Beyond the Gate: The Effect of Grade Retention on Educational Trajectories

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Abstract

Grade retention as a remedial policy is controversial as the benefit of extra instruction time may not outweigh its costs. Previous research has only examined retention for specific grades. Exploiting plausibly exogenous variation in retention generated by a nationwide promotion policy in Chile, I show that the timing of retention is critical to determining its effect on academic performance and access to higher education. Being held back only reduces the probability of future grade retention for young primary students. In addition, for older primary students, there is a reduction in their likelihood of returning to school the following academic year or graduating from high school. High school grade-retained students are the most affected, with a 10-20 percentage point reduction in their likelihood of high school graduation, and many switch to adult education as a response to retention. Interestingly, even though high school students who are held back are just as likely to take the college admission test, they show a positive 0.1 SD increase in Spanish and math performance.

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1 Introduction

Education as a motor for human capital accumulation is critical in determining a person's economic outcomes and life choices (Campbell, 2006). The United Nations established as one of its Global Goals for the end of this decade to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (Rosa, 2017). However, how education is provided varies from country to country and even within a country by educational systems (Gurria, 2016). Gate policies, such as grade retention, have been controversial, as they involve holding back students who lack skills or are below an attainment benchmark. In the United States, approximately 6% of children aged 6 to 17 years had repeated one or more grades on average in 2021, but this percentage varies from state to state, ranging from 2% to 17% (NSCH, 2021). It is still uncertain whether grade retention is an effective policy for enhancing academic performance, as the evidence is inconclusive.

The efficacy of grade retention in offering advantages to lower-achieving students is a subject of extensive controversy and intellectual debate. On the one hand, grade retention might provide an opportunity to master the curriculum within the cumulative learning process. On the other hand, grade retention might impose costs to continuing or completing education, not only for those grade-retained affected by a socioemotional cost and the delay of their eventual market entry, but also to society by inflicting additional per-pupil expenditures on the educational systems. Most academic research on grade retention over the past 20 years has been dedicated to estimating the causal effects of grade retention for students at some elementary and middle school levels on future performance, focusing on grade retention induced by high-stakes exams (Jacob and Lefgren, 2004, 2009; Manacorda, 2012; Mariano and Martorell, 2013; Özek, 2015; Borghesan et al., 2022). At the same time, much less is known about the effects of later grade retention, in particular during high school, and the impact it has on academic outcomes beyond high school completion.

In this paper, I study the impact of grade retention on students' likelihood of continuing school, future retention, school completion, and access to higher education using data from Chile. I estimate the effect separately by school grade, establishing a comprehensive picture of how the timing of grade retention affects the direction and size of the effect for each outcome of interest. As education is a cumulative process, it is natural to expect that the impact may vary by school grade. Young students might benefit from being held back if they are not proficient at reading while having little agency over

their time and practically no opportunity cost of attending school. The context may differ for a high schooler facing higher opportunity costs and a smaller benefit from fewer years to profit from the potential educational boost of an extra year of instruction.

There are three main reasons why the context of Chile is advantageous in exploring this research question. First, Chile's nationwide promotion policy mandates minimum GPA and minimum attendance at the end of the year, providing a plausible source of quasi-experimental variation on the likelihood of being grade retained at the end of each school grade. Second, two criteria for grade promotion allow exploring the impacts of grade retention on two potentially different sets of compliers: students grade-retained because of their poor attendance and students grade-retained because of subpar performance, providing a contrast rarely available in the literature where usually high-stakes exams are used as gate policies. It is plausible that being held back generates very different results if triggered because of low attendance, which might be connected to low motivation and disengagement, than if it is due to students struggling to understand the material but still coming to class. Third and most novel, Chile has a centralized college admissions system, which allows exploring the effects of grade retention beyond high school, particularly on the probability of college application and college exam performance, circumventing attrition issues typically present in the literature.

Exploiting the plausibly exogenous variation generated by a nationwide promotion policy in Chile, I estimate the effects of retention for each phase of the educational process using a fuzzy donut regression discontinuity model to acknowledge the presence of bunching in the forcing variable for multiple educational outcomes. I complement the results with several robustness checks, finding that results are highly invariant to model choices.

The main contributions of this paper to the literature on the impact of grade retention are (i) to provide a comprehensive analysis of the impact of grade retention at different stages of the educational process, (ii) to estimate the effect on high school completion free of attrition bias, and (iii) to characterize the impact of retention on accessing higher education, which, to the best knowledge of the author, has not been previously considered.

There are several takeaways from the analysis findings. First, even though each promotion rule implies a different set of compliers and, therefore, distinct local average treatment effects. However, although different in size, the estimates are remarkably aligned regarding the effect patterns through the school trajectory.

Second, grade retention does not hurt short- or long-term outcomes for students

enrolled in the first cycle of primary school, first to fourth grade. The only significant impact for them is positive: a reduced prevalence of their likelihood of future grade retention.

Third, some negative impacts appear when looking at slightly older students, fifth- to eighth-graders. On average, these students are 17 percentage points more likely not to return the following year if retained for insufficient attendance and five percentage points less likely if retained for insufficient GPA. They are also about eight percentage points less likely ever to be enrolled in senior year, a proxy for high school completion if they fail to cross the GPA threshold. On the bright side, they are significantly less likely to be grade-retained in the future, with a reduction of 40 and 15 percentage points, respectively, by failing for attendance or GPA. The dynamic patterns remained similar and consistent across both retention criteria. The only divergence observed was for the school continuation outcome for eighth graders with a positive effect of grade retention in eighth grade due to GPA, but a negative, noisy impact if not crossing the threshold due to attendance, potentially explained by the differential benefits from completing that grade.

Fourth, the results are less encouraging when considering the impact of grade retention on high school students. They are 10 to 20 percentage points less likely to return to school the following year after being grade-retained, depending on the grade and promotion criteria. Contrary to what was found for younger students, high school students are more likely to be retained again, wiping away a potential benefit of grade retention. They are also much less likely to remain in high school with a reduction of 50 (25) percentage points in the probability of enrolling in the senior year when retained due to insufficient attendance (GPA). However, part of the drop is offset by an increase in their likelihood of switching to adult education by up to 40-60 percentage points. The net effect of these two forces is that students are 10 to 20 percentage points less likely to get their education diploma.

