation at lower levels" (p. 152). Many studies examine grade inflation in postsecondary education, demonstrating that it exists in these institutions (Hunt, 2008; Johnson, 2003; Willingham et al., 2002), has increased over time (Rojstaczer & Healy, 2012), and there is heterogeneity in its effects by

student characteristics (Hu, 2005), fields of study (Achen & Courant, 2009; Hermanowicz & Woodring, 2019) and institution type (Rojstaczer & Healy, 2012). What research there is about grade inflation in high schools indicates that it exists, differs by school type (Bleemer, 2020; Nata et al., 2014; Neves et al., 2017) and student, family, and geographic characteristics (Hurwitz & Lee, 2018), is more prevalent in some subjects (Freeman, 1999; Koretz & Berends, 2001), and for students at the top of the grade distribution (Welch, 2010; Ziomek & Svec, 1997).

Most research on grade inflation focuses on secondary schools and colleges in the United States (ACT, 2005; Camara et al., 2003; Carr, 2004; Godfrey, 2011; Pattison et al., 2013; Woodruff & Ziomek, 2004; Ziomek & Svec, 1995). Grade inflation is, however, present in high schools and colleges in many other countries, including the United Kingdom (Bachan, 2017), Canada (Laurie, 2009), France (Bamat, 2014), the Netherlands (DeWitte et al., 2014), Israel (Maagan & Shapira, 2013), Indonesia (Arsyad Arrafii, 2020), Sweden (Wikstrom & Wikstrom, 2005), and Portugal (Nata et al., 2014; Neves et al., 2017). Our knowledge about grade inflation in high schools in Portugal is, however, limited to anecdotes, a few government reports, and a couple of published studies. Nata et al. (2014) conducted a descriptive analysis of grade inflation in high schools in the country. They operationalized grade inflation using the simple difference between the internal score (high school grade) and the student's score on the national higher education admission exam, and compared these differences across school types and some high school classes taken. They found that independent private schools that charge fees inflate grades more than other school types, and grades in the most competitive subjects in tertiary education are inflated more than for different subjects. However, their empirical strategy was limited

because "there may be other sources of grade inflation" (Nata et al., 2014, p. 872) unaccounted for in their descriptive analysis, and data for one high school type was missing for nearly half the 11-year observation period.

Extending Nata et al.'s work, Neves et al. (2017) operationalized grade inflation by high school type using the individual raw difference between high school grades and national exam scores. The authors found that private schools had higher grade inflation than the other three school types across all national exams' distribution grades. One way their analysis differs from Nata's is their focus on how differences in grades affect college admission chances across school types. Still, their claim to "provide quantified measurements of the *impact* (emphasis added) of this inflation on access to higher education" (Neves et al., 2017, p. 192) is debatable. By their admission (p. 199), because of data limitations, their analysis does not account for "existing differences between the students assessed" or "other variables" that may confound the relationships examined.

We extend the literature by examining grade inflation in secondary schools in an international context, while providing a replicable measure of grade inflation that accounts for confounding factors using regression-based methods. By constructing this measure, we also improve on the grade inflation literature from Portugal, while remedying missing data problems in prior work and studying more recent high school cohorts.

III. FRAMING THE RESEARCH

Utility maximization, especially as used in human capital theory (Becker, 1960; Becker, 1994; Schultz, 1961), has been widely employed in education-related research (DesJardins et al., 2006; Fuller et al., 1982; Kim et al., 2009; Manski, 1977; Winston, 1982)

and is used herein to guide the analysis. Agents (i.e., students, high schools, and postsecondary institutions) are assumed to assess their actions' relative benefits and costs and attempt to maximize their utility subject to constraints. Student actions include selecting a high school, what to study, and whether to attend college. College-goers weigh where to apply, their admission chances to a university or field of study, and their likelihood of graduating. Education choices are made, at least in part, to increase students' human capital and returns in the labor market (for a discussion of moral philosophical concepts used to study education issues, see DesJardins & Toutkoushian, 2005). Likewise, high schools and colleges make choices and are incentivized to meet their objectives. These institutions and their agents (e.g., teachers/administrators) make choices about grading practices, course offerings, and admissions. These interconnections and the incentives these agents and institutions face can help us understand the reasons for and consequences of grade inflation.

Grade inflation in high school may affect student decisions in several ways. Recipients of inflated grades may have increased chances of graduating from high school and be advantaged in terms of admission to college relative to those whose grades are not inflated. Such advantages are particularly consequential in countries like Portugal, where students apply through a centralized admissions system to individual programs of study in a university, with the most prestigious fields limiting enrollments and requiring high entrance grades to be accepted. Thus, there are incentives for students to choose a high school or subjects to study that award high grades, a rational choice like those "made by players in a Tiebout (1956) world" (Johnes, 2007, p. 464).

At the secondary school level, "administrators are assumed to maximize their own welfare" (Walsh, 2010, p. 152) by, among other things, maximizing their reputation, enrollment-related revenues, and value for students and parents. One reputation-enhancing strategy is to graduate high numbers of and improve the college-going chances of students. If, at least initially, such costs are spread across all high schools, grade inflation may be incentivized, leading to "dynamism akin to the wage-price spiral," where grade inflation spreads among teachers and across schools (Pressman, 2007, p. 96) resulting in a form of game-theoretic "herding" (Bikhchandani et al., 1992; Correa, 2001; King, 1995).

Inflating grades may enhance school welfare if students base their enrollment decisions on grading policies (Butcher et al., 2014). Also, funding is often linked to enrollments, with private schools that rely on fees having powerful incentives to capture and, over time, increase enrollments. Other financial reasons incentivizing grade inflation include when schools (or teachers) receive a portion of their funding (salary) based on students' academic performance. In many European countries, grading standards have changed (Boleslavsky & Cotton, 2015), with governmental actors increasingly using instruments (e.g., PISA) and metrics (e.g., school grades; national exam scores; Portela et al. 2010 [1]) to monitor school performance, with "adverse policy reactions" for schools not meeting such goals (Johnes, 2007). For instance, Rouse et al. (2013) report that schools in Florida that do not meet standards and are threatened with adverse policy actions (i.e., competition via school vouchers) adopt policies "aimed at low-performing students, lengthen the instructional time, and optimize scheduling systems" (Welch, 2010, p. 158). In addition, parents and students increasingly view themselves as consumers (Wikstrom, 2005) and pressure school officials to provide high grades for their children (McDonald et

al., 2012). Inflating grades may relieve such pressures on school agents, especially at private schools where some may feel students deserve high grades because of high attendance fees. In Portugal, it has long been rumored (Barroso, 2003; Justino, 2005; Martins, 2009), and there is some descriptive evidence (Nata et al., 2014; Silva et al., 2020) that private high schools "grade inflate in order to favor their students' access to higher education, namely to the most prestigious – and therefore more difficult to access – courses" (Neves et al., 2017, p. 194).

Another way grade inflation may affect school finances is in terms of resources allocated to remediation. Inflated grades provide inaccurate signals (Boleslavsky & Cotton, 2015) about academic performance, making it difficult to ascertain whether students need assistance, reducing the resources allocated to remediation relative to a situation where grades accurately measure achievement.

Grade inflation may also have consequences for postsecondary institutions. A students' ability is latent, so universities often use high school and admissions exam grades, and other information as proxies for this constructusuallydes often function as "currency," acting as a measure of value (e.g., a signal of ability/high school reputation) and medium of exchange, where high grades can "purchase" college access. However, grade inflation leads to problems in such exchanges because of an information asymmetry between the student and institution, which distorts the signaling/screening value (Spence, 1973) of grades (Chan, H,ao & Suen 2007; Harford, 2009). Thus, colleges may be unable to "discern between the truly outstanding from the mere average" (Yang & Yip, 2003, and incentivize high schools to manipulate perceptions about their graduates by inflating grades (Boleslavsky & Cotton, 2015).

Much of the discussion about grade inflation focuses on the negative consequences of this phenomenon. However, some observers suggest that grade inflation is not unambiguously bad. As Bleemer (2021) notes, grade inflation could reduce equity gaps by encouraging disadvantaged students to enter challenging courses and fields of study, increasing student confidence and graduation chances. Also, grades in affluent high schools are near the upper boundary of the grade distribution, so any inflation of grades in other schools will simply allow those students' grades to "catch up" to their peers, mitigating the relative difference between schools.

The discussion thus far has implications for the "huma capital and the sorting models" (Johnes, 2007, p. 462). Grade inflation may reduce the utility of grades as measures of a student's educational promise and future productivity. In terms of signaling, the effect of grade inflation on students is less clear. If the rank order of students is maintained, grades retain their ability to discriminate among students. However, if grades are "compressed" on the top of the distribution over time, then their discriminating function may be lost, as evaluators are unable to distinguish between a "true" maximum grade or an inflated one (Yang & Yip, 2003)

The concepts discussed above help explain the incentives to grade inflate and the consequences of doing so, and provide a link between the conceptual and empirical to provide answers to the following interrelated questions:

(1) Is there evidence of grade inflation in high schools in Portugal?

(2) Does any such grade inflation vary across individual, location, or school-level characteristics?

(3) Do the (conditional) estimated probabilities of inflation vary across school types depending on the location of the grade distribution examined?

(4) Do any differences in grade inflation vary depending on the location of high schools in the country?

Based on the concepts discussed, we hypothesize that private schools will inflate more than public schools, and the effects will vary across individual- and school-level characteristics, as well as geospatially because of differences in higher education opportunities in some regions of the country.

IV. THE SOCIAL AND INSTITUTIONAL CONTEXT

Socio-economic and education issues

Although there has been improvement based on measures used to track such issues, Portugal has considerable social and economic inequality (Wilkinson and Pickett, 2011). For example, the Gini coefficient, the S80/S20, and S90/S10 ratios used to measure equity are higher than EU-28 averages (Portuguese Confederation of Environmental Defense Associations, 2019). In addition, equal shares of Portuguese (about 20%) earn the minimum wage (600€/month in 2019) or are at risk of poverty or social exclusion (Survey on Living Conditions and Income, 2018).