Fifth, a novel outcome of interest potentially affected by grade retention is whether students take the college admissions test. The results show that being held back in high school is associated with a lower probability of taking the test (50 and 15 percentage points, respectively). This result is highly relevant, as even less selective institutions require that they take the college admissions test for admission, not their actual performance being relevant. This implies that grade retention by nudging students not to take the test is *de facto* closing alternatives to career paths for students of all ability levels, contracting their future work possibilities.

Lastly, I explore the impact of grade retention on performance, conditional on taking

the college admissions test and find mixed results. With the caveat that there might be self-selection in the final sample, I find suggestive evidence of positive effects of high school grade retention on performance. They are positive for Spanish considering the GPA margin and positive for math on both margins, on average around 0.1 SD, and especially large in the sophomore year.

In general, these results shed light on the nuanced effects of grade retention on various educational outcomes, emphasizing the importance of considering the timing and promotion criteria when assessing its implications. Consistent patterns at different margins underscore the complex interplay between retention and academic trajectories.

The paper is structured as follows: Section 2 describes how this article is related to the literature on grade retention. Section 3 provides background information on the Chilean education system, data sources used for the estimations, and descriptive statistics while Section 4 covers the empirical strategy implemented in this setting. Section 5 presents the main results of the article, their interpretation, and robustness checks. Finally, Section 6 concludes.

2 Related Literature

Grade retention has attracted considerable attention from researchers exploring its effects at different stages of the education system, mainly focusing on dropout rates. Some of the first approaches to quantifying the impact of grade retention date from more than 30 years ago, although they did not claim causality. Roderick (1994) finds by following a cohort of public school students that of all students ever retained between kindergarten and sixth grade, 80% dropped out of school, while only 27% of students never retained dropped out. She conducts a correlational analysis to model students' past events into their future choices, proposing that retention makes students overaged for a grade, further disengaging them from school. Jimerson et al. (2002) provide a comprehensive meta-analysis of the connection between grade retention and dropout from the psychology literature, concluding that grade retention is a highly ineffective remedial strategy to achieve school completion.

More recent studies have gone beyond the negative association between grade retention and dropout rates, looking for a causal connection. The primary identification challenge to overcome in estimating causal effects in this context is the potential endogeneity bias, with low-achieving students being more likely to be retained and

having worse academic outcomes later in life. Grade retention gate policies provide an avenue to estimate causal effects credibly, with many educational systems applying retention policies for students not socioemotionally or academically prepared for the next grade.

Among the firsts is Eide and Showalter (2001), using the variation in kindergarten entry age as an instrumental variable for the probability of being held back a year in school, exploiting the differences between states. The authors find a positive but insignificant effect of grade retention on school completion for white students, while their instrument is not valid for black students. Following a cohort of the New York School District, Martorell and Mariano (2018) implements a fuzzy regression discontinuity using a standardized test to estimate its effect on different outcomes. They did not find changes in behavioral outcomes such as attendance and suspensions. However, they find an increased probability of dropping out when retained in middle school but not if retained in elementary school. Jacob and Lefgren (2004, 2009) use a regression discontinuity design to estimate the causal effect of grade retention using a standardized test cutoff applied by the Chicago Public School System. In the first article, they found that being retained in a grade increased academic achievement for third-graders but not for sixth-graders. In contrast, in the second one, they find a higher likelihood of dropout for low-achieving eighth-graders but not for students retained earlier.

Similarly, Manacorda (2012) exploits a discontinuity product of a rule that demands fewer than three failed subjects for grade promotion in Uruguay, finding that for students in grades 7-9, retention leads to a higher probability of immediate dropout and lower educational outcomes four to five years after grade failure. He develops estimates of worst-case manipulation scenarios to account for the bunching in exactly three subjects, indicative of manipulation, with the results unchanged. Eren et al. (2017) use Louisiana's statewide test-based promotion policy to estimate the impact of grade retention on dropout and juvenile crime. They found that retention of students in fourth grade has no effect, while retention in eighth grade increases dropouts but reduces crime convictions.

Similarly, Díaz et al. (2021) uses one of the grade promotion policies in Chile to estimate the impact of being retained during the second or third grade on dropout and crime. They also find that grade retention increases dropouts but reduces crime convictions.

The two closest papers to this are Fruehwirth et al. (2016) and Borghesan et al. (2022). Fruehwirth et al. (2016) are the first to propose that retention timing is a major factor in impact size, focusing on differences during the early primary. They estimate the effect of retention for grades K to 4 using ECLS-K data and factor analysis methods. They find

adverse effects on student achievement by age 11 from retention. Their methodology allows them to explore heterogeneity in effects between groups, finding that the impact of kindergarten retention is, on average, negative for retained students but positive for untreated students. Borghesan et al. (2022) also use a factor-analytic model to estimate the impact of grade retention focusing on high school students in Portugal. They find that the retention policy in place increases performance in 12th-grade exams for retained students by 0.2 standard deviations in math and 0.5 standard deviations in Portuguese and, at the same time, increases dropout rates.

This paper expands on their argument by allowing the effect to be grade-specific across the entire educational trajectory. It also circumvents the attrition problem present in all previous literature using RD designs by accessing the universe of students and schools in the country, public and private. Lastly, to the best of the author's knowledge, it is also the first paper to estimate the impact of grade retention on academic outcomes beyond high school in the context of high stakes associated with college admission tests.

3 Institutional Framework

3.1 The Chilean Education System

The traditional education system in Chile consists of preschool, primary (comprising lower and upper cycles, each covering four grades from 1 to 8), and secondary education (encompassing grades 9 to 12). Students are awarded diplomas after completing the eighth and twelfth grades. Attending primary and high school is mandatory for people under 21 years of age, although it is not strictly enforced in practice (Ministry of Education, 2003). Each cohort consists of about 250,000 students who attend private, voucher, or public schools, with fewer than 10% enrolled in private institutions. The Ministry of Education regulates the operation of schools and determines the minimum curriculum requirements for each grade.

Chilean law requires that students have satisfactory academic performance and attendance to be promoted to the following year. In Chile, performance is assessed using a numerical grading system, with grades ranging from 1 to 7, 4 being the minimum passing grade for each subject. To be automatically promoted to the next grade level, students are required to meet the following performance standards: (1) a GPA of 4 or higher, (2) a GPA of 4.5 or higher if failing one class, and (3) a GPA of 5.0 or higher if

failing two classes. In addition, if a failing grade is obtained in Spanish or Math, the GPA requirement increases to 5.5 for students in their sophomore and senior years. The attendance requirement is to attend at least 85% of the school year, which usually lasts about 38-40 weeks, depending on the school. However, the attendance requirement can be waived under exceptional circumstances, such as illness, which must be adequately justified (Ministry of Education, 2001). Although the school principal has the final say regarding a student's promotion, they do not have the authority to adjust attendance records.