In terms of reducing inequality in the country, the education sector has been cited as instrumental in reducing poverty and encouraging employment and social mobility (Portuguese Confederation of Environmental Defense Associations, 2019). Basic skills proficiency and completion rates in high schools are up, and higher education access and attainment have increased (OECD, 2020). Regarding attainment in high schools,

"(b)etween 2008 and 2018, the share of 25-34-year-olds not reaching this level of education fell by 25 percentage points" (OECD, 2020, p. 11), the largest decline in the OECD.

Although education has and continues to be a mechanism to reduce social and economic inequalities, there are problems to overcome, especially at the secondary level. High levels of grade repetition and high dropout levels persist, with Portugal (at 72%) lagging the OECD average of 85% in the share of young adults with at least a high school education (OECD, 2020). Only about 50% of 25–64-year-olds have at least a high school credential, compared to 83% among all OECD countries (OECD, 2020). Importantly, many education measures vary based on socioeconomic background and place of residence.

Education in Portugal

The Portuguese education system is comprised of primary, secondary, and tertiary sectors. Schools are financed using public and private means in all sectors, "but public schools represent the overwhelming majority of providers" (Santos et al., 2021, p. 4). Using the International Standard Classification of Education (ISCED), basic (ISCED categories 1 & 2) and secondary education (ISCED 3) in Portugal consists of twelve years of schooling. Students attend pre-primary education (ages 3 to 5), basic education (ages 6 to 14), and secondary education (ages 15-18), with upper secondary covering grades 10-12. As of 2009, schooling is compulsory until age 18, and public provision of schooling is free.

There are about a thousand upper secondary schools in Portugal, both public and private. Each sector has two types of schools. In the public sector, there are the "regular" high schools and those known as TEIP (Priority Intervention Educational Territories) schools. The latter are relatively new (as of 2006), established to promote educational access and success, social equity goals, and economic growth (Diaz, 2014, p. 4999). The

other public high schools are long-standing, comprising the largest number of upper secondary schools in the country. Both types of public schools derive their funding from government coffers and enroll students from local catchment areas (Nata et al., 2014).

The private school sector, generally perceived as more prestigious, includes two school types: publicly funded and fee-paying schools. The former are located in areas where public provision is insufficient, may be profit-oriented but are not allowed to charge fees, and are bound by the same student selection criteria as public schools (namely the catchment area) (Nata et al., 2014). The latter type of schools "charge fees, are profit-oriented and have a high degree of discretion in selecting their students" (Nata et al., 2014, p. 854).

Upper secondary education is naturally a path for further studies, and grading is essential to determine the educational future of the student. Postsecondary education is provided by public and private institutions, with the former typically being more prestigious and receiving public funding, and the latter financed based largely on fees. Like many European countries, access to public colleges is governed by a policy known as *numerus clausus*, which limits the supply of seats in the most preferred universities and programs of study. High-demand institutions and programs use grades and national tests to select among competing students. Pressman (2007) suggests that this competition incentivizes students to choose high schools with high grading practices, especially in countries (like Portugal) where the economic benefit from attaining tertiary education has been relatively high in recent years (Neves et al., 2017).

Course grading and testing in high schools

Upon entering upper secondary school in the 10th grade, students choose an area of study (academic or technical/vocational), each of which covers different subjects such as Visual Arts, Languages and Humanities, Science and Technology, or Economics and Social Sciences. In each area of study, students have a mandatory course to take. In Economics and Social Sciences and Science and Technology, mathematics is required. In Languages and Humanities, the required course is history, and in the Visual Arts area, it is drawing. The grading scales used to assess students' course performance range from 0 to 20, with 10 being the minimum passing grade. On an international scale, the Portuguese conversion to the mapping is 20-18 = A or Excellent; 17-16 = B or Very good; 15-14 = C or Good; 13-12 = D (Satisfactory); 11-10 = E (Sufficient).

To complete high school, students must achieve a passing grade in all subjects. The final high school GPA is the average of those grades. In four of those subjects, students have to take a national exam. The subjects of those national exams are dependent on the high school track chosen by the student, as well as by the choice of the student within a given track (see Table 1). For each subject, the national exam weighs 30% in the subject's final grade. The exams are centrally designed and anonymously graded by teachers outside of one's school based on centrally defined criteria.

Arguably, the most important role of the national exams is its use in terms of accessing higher education, as some of these tests are required by higher education institutions as admission exams. The application grade to higher education is a weighted average of the final high school GPA and the average score in national exams that the higher education institution defines as admission exams. By law, those admissions exams weigh between 35% and 50% of the application grade (Silva et al., 2020).

The application process to public higher education in Portugal is centralized, and it comprises three rounds. All vacancies offered are available in the first round, and this is when the most and best students apply. Vacancies not filled in the first round are available for subsequent rounds. Another important consideration is that even though each subject-level national exam can be repeated, the student can only access the first round of applications to higher education (where most of the spots are filled) if she did the national exam for the first round. As a result, the first round of the national exams is very important for the students, making it a good proxy for student ability.

However, first-round exam-takers are not all in the same circumstances. As shown in Table 1, students take two mandatory national exams in the 11th grade and two mandatory exams in the 12th grade. The ones taken at the 11th grade are for a two-year subject that the student has studied in the 10th and the 11th grades, while the exams taken in the 12th grade are for three-years of subjects (from 10th to 12th grade). Each year students can retake exams done in previous years. Therefore, there is room for the student to retake their 11th-grade exams one year after (in the 12th grade) without staying an extra year in high school. In practice, every student may retake any exam in the first round of any year. Most students will take their national exam for the first time in the 11th grade, and yet a significant number of students retake the exam one year after completing their high school subject. They retake the exam, for instance, if they want to improve their grade from the previous year and be able to access the first round of higher education applications. These characteristics help explaining some of the dataset inclusion options that are taken and are addressed in the next section.

[TABLE 1 ABOUT HERE]

V. DATA AND METHODS

We use a rich set of data and regression-based methods to examine whether differences in one's final high school grade across the different types of schools are due to grade inflation or the various factors that might explain such differences. Next, the data is described, and then we present the statistical methods employed.

Data

We analyze data for all high school national exams taken in Portugal for the period 2010 to 2019. The data set includes all the grades on national college admissions tests taken by high school students (in 11^{th} or 12^{th} grade in each year) and the corresponding grades in high school, which we refer to as high school grades. The unit of analysis is the exam: each observation in the dataset corresponds to one exam taken by a single student. It is impossible to connect exams taken by the same student, as no student identifier is provided.

For each exam taken, the dataset also contains student characteristics such as gender and age. The dataset also includes information about the high school the student was enrolled in and the high school track that the student chose. This allows us to compute the variable "percentage of exams in one's high school for those enrolled in the Science and Technology track," as a proxy for signaling the willingness to attend competitive programs, as this track provides access to the most selective higher education programs in Portugal. We complement this dataset by adding local context variables obtained from National Statistics. These variables are geospatial measures, providing information about schools located at the municipality level (Portuguese local administrative unit), and include the

migratory balance (the difference between the number of emigrants and immigrants), the share of foreigners in the total population of the municipality, the percentage of individuals of college age (15 to 19), the population density, and the average local monthly gross income (see Table 2).

Some exams are excluded from the dataset. First, we focus on first-round exams only because it allows students to apply to higher education in the highly consequential first round, and also because "retaking" of exams might induce endogeneity. Thus, we believe first-round exams are the best available measure of student ability. Second, to avoid duplicates, as no student identifier is provided, we exclude those retaking the exam in a different year because they are already included in a previous year of the dataset. Third, we exclude exams taken as an external student, that is exams taken by individuals with no high school grade. The category of "external" includes not only retaking, but also students that failed attendance on the subject during the year, or dropped the subject for any other reason. Given that there is no high school grade associated with these exams, no measure of grade inflation could be computed (see Table A1 of the appendix).

"External" exams represent 33% of all exams taken in the first round. Of those 33%, we can verify that 23.4% are classified as retaking and 27.9% are for approval on the subject. The remaining 48.7% include students not registered in the subject who want to take the exam for application to higher education purposes, students enrolled in an international curriculum at high school, and students that want to do the subject only based on the exam. Nevertheless, we verified that, overall, the distribution of external students is balanced across the different types of schools (see Table A1 of the appendix).

[TABLE 2 ABOUT HERE]

Empirical approach

To assess the extent and consequences of grade inflation, we create a variable of the relative change in high school grades distributions. To do so, we compare the distributions of grades in high school and those for the national exam across high school subjects and by academic year for the same set of students/exams. The aim is to quantify and model student relative mobility in the grade distribution, between high school (origin) and national exams (destination). The main advantage of using grade's relative position measures, such as percentiles or ranks, is that it allows us to account for differences in the difficulty of the exams, which typically exhibit some variation over time. For example, exam grade distributions might differ from year to year depending on the difficulty of the exam. By examining relative positions, we avoid the problem of using absolute grades because they may not measure the same level of ability across different sample years.

Specifically, this grade inflation measure is calculated for each subject and year as follows. Eleven values for high school grades are reported (i.e., integers from 10 to 20) and we compute each values' corresponding percentile in the grade distribution. Using the equipercentile method (Braun & Holland, 1982), for each of the eleven grade percentile intervals a corresponding exam score percentile interval is determined (exam scores range between 0 to 200). As a result, two consecutive percentiles define the range of the expected exam score that a student would have obtained if she would have kept the relative position of the high school grade's distribution. Table 3 presents an example of how this works for the case of a student taking Portuguese in 2015 who receives a grade of 18. In the example, that grade is among the 93,77%-97,79% ranked interval of all high school grades in the

subject for that year. The high school percentile interval [93,77-97,79] corresponds to an exam score between 161 and 175. We check if the exam score that the student obtained is within that range. For each exam-year we define a three-category variable, where "1" indicates if the actual exam score is below that range (a proxy for grade inflation or relative inflation), "2" indicates if the actual exam score is within the expected range (a proxy for no grade inflation), and "3" indicates if the actual exam score is above that range (a proxy for grade deflation or relative deflation).

[TABLE 3 ABOUT HERE]

In our previous example, the student with a high school grade of 18 in Portuguese in 2015 would need to have an equivalent percentile on the exam between 161 and 175 to keep her relative position on the high school grade. Therefore, we classify the high school grade as a "2" if the student's actual exam score was within that interval; as a "1" if the student had an exam score lower than 161 – reflecting that her high school grade is relatively inflated compared to the exam score; and as a "3" if the student had an exam score higher than 175, reflecting a high school grade relatively deflated for that student.

Globally, about 38,4% of the sample exhibits relative grade inflation and 38,0% relative deflation, with the remainder indicating no grade inflation. Using a multinomial logit model, we regress this three-category measure on a set of variables to examine differences in high school grade inflation, deflation, and alignment.

Figure 1 presents the temporal differences in inflated grades by high school type. Private Association schools have the lowest grade inflation levels, whereas Private schools have the highest. TEIP and Public schools have similar inflation levels until 2014, and after

that the share of inflation in TEIP schools increase slightly. There are significant variations in grade inflation levels over the observation period, with the 2013-2015 period exhibiting considerably higher inflation values for private schools relative to their public sector peers.

[FIGURE 1 ABOUT HERE]

To more fully understand grade inflation and create a measure that accounts for possible confounding factors, we estimate a multinomial logit model where *i* represents the individual/exam pair, *j* indicates the high school, *r* denotes the school's location (i.e., municipality), and *t* the year. The outcome is the probability that a case is in one of the *m* inflation categories, where *m=1,2,3* and $\left(\pi_{ijrt}^{(m)}\right)$ is modeled as follows:

$$(1) \quad \pi_{ijrt}^{(m)} = \frac{e^{V_{ijrt}^{(m)}}}{1 + \sum_{a=1}^{3} e^{V_{ijrt}^{(m)}}}$$

The baseline category is *m=2,* and $V_{ijrt}^{(m)}$ is a function of explanatory variables such that

$$(2) \quad V_{ijrt}^{(m)} = \alpha^{(m)} + \rho_1 HS\ private + \rho_2 HS\ priv\ ass + \rho_3 HS\ TEIP + \sum_{k=1}^{K} \beta_k^{(m)} X_{ijrt} + \delta_t + \gamma_r$$

with the main regressors of interest being the high school dummies $HS\ private$ (Private), $HS\ priv\ ass$ (Private with association), $HS\ TEIP$ (Priority Intervention school), and the reference category is Public schools; X_{ijrt} is a vector of individual- (age, sex), school- (e.g., percentage of students in that school in the scientific track), and region-level variables (percentage, in the municipality, of foreigners and of 15-19-year-olds, population density, average earnings of the population, and the migratory balance as the different between

immigrants and emigrants), dummy variables for the subject of the exam and for the high school course; as well as, year (δ_t) and municipality (γ_r) fixed effects.

To better understand possible grade inflation mechanisms, we estimate the probability of being in one of the aforementioned grading categories by high school type, school location, and each high school's grade distribution. Five model specifications are estimated to test the sensitivity of the results (discussed in more detail below). Our (conditional) measure of grade inflation improves on those used by Nata et al. (2014) and Neves et al. (2017) in three ways. First, we control for individual characteristics such as gender and age. Second, we account for factors that may affect grade inflation, namely the socio-economic background of the school's student body and the characteristics of the region where the school is located. This is particularly relevant in Portugal because students with high socioeconomic status (SES) are unevenly distributed across the territory. Third, our grade inflation measure uses the relative change in the grade position of students, which we believe results in a more accurate measure of the extent of potential grading bias occurring at the school level.

VI. RESULTS AND DISCUSSION

Baseline results

Table 4 displays the estimated average marginal effects for five alternative model specifications. To conserve space, we only display results for the probabilities of grade inflation and deflation; estimates for the baseline category (No Inflation) are available on request. The simplest model specification is Model 1, which includes the school-type variables and controls for exam subject fixed effects. Model 2 adds individual-level

controls for females and age. Controls for schools and its region are included in Model 3. Model 4 adds year, exam round, and course fixed effects. Preferred based on likelihood ratio tests of model fit, Model 5 adds municipality-fixed effects to Model 4.

[TABLE 4 ABOUT HERE]

Overall, the results reveal that grade inflation is related to the type of school attended. Specifically, when compared to public institutions, students in private association schools are less likely to have their grades inflated in all model specifications. Even after controlling for individual, school, and municipality variables and a set of fixed effects (Model (5)), a student in a private association high school has a 2.16 percentage point (pp) lower probability of having his high school grades inflated compared to a student from a public institution. The opposite result is true for TEIP and private schools in all models; students from those schools have a higher probability (1.61 pp and 6.03 pp, respectively) of receiving inflated high school grades relative to their public-school peers. It is noteworthy that Nata et al. (2014) found that private schools tend to inflate their grades more than public schools. Our results indicate that private association high schools tend to inflate grades less than their public counterparts. Furthermore, these authors also found no grading inflation differences between public and TEIP schools, but our results indicate that TEIP schools inflate grades more than public schools.

While the result that private and TEIP schools inflate more and private association schools inflate less than public schools holds throughout all model specifications, the associated marginal effects for schools are smaller in magnitude – reduced approximately

by half for private and TEIP schools– in Model 5 compared to Models 1-4. These differences are due to the introduction of municipality fixed effects in Model 5, suggesting that grading inflation differences across school types are location specific, with inflation behaviors being more prominent in some regions than others.

In terms of individual characteristics, compared to their male peers, females have higher probabilities of having their grades inflated (by 6.39 pp), as do older students, with each additional year of age corresponding to a decrease in the probability of receiving an inflated high school grade by 3.49 pp. Another interesting result, although small, is related to the percentage of students that the high school has in the Sciences track, which is the track that allows accessing the most competitive degrees in higher education. Schools with a higher percentage of students in this academic track tend to have higher probabilities of inflating grades. Each one standard-deviation increase in the proportion of students in the Science track (that has a standard-deviation of 0.13) increases the probability of having inflated grade by approximately 0.02 standard-deviations, which represents a relatively small effect.

Mechanisms

Overall the regression results indicate there are differences in grading inflation across high school types. To delve into why this might be the case we explore two possible mechanisms. One possibility is that grading inflation may be concentrated in different parts of the grade distribution depending on the school type, as different school types might have different incentives to inflate high school grades. On the other hand, as suggested in the overall results, regional differences may be operating, resulting in geospatial variations in grading practices due to different pressures for schools to inflate grades. One possibility is

there may be variations in the demand for candidates to higher education in different locations across the country (Fernandes et al., 2022).

Grade inflation according to high school grades and exam scores

To delve deeper into the results, we pool all cohorts and estimate inflation probabilities for each grade score for each high school type. These estimates are based on a model that adds an interaction between the high school grade and high school type to Model 5. Figure presents the predicted probabilities of relative inflation for each high school type and grade. The grade inflation pattern according to the high school grade is the same for all type of schools. When the high school grade is the highest possible, the probability of relative inflation varies between 68% and 81%, whereas for the lowest grade possible, this probability is about 18%. In particular, for high-achieving students, TEIP schools have a higher probability of inflation relative to other types of schools, and Private schools have the lowest such propensity. This result might be related to grading practices and/or differences in the average ability level of students across high schools. For example, if grades are allocated based not only on students' knowledge but also by comparison to students' classmates, a 19 in a TEIP school, where the average student quality is lower, might be different than a 19 in a Private school.

[FIGURE 2 ABOUT HERE]

Figure 3 presents the same analysis for relative deflation in high school grading. Private schools have lower probabilities of deflating grades as high school grades increase,

and TEIP schools do not decrease their grades as much as other school types for lower high school grades.

[FIGURE 3 ABOUT HERE]

These results fit with our expectations that the incentives to grade inflate vary across school types. TEIP schools are located in priority territories, which were created with the formal objective of decreasing high school dropouts and increasing completion rates. Therefore, there are significant pressures in these schools to promote completion, which may put upward pressures on grades overall. As explained above, national exams are mandatory for high school completion, and their grade is worth 30% of the final grade of the subject. Therefore, low achieving students that face the exams with a high school grade of 10 or 11 have more pressure to pass the exam to avoid retention, and this group is a larger share in TEIP and public schools (see Table 6). If one believes that grades are also given by comparison to the peers in a class, in TEIP schools where the percentage of low-achievers is higher compared to high-achievers, the number of high secondary school grades is small and might be more relatively inflated due to the context. For instance, an 18 in a TEIP school might not mean the same as an 18 in a Private school, as very rarely TEIP school teachers find high quality students and may measure an "18" differently, attributing it more easily when compared to other schools.

Another motivation for schools to inflate grades is related to access to higher education institutions. As in other systems, access to some Portuguese higher education institutions and degrees is highly competitive as there are many candidates for some

subjects, and the minimum grade for entry grade is often very high. Therefore, there may be more grade inflation among students with the highest grades because such grades may be necessary to enter these preferred institutions/degree programs. Although we verify that, on average, private schools inflate more than public schools, this effect also varies across the high school grade distribution. One might expect higher inflation levels in private schools for those with higher grades because (fee-paying) families may have higher expectations in terms of their children accessing higher education and therefore put pressure on the schools to inflate. As in other systems, access to some Portuguese higher education institutions and degrees is highly competitive as there are many candidates for some subjects, and the minimum grade for entry grade is often very high. Therefore, there may be higher grade inflation among the students with the highest grades because such grades may be necessary to enter these preferred institutions/degree programs. According to Figure 2, when we control for individual and school characteristics, TEIP and public schools seems to inflate more at the top of the distribution when compared to the private schools, contrary to what was expected.

Regional differences

The incentives to grade inflate may also vary across territories and our main theoretical possibility for the existence of such differences relates to access to higher education. Even though the admission exams for higher education are national, competition for higher education vacancies is tighter in some regions than others, which may induce geospatial differences in pressuring schools to grade inflate. Additionally, differences on distribution on high school types by region might help to explain concentration of inflation in some regions.

To examine grade inflation patterns by geography, we divide the country into its districts, of which there are 18 in mainland Portugal. This measure is also an appropriate proxy to measure the radius of influence of higher education institutions, given that all districts have at least one higher education institution. Using such divisions means, however, that not all districts have exam takers in all of the school types over time (see Table 5). To estimate inflation probabilities across districts, we add interactions between high school type and the municipality in which the school is located to Model 5. Figure 4 displays the predicted inflation patterns in each district, with each figure providing the results for each high school type.