These grade promotion policies intend to improve student learning by increasing their time in school instruction, ensuring a minimum foundation of knowledge to build on in the following grade. However, these requirements could be detrimental to some students on the margin of dropping out, as the nudge from grade retention could set them on a trajectory in which they are less likely to return to school the following year, complete high school, or apply and enter higher education.

Students in Chile take part in the SIMCE (*State of Education Assessment (Sistema de Medición de la Calidad de la Educación*) during their time in school. This nationwide low-stakes test is generally administered every two years to students in even grades, evaluating their knowledge of math and Spanish curriculums. The test also includes questionnaires for students, parents, and teachers to assess the school environment. After high school, students can pursue higher education by enrolling in one of three types of institutions: universities, professional learning institutes, and technical training centers. Chile has a centralized university admission system that matches students with university-major dyads in a highly transparent process that considers student ranking of preference of programs. This process heavily weighs student performance on the PSU college admission tests (*Prueba de Selección Universitaria*). The PSU exam tests students' Spanish, math, history, and science knowledge, with the last two being optional. Taking the PSU is not required for graduation. Although PSU's prominent role is to serve as a critical input in the university admission process, some less selective institutions generally require that students have taken the PSU as a condition for enrollment regardless of their performance.

In addition to its regular education path, Chile offers people who have not completed their primary education and are older than 15 years, or people who have not completed their secondary education and are older than 17 years, the option to enroll in *adult education*.[1] This modality offers a faster completion path, allowing students to cover

[1]Principals can enroll people younger than the criteria in exceptional cases, only if it is the case for less than 20% of the enrolled students (MINEDUC, 1988).

the topics of two regular instructional grades in one year, requiring them to attend school 24-26 hours a week, usually in the late afternoon (Espinoza et al., 2013).

3.2 Data

The primary sources of information in this paper are public official administrative records on student performance and student graduation from the Ministry of Education from 2005 to 2022. The performance dataset provides a log of all students in the country, with information on birth date, gender, grade, school, type of education, and end-of-year academic standing for each student, including their GPA, final attendance, and promotion status: retained or promoted to the next grade. The graduation data set provides information on whether students completed high school at some point, regardless of the method.

Students are identified across datasets and over time with a unique time-invariant identifier, an advantage of this paper, as most previous studies have their results subject to attrition bias if students move out of the district or change schools, as authors usually cannot follow that kind of switch. With national records on the universe of students and a unique time-invariant identifier for each of them, this paper produces estimates free from attrition-induced bias.

The student performance panel is merged with restricted access PSU and fourth-grade SIMCE results. As retention might affect the timing of test taking, the first SIMCE and PSU tests are kept for each student, regardless of the year of application. PSU taking and, conditional on it, performance in Spanish and math are used as outcomes of interest. SIMCE math and Spanish results provide a baseline of underlying knowledge and skills. In contrast, the parental questionnaire provides information on the socioeconomic characteristics of each family, including the highest degree of maternal education, family income, and parental expectations of the highest degree their child will complete. This information is used to explore the heterogeneity in the results.

The sample is restricted to first-time first-graders from 2005 to 2007, born from 1998 to 2001, and follows them through their educational trajectory (potentially) up to 2022. Estimates only include students who are enrolled for the first time in a grade.

3.3 Descriptive Statistics

Table 1 presents descriptive statistics of the universe of students and is then restricted for each estimation sample, depending on the margin of promotion criteria. Columns (1) to (3) indicate summary statistics for people in the cohorts of interest, regardless of their end-of-year attendance and GPA situation, and separately for each column's lower primary, upper primary, and secondary education cycles. There are 734,784 first-time first-graders. By the ninth grade, that number had dropped to 675,533 students still in school. According to statistics for other countries (Jere et al., 2022), boys are more likely to leave the system, as is apparent in the increasing proportion of women over time. Retention is more common at higher grade levels, with a decline in attendance and GPA as students progress on their academic journey. From the universe of students, about 75% enrolls as high school senior, 18% eventually switches to adult education, and 70% takes the college admissions test. The PSU performance summary statistics align with the standardized test design, with 500 points as the mean and 100 points as the standard deviation.

Columns (4) to (6) and (7) to (9) show the results for each group of grades for students at risk of repetition due to attendance and GPA, respectively. I define these "risk zones" as attendance or GPA up to five values away from the threshold, meaning an attendance of 80 to 90% of the school year and a 4.0 to 5.0 GPA. I refer to these "at-risk" samples as the GPA and attendance samples. The first row shows that gender is somewhat balanced for the attendance threshold sample, while it is much more composed of male students for the GPA threshold sample. There are few differences in terms of age in both threshold samples. For each grade cycle, grade retention is more predominant in the GPA sample. Students in the GPA sample have higher attendance levels than those in the attendance sample (87 vs. 89%), and conversely, students in the GPA sample have lower GPAs on average than those in the attendance sample (5.5 vs. 4.7 GPA).

Within each at-risk sample, there is also an increasing gradient in the fraction of students attending the senior year, which is mechanical as students are dropping out of the regular education system, implying a much lower probability for students in the GPA sample, and conversely, much higher incidence of students switching to adult education. The PSU enrollment rate increases mechanically in the cycles, with a much higher fraction of students in the attendance sample than in the GPA sample. PSU results are consistent with the pattern for senior grade enrollment, with students in the attendance sample having higher PSU performance than those close in the GPA sample (482 vs 436 points, a difference of about half of a standard deviation size).

The attendance distribution for each grade is presented in Figures A.1 and A.2. On average, around 16% of the students have an attendance level lower than the mandatory 85% of school days, and 5 to 9% attend precisely the minimum required. Approximately 35% of the students have chronic absenteeism, defined as missing more than 10% days of school. Similarly, Figures A.3 and A.4 present the distribution of GPA by grade, with vertical dashed red lines indicating the potential thresholds applied to them by the GPA criteria. Bunching is also present at the thresholds of 4.5 and 5.0 for GPA but is not as severe as in the case of attendance at the 85% level.