[TABLE 5 ABOUT HERE]

As noted in the results discussed above, TEIP and Private schools have higher probabilities of inflation, but inflation patterns differ geospatially (see Figure 4). For districts located in the North, the probability of inflation is higher (on average) for each high school type. One reason for this finding is a lack of HE supply in the North compared to the South of the country. There is evidence that there are not enough vacancies at public higher education institutions located in the North compared to the number of students from the North that apply to HE (DGES, 2022). Hence, competition to access public HE degrees in those regions might explain a higher inflation probability for schools in that area. This problem is particularly relevant given that there are fewer slots in public HE in the northern regions and many students in high schools, namely in Aveiro, Braga and Porto (see Table

5). Therefore, the relative scarcity of slots (compared to Lisbon) could be putting more pressure on schools and teachers to give students higher grades to access HE.

Given that in the North there is more competition to access public higher education, schools might have incentives to inflate grades for those students that want to go to higher education. To analyze that, we divided students into high achievers (high school grades between 17 and 20, see Table 6) and low achievers (high school grades between 10 and 12). We computed the probability of inflation for each district for each type of achiever. High achievers have a slightly higher probability of inflation in some districts for TEIP and Private schools when compared to low achievers. Nevertheless, the overall pattern described above remains quite constant.

[TABLE 6 ABOUT HERE]

[FIGURE 4 ABOUT HERE]

VII. CONCLUSIONS

Herein we examined whether there is, and if so the extent of grade inflation in courses taken during high school in Portugal over a 10-year period. Our results indicate that high school grades have risen over time, even when controlling for national exam scores and student and high school characteristics. We find that these grade increases are most prevalent in private and TEIP high schools, and that the region where the school is located is very relevant to explain grade inflation patterns. Our findings also demonstrate that the effects of the factors controlled for in the regressions vary across the distribution of grades, with more pronounced effects for the upper part of the grade distribution, and, in particular, for students located in the North of the country.

Our results are in line with the literature that shows that students from high socio-economic families, usually the ones that can afford private high schools, are more likely than their peers to be the recipients of inflated grades (Gershenson, 2018; Nata et al., 2014; Neves et al., 2017; Smith and Naylor, 2005). Nevertheless, we also find that students from low socioeconomic backgrounds, usually where TEIP schools are present, are also the recipients of inflated grades.

Our results are essential for the discussion of grade inflation in high schools. Policymakers and stakeholders should reflect on how high school grades are being used to select students for higher education. For example, grades might reflect bias depending on the geographic location where students come from. The socioeconomic context, and therefore the high school type, might also affect whether students' grades are inflated. There is a current discussion in different European countries on whether access to higher education should be based on a combination of high school grades and exam scores. This discussion had particular attention of the society because during COVID-19 some European countries need to cancel exams (partially or totally) and do the admission to HE based on the high school grades only (for instance, the case of UK). In Portugal, during that time, the national exams became optional for students. So this article has the potential to impact policy discussions about these issues. The exam scores are particularly being questioned in non-European countries also - for instance, in the United States for the ACT and SAT tests - due to their one-shot characteristic. One argument is that exam scores are deficient as a measure of the knowledge attained by the students compared to a more long-term measure such as high school grades. Our article adds to this discussion because eliminating standardized exams and relying solely on high school grades, as we have

demonstrated, could represent an important source of regional and socioeconomic biases in accessing higher education, and could also limit policy goals in terms of promoting success in high school or social mobility

For future research and policy, we suggest more closely examining the high school subjects covered by a national examination, but also subjects with no external evaluation (in the case of Portugal, those are subjects in the 12th year that count for the high school GPA but do not have an exam). Understanding whether the four types of high schools in Portugal grade students differently on those subjects is crucial to fully comprehend grading bias. However, doing so will require student-level information rather than exam taken information, as well as a link to all student academic performance data during secondary school.

Our research demonstrates the extent of and differences in grade inflation across groups, time, and geospatial measures and we note the potential consequences for students/families, teachers, and schools. Given the strategic behavior of students regarding high school and college choices, as well as high school's positioning to increase prestige or profit, studying grading differences may help us better understand the distortions that these strategic behaviors might impose on educational systems. We suspect similar mechanisms and results could be at play in other countries, and hope this article presents a starting point for more study of this phenomenon across different secondary school systems across the globe.

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REFERENCES

Achen, A. C. and Courant, P. N. (2009). What are grades made of? *Journal of Economic Perspectives*, *23*(3), 77-92.

ACT. (2005). Are high school grades inflated? Issues in college readiness. Retrieved from https://files.eric.ed.gov/fulltext/ED510537.pdf on November 3, 2021.

Amaral, A. and Magalhães, A. (2009). Between institutional competition and the search for equality of opportunities: Access of mature students. *Higher Education Policy*, 22(4), 505–521.

Arsyad Arrafii, M. (2020). Grades and grade inflation: exploring teachers' grading practices in Indonesian EFL secondary school classrooms. *Pedagogy, Culture and Society*, *28*(3), 477-499.

Bachan, R. (2017). Grade inflation in UK higher education. *Studies in Higher Education*, *42*(8), 1580-1600.

Bar, T., Kadiyali, V. and Zussman, A. (2012). Putting grades in context. *Journal of Labor Economics*, *30*(2), 445-478.

Bamat, J. (2014, July 7). Are French high school students getting smarter? *France24.*

Barroso, J. (2003). Organização e regulação dos ensinos básico e secundário em Portugal: Sentidos de uma evolução. *Educação e Sociedade, 24(82), 63–92.*

Becker, G. S. (1960). Underinvestment in college education? *The American Economic Review, 50*(2), 346-354.

Becker, G. S. (1994). *Human capital: A theoretical and empirical analysis with special reference to education*. Chicago, IL: The University of Chicago Press.

Ben-Akiva, M. and Lerman, S. R. (2021). Disaggregate travel and mobility-choice models and measures of accessibility. In *Behavioural travel modelling* (pp. 654-679). Routledge.

Bikhchandani, S. Hirshleifer, D. and Welch, I. (1992). A theory of fads, fashion, custom, and cultural change as informational cascades. *Journal of Political Economy*, *100*(5), 992-1026.

Bleemer, Z. (2020). Grade inflation at more-and less-affluent high schools. *UC-CHP Policy Brief*.

Bleemer, Z. (2021). Grade inflation is just plain bad. Right? Maybe not. Retrieved from https://www.washingtonpost.com/education/2021/09/21/why-grade-inflation-is-useful/ on September 23, 2021.

Boleslavsky, R. and Cotton, C. (2015). Grading standards and education quality. *American Economic Journal: Microeconomics*, *7*(2), 248-79.

Bonesrønning, H. (1999). The variation in teachers' grading practices: Causes and consequences. *Economics of Education Review 18*(1): 89–106.

Boretz, E. (2004). Grade inflation and the myth of student consumerism. *College Teaching*, *52*(2), 42-46.

Bracey, G. W. (1994). Grade inflation. *Phi Delta Kappan*, 76, 328–31.

Braun, H. E., & Holland, P. W. (1982). Observed-score test equating: A mathematical analysis of some ETS equating procedures. In P. W. Holland & D. B. Rubin (Eds.), Test equating (pp. 5-50). New York: Academic Press.

Camara, W., Kimmel, E., Scheuneman, J. and Sawtell, E. A. (2003). *Whose grades are inflated?* (Research Report No. 2003-4). New York, NY: College Board.

Carr, P. C. (2004). The NAEP high school transcript study. *Education Statistics Quarterly*, *6*, 4–5.

Chan, W., Hao, L. and Suen, W. (2007). A signaling theory of grade inflation. *International Economic Review*, *48*(3), 1065-1090.

Chowdhury, F. (2018). Grade inflation: Causes, consequences and cure. *Journal of Education and Learning*, *7*(6), 86-92.

Cizek, G. J. (1996). There's no such thing as grade inflation. *Education Week*, *15*(30), 22-32.

Correa, H. (2001). A game theoretic analysis of faculty competition and academic standards. *Higher Education Policy*, *14*(2), 175-182.

Corstjens, M. L. and Gautschi, D. A. (1983). Conjoint analysis: A comparative analysis of specification tests for the utility function. *Management Sciences, 29*(12), 1393–1413.

DesJardins, S. L., Ahlburg, D. A. and McCall, B. P. (2006). An integrated model of application, admission, enrollment, and financial aid. *The Journal of Higher Education*, *77*(3), 381-429.

DesJardins, S. L. and Toutkoushian, R. K. (2005). Are students really rational? The development of rational thought and its application to student choice. In *Higher education: Handbook of theory and research* (pp. 191-240). Springer, Dordrecht.

DeFraja, G. and Landeras, P. (2006). Could do better: the effectiveness of incentives and competition in schools. *Journal of Public Economics*, *90*(1-2), 189-213.

De Witte, K., Geys, B. and Solondz, C. (2014). Public expenditures, educational outcomes and grade inflation: Theory and evidence from a policy intervention in the Netherlands. *Economics of Education Review*, *40*, 152-166.

Dias, D. (2015). Has massification of higher education led to more equity? Clues to a reflection on Portuguese education arena. *International Journal of Inclusive Education*, *19*(2), 103-120.

Dias, M. (2014). Priority educational territories in Portugal: New patterns of educational governance?. *Procedia-Social and Behavioral Sciences*, *116*, 4998-5002.

DGES (2022). Relatório do grupo de trabalho sobre o acesso ao ensino superior [report of the working group on access to higher education]. Report. Retrieved from https://wwwcdn.dges.gov.pt/sites/default/files/relat_acesso_ensino_superior_28_jul.pdf on January 18, 2023.

Santos, J.P., Tavares, J. and Mesquita, J. (2021). *Leave them kids alone!* National exams as a political tool. *Public Choice* 189, 405–426

Education at a Glance: OECD Indicators (2019). Country Report: Portugal. Retrieved from https://www.oecd.org/education/education-at-a-glance/EAG2019_CN_PRT.pdf on November 6, 2021.

Edwards, C. H. (2000). Grade inflation: The effects on educational quality and personal well being. *Education*, *120*(3), 538–46.

Eiszler, C. F. (2002). College students' evaluations of teaching and grade inflation. *Research in Higher Education*, *43*(4), 483-501.

Fack, G., Grenet, J. and He, Y. (2019). Beyond truth-telling: Preference estimation with centralized school choice and college admissions. *American Economic Review*, *109*(4), 1486-1529.

Fehr, E., and Tyran, J. R. (2001). Does money illusion matter? *American Economic Review*, *91*(5), 1239-1262.

Fernandes, F., Sá, C., Mourato, J., Bento, M.C. and Biscaia, R. (2022). Relatório do Grupo de Trabalho sobre o Acesso ao Ensino Superior. Available at: https://wwwcdn.dges.gov.pt/sites/default/files/relat_acesso_ensino_superior_28_jul_0.pdf

Finefter-Rosenbluh, I. and Levinson, M. (2015). What is wrong with grade inflation (if anything)? *Philosophical Inquiry in Education*, *23*(1), 3-21.

Freeman, D. G. (1999). Grade divergence as a market outcome. *Journal of Economic Education*, *30*, 344–51.

Fuller, W. C., Manski, C. F. and Wise, D. A. (1982). New evidence on the economic determinants of postsecondary schooling choices. *Journal of Human Resources*, 477-498.

Gershenson, S. (2018). Grade inflation in high schools (2005-2016). *Thomas B. Fordham Institute*.

Godfrey, K. (2011). *Investigating grade inflation and non-equivalence* (Research Report 2011-2). New York, NY: College Board.

Harford, T. (2009). Outside edge: An easy answer to grade inflation. *Financial Times*, March 20, 2009.

Hermanowicz, J. C. and Woodring, D. W. (2019). The distribution of college grades across fields in the contemporary university. *Innovative Higher Education*, *44*(6), 497-510.

Hu, S. (2005). Beyond grade inflation: Grading problems in higher education. *ASHE Higher Education Report*, *30*(6), 1-99.

Hunt, L.H. (Ed.). (2008). Grade inflation: Academic standards in higher education. Albany, NY: State University of New York Press.

Hurwitz, M. and Lee, J. (2018). Grade inflation and the role of standardized testing. *Measuring success: Testing, grades, and the future of college admissions*, 64-93.

Johnes, G. (2004). Standards and grade inflation, In Johnes G. and Johnes J., *International Handbook on the Economics of Education*. London: Edward Elgar Publishing.

Johnson, V. E. (2003). Grade inflation: A crisis in college education. New York, NY: Springer.

King, S. P. (1995). Search with free-riders. *Journal of Economic Behavior and Organization*, *26*, 253–71.

Kohn, A. (2002). The dangerous myth of grade inflation. *The Chronicle of Higher Education*, *49*(11), B7.

Koretz, D. and Berends, M. (2001). *Changes in high school grading standards in mathematics, 1982-1992*. Rand Corporation: Santa Monica, CA.

Kostal, J. W., Kuncel, N. R. and Sackett, P. R. (2016). Grade inflation marches on: Grade increases from the 1990s to 2000s. *Educational Measurement: Issues and Practice*, *35*(1), 11-20.

Krautmann, A. C. and Sander, W. (1999). Grades and student evaluations of teachers. *Economics of Education Review*, *18*(1)*,* 59-63.

Kuncel, N. R., Credé, M. and Thomas, L. L. (2005). The validity of self-reported grade point averages, class ranks, and test scores: A meta-analysis and review of the literature. *Review of educational research*, *75*(1), 63-82.

Lackey, L. W. and Lackey, W. J. (2006). Grade inflation: potential causes and solutions. *International Journal of Engineering Education*, *22*(1), 130.

Laurie, R. (2009). Raising the bar: A data-driven discussion on grade inflation. *Education Canada*, *49*(4), 32.

Lindahl, E. (2016). Are teacher assessments biased? Evidence from Sweden. *Education Economics 24*(2): 224–38.

Maagan, D. and Shapira, L. (2013). *Reconsidering grade inflation in Israel.* Jerusalem: Israeli Central Bureau of Statistics.

Manski, C. F. (1977). The structure of random utility models. *Theory and Decision, 8*(3), 229.

Manski, C. F. (1989). Schooling as experimentation: A reappraisal of the postsecondary dropout phenomenon. *Economics of Education Review*, *8*(4), 305-312.

Manski, C. F. and Wise, D. A. (1983). *College choice in America*. Cambridge, MA: Harvard University Press.

Marks, D. (2002). Academic standards as public goods and varieties of free-rider behaviour. *Education Economics*, *10*(2), 145-163.

Martins, P. (2009). *Individual teacher incentives, student achievement and grade inflation. IZA discussion paper*. Bonn: Forschungsinstitut zur Zukunft der Arbeit.

McDonald, P., Pini, B. and Mayes, R. (2012). Organizational rhetoric in the prospectuses of elite private schools: Unpacking strategies of persuasion. *British Journal of Sociology of Education, 33*(1), 1–20.

McFadden, D. (1976). Aggregate travel demand forecasting from disaggregated behavioral models. *Transportation Research Record, 534,* 24–37.

Mikka, T. (2021). *The grade multiplier: Applying Gresham's Law to grade inflation*. UCLA Working Paper. Retrieved from https://www.mikkadeloia.com/research on October 20, 2021.

Nata, G., Pereira, M. J. and Neves, T. (2014). Unfairness in access to higher education: a 11 year comparison of grade inflation by private and public secondary schools in Portugal. *Higher Education*, *68*(6), 851-874.

Neves, T., Ferraz, H. and Nata, G. (2017). Social inequality in access to higher education: grade inflation in private schools and the ineffectiveness of compensatory education. *International Studies in Sociology of Education*, *26*(2), 190-210.

Nordin, M., Heckley, G. and Gerdtham, U. (2019). The impact of grade inflation on higher education enrolment and earnings. *Economics of Education Review*, *73*, 1-10.

Oleinik, A. (2009). Does education corrupt? theories of grade inflation. *Educational Research Review*, 4(2), 156-164

Pattison, E., Grodsky, E. and Muller, C. (2013). Is the sky falling? Grade inflation and the signaling power of grades. *Educational Researcher*, *42*(5), 259-265.

Parsons, G. R. (2000). Narrow choice sets in a random utility model of recreation demand fishing in Maine. *Land Economics, 76*(1), 86–99.

Portela, M., Areal, N., Sá, C., Alexandre, F., Cerejeira, J., Carvalho, A. and Rodrigues, A. (2008). Evaluating student allocation in the Portuguese public higher education system. *Higher Education*, *56*(2), 185-203.

Portela, M. C. A. S. and Camanho, A. S. (2010). Analysis of complementary methodologies for the estimation of school value added. *Journal of the Operational Research Society*, *61*(7), 1122-1132.

Portuguese Confederation of Environmental Defense Associations (2019). *Inequalities and development in Portugal: Portugal's contribution to implementing SDG 10*. Retrieved from https://gcap.global/wp-content/uploads/2019/06/12.3.a-report-PT.pdf November 6, 2021.

Pressman, S. (2007). The economics of grade inflation. *Challenge*, *50*(5), 93-102.

Rosovsky, H. and Hartley, M. (2002). Evaluation and the academy: Are we doing the right thing. *Cambridge, MA: American Academy of Arts and Sciences*.

Rouse, C. E., Hannaway, J., Goldhaber, D. and Figlio, D. (2013). Feeling the Florida heat? How low-performing schools respond to voucher and accountability pressure. *American Economic Journal: Economic Policy*, *5*(2), 251-81.

Sanchez, E. and Buddin, R. (2016). How accurate are self-reported high school courses, course grades, and grade point average? *ACT Research Report Series 3*. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/5269-research-report-how-accurate-are-self-reported-hs-courses.pdf on November 4, 2021.

Schultz, T. (1961). Investment in human capital. *The American Economic Review* 51(1): 1–17.

Schwartz. S. (2004). How to tame grade inflation. *The Guardian*. October 21, 2004.

Silva, M. C., Camanho, A. S. and Barbosa, F. (2020). Benchmarking of secondary schools based on students' results in higher education. *Omega*, *95*, 102-119.

Smith, J. and Naylor, R. (2005). Schooling effects on subsequent university performance: evidence for the UK university population. *Economics of Education Review*, *24*(5), 549-562.

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, *87*(3), 355-374.

Survey on Living Conditions and Income (SLCI), 2018. Retrieved from https://www.cso.ie/en/releasesandpublications/ep/p-silc/surveyonincomeandlivingconditionssilc2018/ on November 6, 2021.

Tirole, J. (1996). A theory of collective reputations (with applications to the persistence of corruption and to firm quality). *The Review of Economic Studies*, *63*(1), 1-22.

Walsh, P. (2010). Does competition among schools encourage grade inflation? *Journal of School Choice*, *4*(2), 149-173.

Watts, L. K. and Winters, R. (2017). Examining grade inflation and considerations for radiologic sciences: A literature review. *Journal of medical imaging and radiation sciences*, *48*(1), 95-102.

Wikström, C. and Wikström, M. (2005). Grade inflation and school competition: An empirical analysis based on the Swedish upper secondary schools. *Economics of Education Review*, *24*(3), 309-322.

Willingham, W. W., Pollack, J. M. and Lewis, C. (2002). Test scores: Accounting for observed differences. *Journal of Educational Measurement, 39*(1), 1–37.

Winston, G. C. (1982). *The timing of economic activities: Firms, households, and markets in time-specific analysis.* Cambridge: Cambridge University Press.

Winzer, M. (2002). Grade inflation: An appraisal of the research. Retrieved from https://people.uleth.ca/~runte/inflation/short.htm on November 2, 2021.

Woodruff, D. J. and Ziomek, D. L. (2004). *Differential grading standards among high schools* (ACT Research Report Series 2004-2). Iowa City, IA: ACT.

Yang, H. and Yip, C. S. (2003). An economic theory of grade inflation. *University of Pennsylvania*.

Ziomek, R. L. and Svec, J. C. (1997). High school grades and achievement: Evidence of grade inflation. *NASSP Bulletin*, *81*(587), 105-113.