Figure 1 plots the trajectory in time of all students in the cohort of interest, showing their progression status each year after starting school. The height of each bar indicates the number of students enrolled in any educational program each year after starting school. The blue portion of the bar indicates the number of students who have an on-time progression (always promoted). The orange portion indicates the number of students who have repeated one year, while the green portion indicates the number of students two or more grades behind. The red portion of the bar indicates the number of students enrolled in adult education. This figure shows some usual features of the typical transition of students through the educational system. First, of the around 734,000 students who enroll on time in first grade, around 10% has been held back by the fourth grade, and that percentage reaches 20 by eighth grade. Second, 10% of the students are no longer enrolled in any program in year 12, and only two-thirds of those still in school are on time. Lastly, starting in the tenth grade, some students leave the regular education system to switch to adult education.

Figure 2 provides a snapshot of the final graduation situation of the students according to their school retention status. It shows that 64.8% of the students in the sample are never retained during school, 19.8% are retained only once, and 15.4% are retained twice or more. Of the students never retained, only 4.2% never graduated, while for those retained once, the proportion is 15.26%, and for those retained twice or more, 37%.

Figure 3 presents the end-of-year promotion status in each grade for students in the estimation sample. The blue portion of the figure shows the number of students in both risk zones simultaneously, while orange and green represent students in the attendance and GPA risk zones, respectively. Some interesting facts are derived from this figure. First, the number of students in the attendance threshold vicinity is mostly flat across grades, fluctuating around 150,000 students. In contrast, the number of students in the vicinity of the GPA threshold varies and presents an inverted U-shape in grades. Second, the highest retention rate is observed in grade 9, the first grade of secondary education. This feature

may be partly due to changes in curricula and expectations placed on students in addition to a new environment and peers due to students switching schools, as many schools have only primary education. Nevertheless, note that the fraction of students grade-retained from students appearing in both threshold-vicinities maps pretty closely the pattern of the fraction grade-retained in the GPA-margin subsample, indicating that this is where most of the retention action takes place, consistent with the gradients in Figures A.5 and A.6. Third, the fraction of students appearing in both samples for a given school grade is at most a third of students in each sample, usually much fewer, implying that results might not align across threshold samples, as compliers primarily come from different populations.

The last question to get an accurate picture of the dynamics of grade retention in this context is how much variation there is in who ends up close to the promotion threshold. Figure 4 plots the frequency with which each student is at risk of retention during their school life, showing that the retention risk is not consistently present for a set of students only. Subfigure (a) on the left shows that only 26% of the students are never close to the 85% attendance threshold, with considerable variation in the number of times that the remaining 74% of the students are at risk. Subfigure (b) on the right shows a similar pattern, with 41% of the students never close to the 4.5 GPA threshold, but still with more than 33% of the students being in the vicinity more than three times in their school life. These facts imply that it is not the case that the estimation is consistently comparing the same two groups repeatedly on each grade, but rather a varying group of students over time.

4 Empirical Strategy

Establishing a causal relationship between retention and later educational results is not straightforward as other variables, such as ability, motivation, and parental involvement, might also provide a channel that simultaneously affects retention and academic success. To overcome this challenge, I take advantage of the discontinuity in the probability of grade retention imposed by the institutional setting. The law establishes that students must attend classes for at least 85% of the school year and have a GPA greater than 4.5 if they fail a subject for automatic promotion.[2]

I exploit these thresholds in a fuzzy donut regression discontinuity design to estimate a

[2]As previously mentioned in Section 3, there are more thresholds in the design of the policy, but 4.5 is the only one that appears to have an incidence on the probability of grade retention according to Figures A.9 and A.10.

local average treatment effect of marginal retention in the probability of continuing school, graduating, and applying to higher education. I estimate the effects of grade retention separately for each school grade, using attendance and GPA requirements. Consequently, the samples include different populations of interest within each school grade, depending on the margin by which they might have been at risk of retention. The identification assumption is that students who end up on each side of the threshold in the vicinity of 85% attendance (but different from exactly 85%) at the end of the year are comparable in all aspects except for the probability of being held back. Similarly, I expect students who achieve a GPA close to 4.5 (but not exactly that) to be comparable across all characteristics, except for the increase in the probability of grade retention associated with not crossing the threshold.

The estimation process is described in two steps for clarity in the exposition. The first stage of the fuzzy regression discontinuity design is presented in Equation 1. According to this stage, there is a discrete change in the probability of being grade-retained when the attendance (GPA) crosses the 85% (4.5) threshold.

$$R_{it}^{g} = \alpha_1 + \beta_1 \mathbb{1}\{Z_{it}^{g} \geq 0\} + \gamma_1 Z_{it}^{g} + \delta_1 (Z_{it}^{g} \times \mathbb{1}\{Z_{it}^{g} \geq 0\}) + \kappa_1 \mathbf{X}_{i}^{g} + \epsilon_{1,it}^{g} \tag{1}$$

where R_{it}^{g} is an indicator variable that indicates whether the student i of grade g was grade-retained in year t. Depending on the criterion, Z_{it}^{g} is attendance centered on 85 or GPA centered on 4.5. $\mathbb{1}\{Z_{it}^{g} \geq 0\}$ is an indicator function that equals 1 if the centered variable surpasses 0 (that is, the running variable crosses the threshold). $\mathbf{X}_{i}^{g}$ is a control vector that includes individual-level controls that could be time-variant, such as the student's gender, GPA up to two years lagged, attendance up to two years lagged.[3] School-level fixed effects are included to control for differences in grade retention associated with school-specific policies (such as leniency in grading or a principal's dislike for grade retention). Fixed effects at the cohort of school entry level are also included to control for common aggregate shocks at the cohort level (such as changes in the national curriculum or electoral cycles). Standard errors are estimated using a bootstrap method across grade levels for each outcome to address both heteroskedasticity and within-individual correlation.

Equation 2 presents the second stage of the model, estimating the effect of being marginally retained in various outcomes of interest, instrumenting actual retention with the predicted retention derived from the results of Equation 1.

$$Y_{i,t+j}^{g} = \alpha_2 + \beta_2 \hat{R}_{it}^{g} + \gamma_2 Z_{it}^{g} + \kappa_2 \mathbf{X}_{i}^{g} + \epsilon_{2,it}^{g} \tag{2}$$

[3]For grade 1, no lags are included in the estimation, while for grade 2 only once-lagged terms are included.

where $Y^g_{i,t+j}$ represents various outcomes of interest. First, school continuation, an indicator variable that denotes whether a student i is observed to be enrolled in any school the following year. Second, future retention, exploring whether the student i repeats a grade any year after t. Third, ever enrolled in senior year of regular education, an indicator variable that takes value 1 if student i ever enrolls in grade 12. Fourth, adult education, an indicator variable that takes value 1 if student i ever enrolls in adult education. Fifth, taking into consideration the previous two, school graduation, an indicator variable that takes value 1 if students appear to have graduated from high school up to five years after their on-time graduation year, independent of the type of education path followed. Fourth and last, I look at evidence of their choices towards higher education by seeing if the student i ever enrolls to take the college admissions test and how well they perform in math and Spanish, conditional on taking the test. $\hat{R^g_{it}}$ is the predicted grade retention associated with Equation 1, and $\mathbf{X}^g_i$ is the same vector of controls as above. School and cohort fixed effects are included, with standard errors bootstrapped within each outcome of interest for the different grade levels.