TABLES

Table 1: National Exams In High School, By General Track

Track	11th Grade (for biennial courses)		12th Grade (for triennial courses)	
	Field-Specific Exams (choice of two, mandatory)	General Exams (optional)	Field-Specific Exams (mandatory)	General Exams (mandatory)
Arts	Descriptive Geometry Mathematics B History of Culture and Arts	Philosophy(*)	Drawing	Portuguese
Science and Technology	Biology and Geology Physics and Chemistry Descriptive Geometry	Philosophy(*)	Mathematics A	Portuguese
Socio-Economics	Economics Geography History B	Philosophy(*)	Mathematics A	Portuguese
Languages and Humanities	Geography Latin German French English Spanish Portuguese Literature Applied Mathematics	Philosophy(*)	History A	Portuguese

Source: DGE.
Notes: (*) Since 2011, students are allowed to swap one of the two additional field-specific exams with the Philosophy exam.

Table 2: National Exams Dataset

	Mean	S.D.
Initial year	2009/2010	
Final year	2019/2020	
No. cohorts	10	
No. schools	658	
No. school-year	6,151	
No. exams (for those with an high school grade)	2,078,896	
No. exams per school-year	578.47	377.94
Female (share)	0.57	
Age	16.81	0.88
High school type (share)		
Public	0.82	
TEIP	0.06	
Private	0.07	
Private with association	0.05	
High school course (share) – General Track		
Science and technology	0.57	
Socio economics	0.10	
Languages and humanities	0.25	
Arts	0.07	
Exams in science and technology within school/year (share)	0.58	0.13
High school grade	13.67	2.61
National exam grade	10.66	3.86
Migratory balance	-34.5	386.32
Average monthly income (euros)	894.76	204.02
Foreigners (share)	0.03	
Population 15-19 (share)	0.05	
Population density	325.21	831.28

Sources: Júri Nacional de Exames (JNE), DGT/MAAC – Série Cartográfica Nacional à escala 1:50000, Carta Administrativa Oficial de Portugal, and National Statistics Office.

Table 3: Relative Positioning of High School Grades and Expected Exam Scores in Portuguese for 2015

High school grade distribution		Corresponding result of the high school grade percentile in exam's distribution		
Grade	Percentile interval	Expected exam score (lower bound)	Expected exam score (upper bound)	Exam-equivalent interval
10	[0 - 9,54]	0	67	[0 - 67]
11	[9,54 - 24,57]	67	86	[67 - 86]
12	[24,57 - 40,54]	86	101	[86 - 101]
13	[40,54 - 55,64]	101	115	[101 - 115]
14	[55,64 - 68,67]	115	126	[115 - 126]
15	[68,67 - 79,47]	126	138	[126 - 138]
16	[79,47 -87,74]	138	149	[138 - 149]
17	[87,74 - 93,77]	149	161	[149 - 161]
18	[93,77 - 97,79]	161	175	[161 - 175]
19	[97,79 - 99,57]	175	186	[175 -186]
20	[99,57 - 100]	186	200	[186 - 200]

Table 4: Multinomial Regression Results (Average Marginal Effects)

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Variables	Relative inflation	Relative deflation	Relative inflation	Relative deflation	Relative inflation	Relative deflation	Relative inflation	Relative deflation	Relative inflation	Relative deflation
HS Type										
Private	0.0946***	-0.0705***	0.0894***	-0.0691***	0.0947***	-0.0764***	0.0826***	-0.0669***	0.0603***	-0.0451***
	(0.0013)	(0.0014)	(0.0013)	(0.0014)	(0.0014)	(0.0015)	(0.0014)	(0.0015)	(0.0015)	(0.0016)
Private with association.	-0.0255***	0.0286***	-0.0292***	0.0303***	-0.0445***	0.0465***	-0.0465***	0.0481***	-0.0216***	0.0263***
	(0.0016)	(0.0015)	(0.0016)	(0.0015)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0019)	(0.0019)
TEIP	0.0204***	-0.0214***	0.0212***	-0.0217***	0.0292***	-0.0305***	0.0300***	-0.0314***	0.0161***	-0.0120***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0018)	(0.0017)
Female			0.0615***	-0.0592***	0.0601***	-0.0577***	0.0631***	-0.0599***	0.0639***	-0.0607***
			(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Age			-0.0394***	0.0196***	-0.0371***	0.0174***	-0.0340***	0.0150***	-0.0349***	0.0156***
			(0.0006)	(0.0005)	(0.0006)	(0.0005)	(0.0006)	(0.0005)	(0.0006)	(0.0005)
% of Science students					0.0836***	-0.0832***	0.1066***	-0.1021***	0.0971***	-0.0870***
					(0.0030)	(0.0030)	(0.0032)	(0.0032)	(0.0036)	(0.0037)
Migratory balance					0.0000***	-0.0000***	0.0000**	-0.0000***	0.0000	-0.0000**
					(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Foreigners share					-0.5669***	0.5740***	-0.5540***	0.5724***	-0.1566***	0.0264
					(0.0106)	(0.0096)	(0.0106)	(0.0096)	(0.0391)	(0.0376)
Pop1519 share					0.1099*	-0.2443***	0.1227**	-0.2482***	-1.2803***	0.9868***
					(0.0590)	(0.0591)	(0.0591)	(0.0592)	(0.2016)	(0.2031)
Pop._density					0.0000***	-0.0000***	0.0000***	-0.0000***	0.0000**	-0.0000***
					(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ave. monthly income					-0.0001***	0.0001***	-0.0001***	0.0001***	0.0000	-0.0000
					(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	2,078,896		2,078,896		2,078,896		2,078,896		2,078,896	
AIC	2.1607		2.1523		2.1454		2.143		2.122	
BIC	-25749572.2		-25766521.1		-25780999.7		-25785052.7		-25819695.6	
Exam subject FE	Yes		Yes		Yes		Yes		Yes	
Year FE							Yes		Yes	
Course FE							Yes		Yes	
Municipality FE									Yes	

Source: Authors' calculations. Reference category is "No Grade Inflation."

Note: We computed the Likelihood-ratio tests to compare all models to model 5 and we compared each model to the following model (i.e. model 4 vs model 3 when we passed from model 3 to 4. The Prob > chi2 was 0.000 in all tests. Model 5 is the most complete model.

Table 5: High School District Compositions

Region	District	High school type (%)				No. exams
		Public	Private	Private w/ association	TEIP	
	Total	0.82	0.07	0.05	0.06	2,078,896
North	Aveiro	0.87	0.02	0.11	0.01	141,114
North	Braga	0.80	0.08	0.08	0.04	22,722
North	Bragança	0.93	0.03		0.04	191,925
North	Castelo Branco	0.74	0.01	0.05	0.21	22,901
North	Coimbra	0.85	0.03	0.10	0.02	33,336
North	Guarda	0.96	0.02		0.03	87,295
North	Porto	0.72	0.18	0.02	0.07	34,620
North	Viana do Castelo	0.94	0.01	0.03	0.02	76,219
North	Vila Real	0.84	0.00	0.01	0.14	29,135
North	Viseu	0.91	0.02	0.02	0.06	91,332
South	Beja	0.61		0.05	0.34	440,243
South	Évora	0.86	0.00		0.13	20,324
South	Faro	0.86	0.02		0.13	369,607
South	Leiria	0.76	0.00	0.18	0.06	86,464
South	Lisboa	0.78	0.10	0.05	0.07	157,731
South	Portalegre	0.81			0.19	47,480
South	Santarém	0.87		0.09	0.04	41,142
South	Setúbal	0.93	0.03		0.04	77,031
Islands	Açores	0.99	0.01			48,463
Islands	Madeira	0.92	0.08			59,812

Source: Authors' calculations

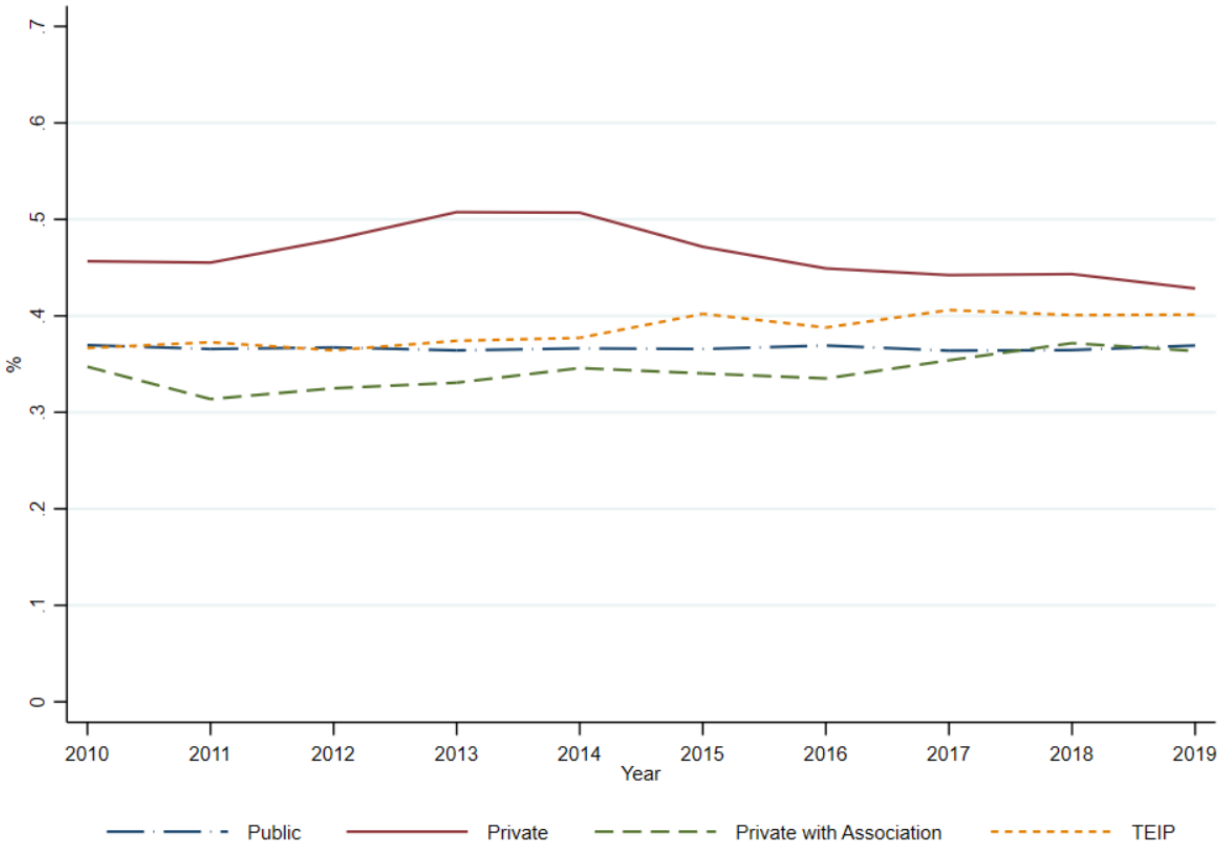
Table 6: High School Composition By Types Of Students

	% of high school grades			
	[10,12] (low achievers)	[13,16]	[17,20] (high achievers)	N
Public	40.9	44.1	15.0	1,701,435
Private	19.0	42.6	38.4	150,511
Private with association	35.8	44.1	20.1	102,247
TEIP	44.5	42.5	12.9	124,703
Total	39.3	43.9	16.8	2,078,896

Source: Authors' calculations

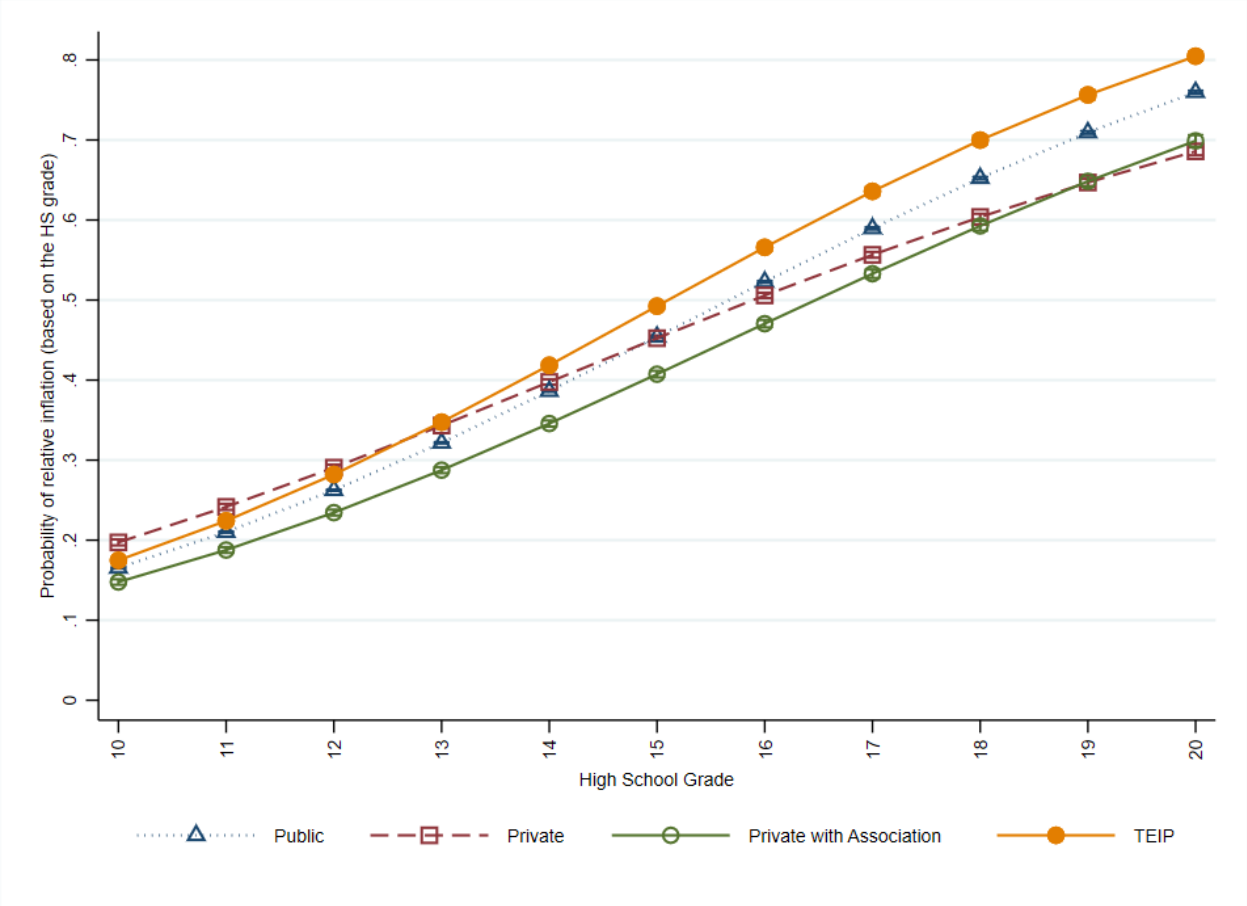
Figures

Figure 1: Percentage of Students with Inflated High School Grades by School Type and Year



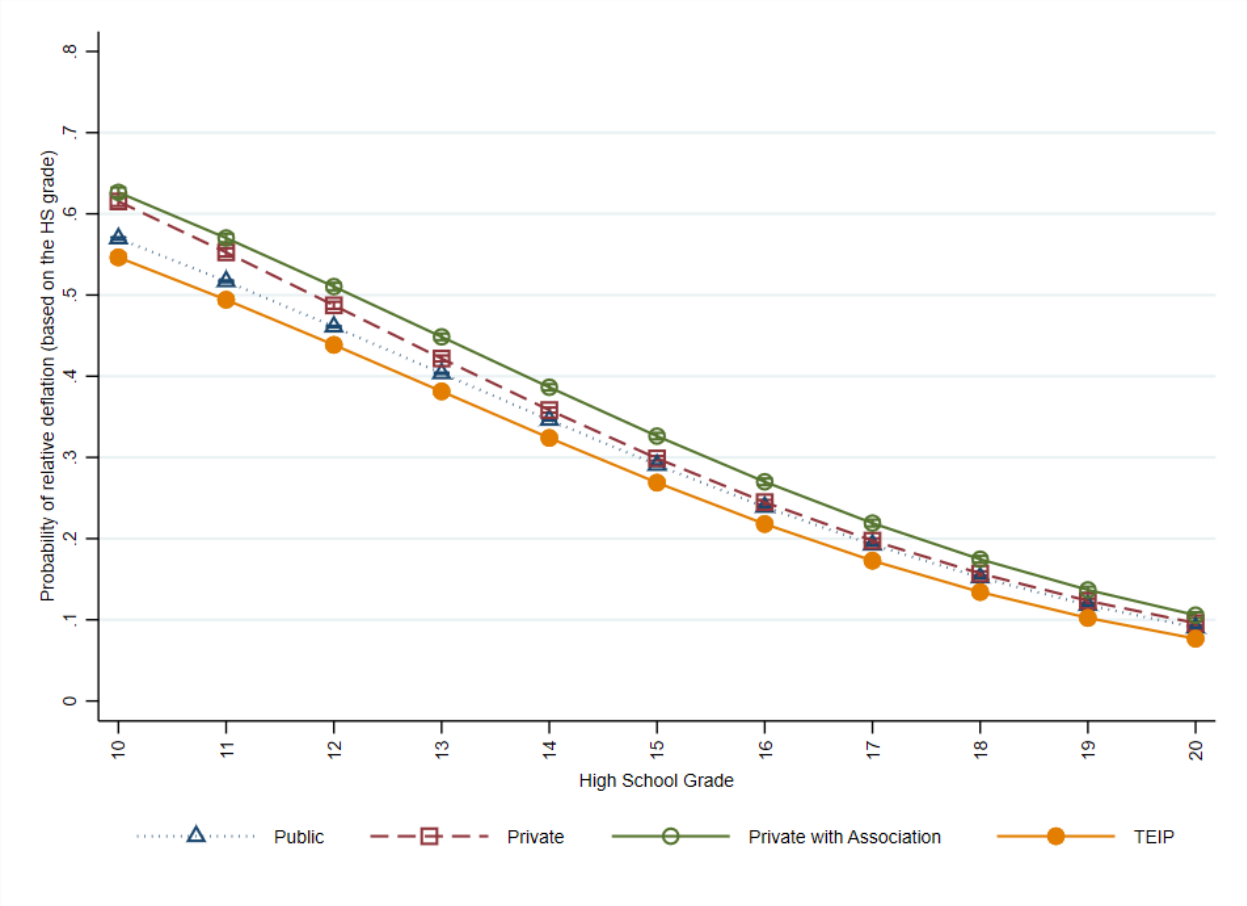
Source: Authors' calculations

Figure 2: Estimated Probability of Grade Inflation (based on the High School Grade)



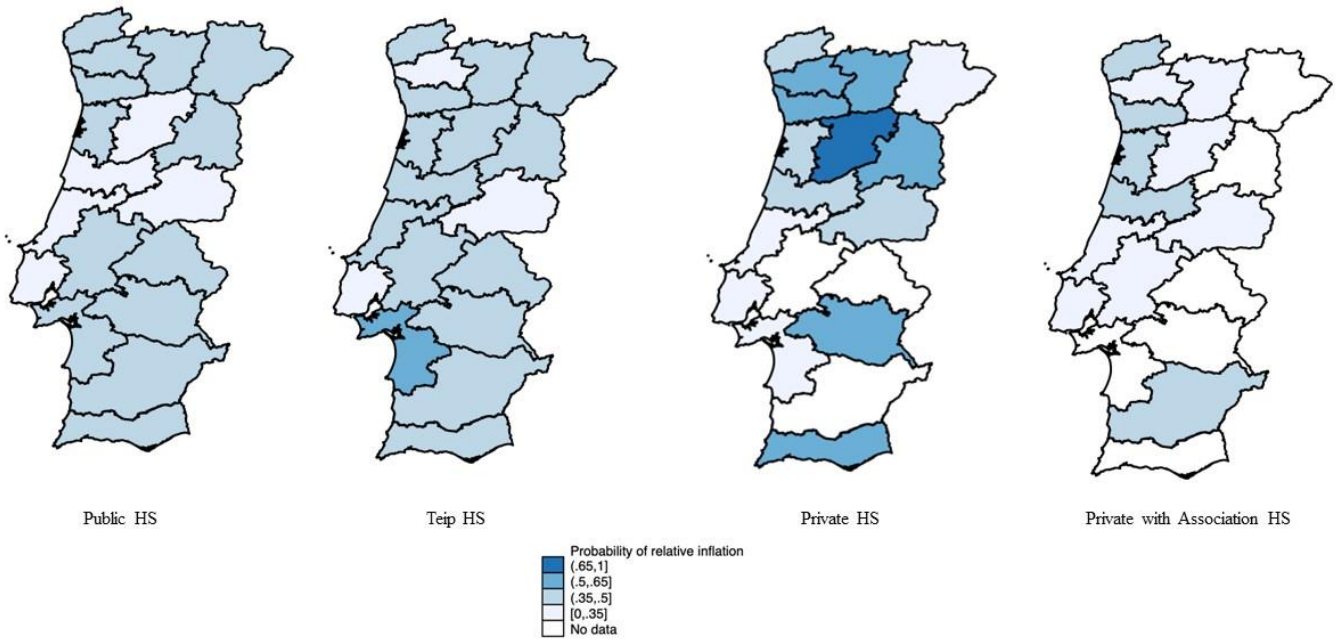
Source: Authors' calculations
Note: Confidence Intervals at 95%