This empirical approach stems from the identification assumption that "if individuals, even while having some influence, are unable to precisely manipulate the assignment variable, a consequence of this is that the variation in treatment near the threshold is randomized as though from a randomized experiment" (Lee and Lemieux, 2010) which in turn leads to causal effect estimates. The presence of significant bunching at 85% on the attendance histograms suggests that active manipulation is at play, likely due to the incentives of the attendance rule. As a result, some schools may have either adulterated their records or implemented effective strategies to encourage students to attend school enough to avoid the risk of not being promoted to the next grade by this margin. GPA does not appear to be as heavily manipulated as attendance, although some evidence of mild bunching at levels 4.5 and 5.0 starts in grade 5 and above.

It is important to note that if student unobservables are correlated with their ability to define their attendance or GPA at the threshold, this approach would lead to biased estimates. This is given that the identifying assumption of comparability on both sides of the cutoff is violated if the attendance of exactly 85% (GPA 4.5) is correlated with other characteristics. However, as long as students cannot fully determine whether they cross the threshold or not when in the vicinity, impact estimates can be obtained by applying a "donut RD" estimation strategy, as demonstrated by Barreca et al. (2016, 2011). This approach involves dropping students with exactly 85% attendance (4.5 GPA) from the sample and then sequentially leaving out those with attendance 84 to 86 (GPA 4.4

to 4.6), and so forth, increasing the "donut hole" size, allowing for unbiased estimates for unheaped individuals. Note that this approach is necessary given that attendance is reported granularly at 0.1 intervals, not allowing the standard approach of McCrary (2008) to test continuity in the running variable. The modified approach changes the interpretation of the results, as the estimates now capture the local average treatment effect of grade retention on high school completion for students with attendance (GPA) records close to, but different from, the heaped threshold levels.

Computing local average treatment effects with this strategy requires some additional assumptions. First, the relevance restriction indicates that the instruments (attendance and GPA) strongly correlate with grade retention. Figures A.7 and A.8 present binned scatter plots of the probability of grade retention at each level of attendance at the end of the year, where crossing the 85% attendance threshold is associated with a decrease in the probability of grade retention. Figures A.9 and A.10 show similar results for the end-of-year GPA, where crossing the 4.5 GPA threshold is associated with a decrease in the probability of grade retention. Note that the plot allows for breaks at all potentially relevant GPA thresholds, that is, 4.0, 4.5, 5.0, and 5.5. However, starting in grade 3, only a 4.5 GPA is associated with a marked drop while having a critical mass of students in that part of the distribution which is not the case for a 4.0 GPA. The first-stage estimates remain robust and consistent across alternative model settings, indicating that being slightly above the mandatory attendance (GPA) threshold reduces the probability of grade retention by about two to fifty percentage points. Depending on the grade, there is a significant drop in probability, ranging from 20 to 50 percentage points for the threshold at a GPA of 4.5. When crossing the threshold, attendance appears to be a much less binding criterion for grade retention, resulting in a drop in the probability of grade retention ranging from 2 to 10 percentage points. In Figure A.11, the different possible first stage coefficients estimated using Equation 1 are plotted separately for students in grades 4 and 9, for each margin of grade retention, ordered from the smallest to the largest. The results are consistent with previous numbers and highlight the significance of the donut hole in accounting for differences in students with attendance or GPA at precisely the threshold from other students.

The second identification assumption to consider is the exclusion restriction. This assumption indicates that attendance (GPA) can only affect the outcomes of interest by influencing the probability of grade retention. This assumption, although untestable, is plausible in this scenario, as the sample is restricted to a narrow range of attendance (GPA) values, mainly because the actual level in that span is irrelevant, except for its incidence in

the likelihood of retention due to the promotion policy for students. Therefore, attendance and GPA are not expected to affect the choice to drop out, complete school, or take the college admissions test through other channels besides nudging the student when held back. The third assumption, monotonicity, is also likely to hold, as it is doubtful to expect the presence of defiers in this context.

Although it is impossible to rule out whether the unobservable characteristics of students who end up on each side of the threshold are similar, it is essential to consider whether they look comparable regarding their observable characteristics. Figure A.12 presents a set of binned scatter plots of average characteristics for students within five values of the relevant threshold, conditional on attendance on the left and conditional on GPA on the right. The top four subfigures show no evidence of noticeable jumps at the threshold in the average age or gender composition of the students for either sample. The subfigure in the last row on the left plots the average GPA conditional on each attendance level for the attendance threshold sample, presenting no relevant jumps for any grade. Symmetrically, the subfigure in the suitable plots the average attendance conditional on GPA level for the GPA threshold sample, showing no evidence of jumps at the threshold as well. These results indicate smoothness in the covariates close to the threshold.

It is relevant to mention the difficulties behind the lack of a comprehensive picture of the dynamic treatment effects of retention up to now. Abbring and Heckman (2007) highlight the methodological issues that arise when identifying these effects within a potential outcomes framework. For this method to work effectively, two key assumptions must hold, namely, the no-anticipation and conditional independence conditions. According to Abbring and Van den Berg (2003), the no-anticipation condition requires that outcomes at time t (and before) must be the same for policies that allocate the same treatment up to and including t, regardless of the treatments given after t. This implies that current potential outcomes should not be influenced by future treatment. For its part, the conditional independence condition relies on sequential randomization. This means that conditional on individual history and information, the setting becomes a dynamic extension of a static randomized experiment, allowing for the identification of causal effects sequentially, as pointed out by Gill and Robins (2001). Abbring and Heckman (2007) state that justifying the use of instrumental variables in dynamic models is relatively complex. This is because the candidate instruments need to vary not only between individuals but also within an individual over time. This requires instruments based on unanticipated person-specific shocks that affect treatment choices but not outcomes at each point in time. However, the setting of the study being referred to here is

a rare exception. Promotion criteria are implemented yearly on two margins and, conditional on the limited variation of GPA and attendance in the estimation window, they are expected to only affect outcomes by increasing the likelihood of a student being held back.

To ensure clarity in discussing the impact of grade retention on different outcomes for a particular school year, I have reduced the dimensionality in the empirical model. The simplification involves keeping the settings consistent across grades and outcomes, such as using a bandwidth size of five values on each side of the relevant threshold and excluding students with exactly 85% attendance or 4.5 GPA in the donut hole, depending on the estimation sample. Additionally, a rectangular kernel is used. Robustness checks are provided in Section 5.2 to ensure that the results remain stable even if there is variation in the settings used for estimation.

5 Results

5.1 The Effect of Retention on Educational Outcomes

For ease of exposition, the results in this section are summarized in figures, each associated with their respective table, including the mean value of the dependent variable and the F statistic associated with the estimates from the first stage. All figures use diamond markers to represent the estimated effect of grade retention (Y-axis) for each school grade (X-axis) and include shaded areas to indicate the intervals for 90 and 95% confidence levels. Within each figure, the left-hand side subfigure (a) shows the results for the attendance sample, while the right-hand side subfigure (b) does the same for the GPA samples.

Figure 5 presents the results of the impact of grade retention on short-term school continuation. This binary variable indicates whether each student appears to be enrolled in any classroom in the following year. Subfigure (a) shows that marginally grade-retained high school students, due to the attendance margin, are 12 to 25 percentage points less likely to return to school the following year. This impact is also statistically significant for grade 5, the first grade in the upper primary cycle, and as the estimate is noisier, the effects remain relatively similar in size. Subfigure (b) shows that for upper primary and high school students, retention due to the GPA criteria implies an estimated 2 to 5 percentage points decrease in their likelihood to return to school the following year, with an impact as high as a decrease of 15 percentage points for eleventh graders. The impact for eighth-

graders goes in the other direction, nudging students to return to school (7 percentage points). There are some unique features to consider. First, a diploma is awarded by completing the eighth grade, increasing the incentives to pass the grade. Second, many schools do not offer grades beyond 8, forcing students to switch schools. Students may be subjected to less peer pressure to drop out if they are out of sight of previous peers, making staying an extra year less costly for them. Third, they may also become eligible to work since 15-year-olds can work with parental authorization although it is rare in Chile.

A potential benefit of holding back a student is ensuring that they count on a solid foundation to build upon new knowledge, reducing the need to be held back later in their school life. Figure 6 presents the results when the dependent variable takes the value 1 if a student is ever retained in the future, starting the following year and up to graduation. It shows identical patterns irrespective of the threshold of relevance. The impact is mostly negative for both primary cycles. Still, it becomes positive for high school students, consistent with a story of earlier grade retention reducing the likelihood that a student is re-retained again later. This might help avoid retention on a grade associated with worse academic impacts. Grade-retained students in secondary school are more likely to be grade-retained again, making the situation even worse.

Next, I explore grade retention's impact on the student's likelihood of enrolling as a high school senior. Figure 7 presents the results, which are strikingly similar between samples - no significant effect if retained during the primary and increasingly negative towards the higher grades of high school, with an impact as significant as a reduction in 55 to 70 percentage points, depending on the threshold. However, that does not imply that all students drop out for good. Figure 8 presents the effect on the probability that a student will ever enroll in adult education. The results show an inverse pattern compared to those for senior year enrollment on both margins, with high school students largely induced to switch to adult education due to retention.

High school completion can be rationalized as the combination of two possible paths: regular and adult education completion. Figure 9 presents the net results on graduation from the previous exercise, estimating the result where the dependent variable takes the value 1 if an individual ever graduates from high school, regardless of the educational path and 0 otherwise. The results align with the findings in Figure 5. Grade retention reduces the likelihood that a student graduates from high school by as much as 45 percentage points for the attendance sample when coefficients are statistically significant. The impact is negative and is more precisely estimated for the GPA sample, ranging between 7 and 12 percentage points when the coefficients are statistically significant, depending on the

grade.

The last three sets of figures show what happens with the probability of college admissions testing and the performance they have in it, conditional on getting to senior year. Figure 10 does not show any evidence of impacts on the likelihood that a student will take the PSU. This finding is particularly pertinent because while many higher education programs admit students based on their performance in the PSU, some less selective programs (shorter non-BA conducting programs, Professional Institutes, and Technical Formation Programs) have as a requirement for applying taking the PSU, no matter the score.

Figures 11 and 12 show the performance in Spanish and math, respectively. Conditional on taking the PSU, there appears to be a positive impact on scores on the GPA margin for high school students on both exams. However, it might have to do with students being grade retained in those grades being less likely to take the test so that the sample taking the test is self-selected. There is evidence of sizable effects for the ninth and eleventh grades across both threshold criteria for math, being around 0.1 SD. This impact is as large as the impact of having a 1 SD better quality teacher found by Chetty et al. (2014), and slightly smaller but in line with the findings of retention impact on exit exams by Borghesan et al. (2022).

5.2 Robustness Checks and Heterogeneity Analysis

5.2.1 Sensitivity to Parameter Choices

Since this paper analyzes the impact of grade retention for each year using two retention policies and multiple outcomes of interest, it is nontrivial to portray how robust the results are to the choice of the parameters for estimation. Figure A.13 offers an alternative, comprehensively displaying the estimates of the impact of being held back in ninth grade on the likelihood of high school completion, focusing on GPA as the promotion threshold of relevance. The plot shows the coefficients and confidence intervals for different combinations of bandwidth choices with potentially distinct lower and upper limits and varying donut hole sizes and orders the estimates by size. Below the plot, vertically aligned with the corresponding estimate, is the detail of sample selection using the forcing variable, with bold circles indicating who is included for each estimation according to their end-of-year GPA. The figure shows that the impact on high school completion for ninth-graders is relatively robust, as the results are always negative

except for one estimation point. However, the results become much noisier as the upper limit for the bandwidth of inclusion becomes more restrictive, which is in line with a considerable reduction in sample size since the number of students with GPAs below the threshold is much smaller than the number of students above it.

5.2.2 Sensitivity to Exclusion of Students Simultaneously on Both Margins

One potential concern about the results of both samples being so similar might be the overlap in students who fail to cross both promotion thresholds in the same grade, de facto estimating the same effect twice. Figure 3 shows that although most students at risk of retention are so due to low attendance or low GPA, for some grades, the fraction of students at risk of retention due to both criteria can reach a third of students at risk on each margin. To explore whether that is the case, I reestimate the effects, considering in the sample only students who are at risk of retention for exclusively one margin. The results are presented in Figure A.14. The upper panels show differences in retention estimates at high school graduation for each grade, and the lower panels look at the math PSU results.