Figure 3: Estimated Probability of Grade Deflation (based on the High School Grade)



Source: Authors' calculations
Note: Confidence Intervals at 95%

Figure 4: Estimated Probability of Grade Inflation by (Mainland) District and Type of School



Source: Authors' calculations

APPENDIX A

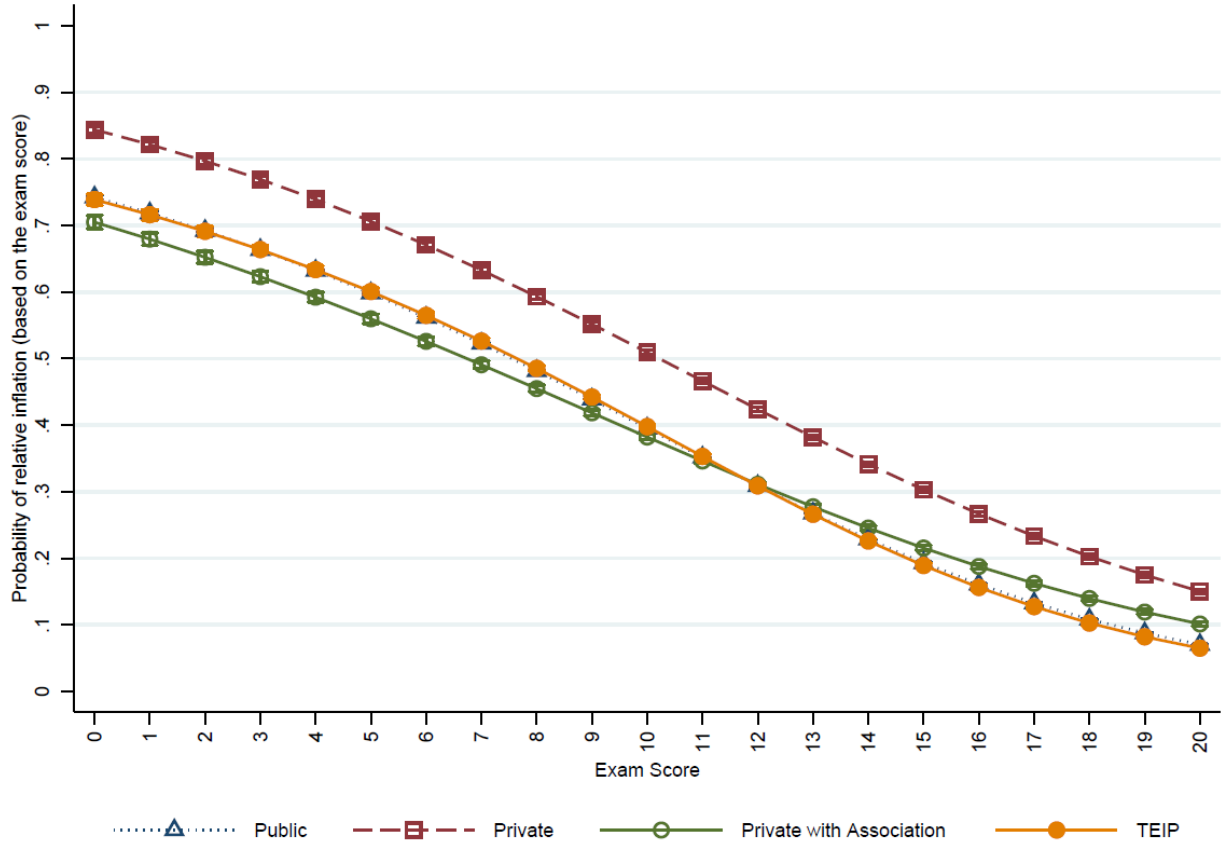
Table A1: Characterization of Exams Taken in the 1st Round on the Period 2010-2019 (Share)

			Registered as an internal		Registered as an external	
			(1)	(2)	(3)	(4)
	N	External	For approval	Retaking	For approval	Retaking
Total	3,132,070	33.0	99.6	0.4	27.9	23.4
High school type						
Public	2,539,505	32.7	99.6	0.4	29.1	23.0
Private	259,729	37.8	99.7	0.2	15.1	25.3
Private with association	142,733	28.0	99.5	0.5	33.3	32.1
TEIP	189,103	33.7	99.5	0.5	28.2	21.1

Source: Júri Nacional de Exames (JNE)

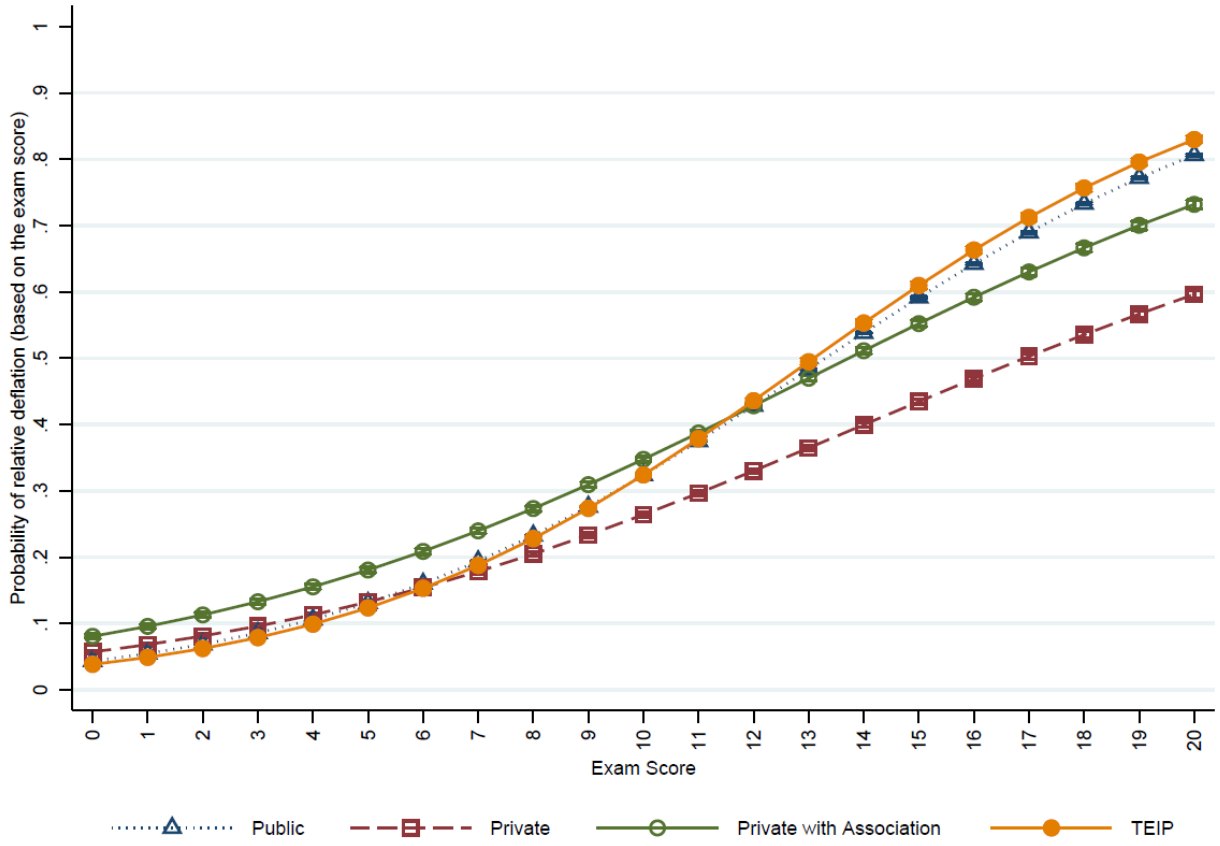
Note: Each student needs to register in order to do the national exams. In the period of analysis exams were mandatory. Each student needed to take the exams of their track and obtain at passing score (see Table 1). For each exam, the student can be registered as an internal or external. If registered as internal the exam will count 30% of the final grade of the subject, and the remaining 70% corresponds to the high school grade that is given beforehand by the teacher. If registered as external the exam will count 100%. In our analysis we will consider only exams from column (1) (see section V for the explanation).

Figure A1: Estimated Probability of Grade Inflation (based on the Exam Score)



Source: Authors' calculations

Figure A2: Estimated Probability of Grade Deflation (based on the Exam Score)



Source: Authors' calculations

ENDNOTES

[1] See https://infoescolas.mec.pt/ for an example from Portugal. This website also contains information about the extent to which secondary school grades are congruent with grades awarded by other schools who have students with similar national exam scores (the "Alignment" indicator). This indicator ranges from −2 ("under-scoring") to 2 (indicating grade inflation). Secondary schools are classified as being either highly misaligned up (high internal grade inflation), misaligned up (internal grade inflation), aligned, misaligned down (internal grade deflation), or highly misaligned down (high internal grade deflation). For an additional discussion of the use of performance metrics in secondary education in the United States, Canada, the UK, and Australia, see (Johnes, 2007).