The subfigures (a) and (c) depict the results obtained using attendance as the relevant threshold, showing consistent results. Still, the magnitude of the effect increases when the overlapping sample is excluded, mainly when it is negative. However, there is no change in the results for high school students, and the wider confidence intervals associated with the smaller sample size do not result in any qualitative change for any grade. On the other hand, subfigures (b) and (d) compare results for the same two outcomes but use GPA as the relevant threshold. In this case, the results are the same, with no differences in the estimation coefficients and only a slight increase in the confidence intervals. These results do not provide evidence that including students with both types of retention risks is a driver of concordance among the principal results among the two criteria for grade promotion.

5.2.3 Heterogeneity in Main Results

Maturity - One factor that can affect students' choices when they face grade retention is their maturity. To study for potential differences depending on maturity, I exploit age differences, dividing students into two similarly sized groups based on whether they turned seven years old before or after November in the year they started first grade. The findings of this exercise are presented in Figure A.15. According to the results obtained

from the GPA margin, the impact on high school graduation is more pronounced for younger students. The impact is significantly negative from fifth grade and always more prominent than the results for younger students when those are significant, driven by younger students' likelihood of school continuation being more negatively affected than older students. Although the results for the attendance margin are noisier, they show similar patterns.

These findings align with the results in Jacob and Lefgren (2009). They find that the impact of retention on older eighth graders is a significant 11 percentage points increase in their probability of dropout for young students and an increase of 10 percentage points in their probability of high school graduation, with nonsignificant effects on older students.[4] Here, the GPA-margin results coincidently indicate a 10 percentage points increase in the probability of high school graduation, which is also only present for younger eighth-grade students.

Gender - The impact of school retention on male and female students can differ according to their respective benefits and opportunity costs of attending and completing school. Figure A.16 explores whether retention affects them differently. The results indicate that the school continuation patterns look very similar between genders. However, only girls are positively impacted by retention in eighth grade, although the difference is not statistically significant. Furthermore, girls are less likely to switch to adult education during primary school, while their male counterparts are nudged to do so due to retention starting in the seventh grade. On the other hand, high school graduation patterns show that only male students are negatively impacted in their likelihood of graduating high school due to retention in eighth grade. However, the pattern changes for retention in the eleventh grade, as boys are unaffected by it.

School with only primary or secondary - A reason why students might decide not to come back to school the following year after retention is stigma, specially from peer perceptions. To test if this is a source of differences in choices, I explore whether it is relevant if your school has only one type of education, forcing students to switch schools to attend high school. Results are shown in Figure A.17.

School type - Another potential factor affecting the impact of retention is the type of school students attend, which is absorbed in the estimation by the school fixed effects. Figure A.18 shows the results separating the effects by whether students attended public, voucher (subsidized) or public schools. We see that the results for voucher and public

[4]Their high school graduation measure is subject to graduating from a Chicago public school, slightly less precise than in the general high school graduation on this paper

school students are very similar, while the results for private school students, who make up less than 10% of the student population, present much more noise in the estimation.

6 Discussion

Grade retention is a commonly used policy that aims to improve academic performance and address achievement gaps among students. However, there is no comprehensive conclusive evidence of its causal effects on retained students by grade. In the US, states and school districts typically retain students by implementing promotion requirements at key transitional points in their schooling, such as passing a high-stakes exam, completing a minimum number of credits, maintaining a minimum attendance record, or achieving a minimum GPA. The most common point for retention across states is in the third grade (Fischer et al., 2023). For example, in Texas, students are required to have a minimum attendance of 90% to receive credit (Rowland, 2014). In Chile, where the school year is approximately 38-40 weeks long (190 to 200 school days), the 85% attendance requirement implies that students must attend between 162 and 170 days for automatic grade promotion (Ministry of Education, 2010), in line with the minimum number of days in the United States for those states with attendance requirements (Walsh et al., 2014).[5] In this article, I estimate the effect of grade retention on several academic outcomes at each grade in the education process, relying on two criteria for grade promotion in Chile as a source of exogenous variation on the probability of grade retention.

The main results of this paper indicate that for students who are marginally grade-retained due to attendance, there is a significant negative impact on short-term school continuation starting from the fifth grade, with a decrease in the likelihood of returning to school the following year of 12 to 25 percentage points. In the case of students who are marginally grade-retained due to GPA criteria in upper primary and high school, there is a 2 to 5 percentage points decrease in their likelihood of returning to school in the following year.The impact on 11th graders who are marginally grade-retained can be as high as a 15 percentage point decrease in their likelihood of returning to school in the next year. However, for eighth graders, there is a positive impact, with a 7 percentage points increase in their likelihood of returning to school.

The study's results consistently demonstrate that retention in primary grades reduces the likelihood of future grade retention. However, retention in high school has the opposite

[5]Thirty-one states and the District of Columbia in the US require schools to offer between 160 and 180 days of student instruction.

effect, increasing the likelihood of future grade retention. This exacerbates the negative impact of grade retention on school continuation that has already been observed for high school students. It is worth noting that this pattern of results holds true regardless of the promotion criteria threshold used to explore the effect on future grade retention.

When examining longer-term outcomes, the effect on high school graduation aligns with the findings for short-term school continuation starting in fifth grade. The results indicate that students who experience grade retention are less likely to reach their senior year, with impacts ranging from 5 to 20 percentage points for different grades. Similar trends are observed for the GPA threshold. These findings are consistent with the existing literature, which suggests that grade retention is associated with an increased risk of dropping out of school. However, there is a silver lining. Starting in the seventh grade, there is a clear pattern that indicates that grade retention significantly contributes to students eventually switching to adult education. The results are similar for the GPA margin, with repetition in grades 1 and 2 also pushing students toward adult education, which dampens the negative impact that grade retention has on regular-track school completion.

Grade retention during lower primary grades shows some suggestive evidence of positive effects on the likelihood of enrolling to take the college admissions test (PSU). However, grade retention in high school has a negative impact, consistent across both retention criteria. This result is crucial because access to many higher education programs in Chile is contingent on taking the PSU, regardless of the score. When considering the performance of the students who took the PSU, there are mixed results, noting that this analysis is limited by potential bias due to self-selection into test taking. Taking into account the GPA margin, there is some evidence of positive effects on Spanish scores. At the same time, for math, there is evidence of substantial effects for ninth- and eleventh-graders, irrespective of the threshold criteria.

The robustness checks and heterogeneity analyses further supported the main findings. Sensitivity analyses demonstrated the robustness of the results across different parameter choices and sample exclusions, indicating the consistency of the findings. Heterogeneity analyses revealed interesting patterns based on student characteristics, such as age, gender, and school type. Younger students were more negatively affected by grade retention, possibly due to maturity differences. Gender differences were observed, with varied impacts on school continuation and high school graduation. Moreover, the type of school attended influenced the impact of grade retention, with private school students displaying noisier results compared to public and voucher school students.

The findings of this study offer valuable insights into the impact of grade retention and underscore the importance of timing and context in making these choices. These results align with existing research and contribute to the field by clarifying why some studies previously presented conflicting evidence. A significant discovery in this research is that grade retention during high school has several adverse effects. It increases the likelihood of re-retention, prolongs the time to graduation, and even prevents it. These findings highlight that, on average, associated costs could outweigh the potential benefits of retaining a student later in their academic journey, particularly in high school, when there are fewer years available to reap the benefits from extra instruction. Nevertheless, the increase in performance presents the possibility that for some students grade retention is beneficial. More data, especially income data, would be necessary to claim which effect dominates on average.

It is crucial to recognize the limitations of this study, particularly that these results represent local average treatment effects, and not treatment on the treated. Therefore, generalizations of these findings to different populations or promotion criteria must be made with caution.

Overall, this paper comprehensively analyzes grade retention across various school grades. It leverages a donut fuzzy regression discontinuity design to explore the quasi-experimental variation in the probability of grade retention due to promotion requirements based on attendance and GPA. The study adds to the existing body of literature and offers significant implications for policymakers, educators, and individuals. These findings underscore the importance of considering the intricacies of different school grades, relevance thresholds, and retention criteria when evaluating the implications of grade retention policies and can help design more effective and targeted interventions that support students' academic success and long-term outcomes.

References

Abbring, J. H. and Heckman, J. J. (2007). Econometric evaluation of social programs, part iii: Distributional treatment effects, dynamic treatment effects, dynamic discrete choice, and general equilibrium policy evaluation. *Handbook of econometrics*, 6:5145–5303.

Abbring, J. H. and Van den Berg, G. J. (2003). The nonparametric identification of treatment effects in duration models. *Econometrica*, 71(5):1491–1517.

Barreca, A. I., Guldi, M., Lindo, J. M., and Waddell, G. R. (2011). Saving babies? revisiting the effect of very low birth weight classification. *The Quarterly Journal of Economics*, 126(4):2117–2123.

Barreca, A. I., Lindo, J. M., and Waddell, G. R. (2016). Heaping-induced bias in regression-discontinuity designs. *Economic Inquiry*, 54(1):268–293.

Borghesan, E., Reis, H., Todd, P., et al. (2022). *Learning Through Repetition?: A Dynamic Evaluation of Grade Retention in Portugal*. Penn Institute for Economic Research, Department of Economics, University of Pennsylvania.

Campbell, D. E. (2006). What is education's impact on civic and social engagement. In *Measuring the effects of education on health and civic engagement: Proceedings of the Copenhagen symposium*, pages 25–126.

Chetty, R., Friedman, J. N., and Rockoff, J. E. (2014). Measuring the impacts of teachers i: Evaluating bias in teacher value-added estimates. *American economic review*, 104(9):2593–2632.

Díaz, J., Grau, N., Reyes, T., and Rivera, J. (2021). The impact of grade retention on juvenile crime. *Economics of Education Review*, 84:102153.

Eide, E. R. and Showalter, M. H. (2001). The effect of grade retention on educational and labor market outcomes. *Economics of Education review*, 20(6):563–576.

Eren, O., Depew, B., and Barnes, S. (2017). Test-based promotion policies, dropping out, and juvenile crime. *Journal of Public Economics*, 153:9–31.

Espinoza, Ó., Castillo, D., González, L. E., and Santa Cruz Grau, J. (2013). Caracterización de programas de reinserción escolar y de nivelación de estudios en chile: modalidad regular. *Documento de Trabajo PIIE*, 3.

Fischer, A., Jamieson, C., Silva-Padron, G., Peisach, L., and Weyer, M. (2023). Is there a third-grade retention policy? if so, what exemptions are provided?

Fruehwirth, J. C., Navarro, S., and Takahashi, Y. (2016). How the timing of grade retention affects outcomes: Identification and estimation of time-varying treatment effects. *Journal of Labor Economics*, 34(4):979–1021.

Gill, R. D. and Robins, J. M. (2001). Causal inference for complex longitudinal data: the continuous case. *Annals of Statistics*, pages 1785–1811.

Gurria, A. (2016). Pisa 2015 results in focus. *PISA in Focus*, 1(67):1.

Jacob, B. A. and Lefgren, L. (2004). Remedial education and student achievement: A regression-discontinuity analysis. *Review of economics and statistics*, 86(1):226–244.

Jacob, B. A. and Lefgren, L. (2009). The effect of grade retention on high school completion. *American Economic Journal: Applied Economics*, 1(3):33–58.

Jere, C., Eck, M., and Zubairi, A. (2022). *Leave No Child Behind: Global report on boys' disengagement from education*. UNESCO.

Jimerson, S. R., Anderson, G. E., and Whipple, A. D. (2002). Winning the battle and losing the war: Examining the relation between grade retention and dropping out of high school. *Psychology in the Schools*, 39(4):441–457.

Lee, D. S. and Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of economic literature*, 48(2):281–355.

Manacorda, M. (2012). The cost of grade retention. *Review of Economics and Statistics*, 94(2):596–606.

Mariano, L. T. and Martorell, P. (2013). The academic effects of summer instruction and retention in new york city. *Educational Evaluation and Policy Analysis*, 35(1):96–117.

Martorell, P. and Mariano, L. T. (2018). The causal effects of grade retention on behavioral outcomes. *Journal of Research on Educational Effectiveness*, 11(2):192–216.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of econometrics*, 142(2):698–714.

MINEDUC (1988). Reglamento de evaluación y promoción del alumnos de educación general básica, de educación media, de educación de adultos, y proceso de titulación en educación técnico-profesional. *Reglamento Ministerio de Educación Pública*.

Ministry of Education (2001). Decreto exento n° 83 - reglamenta calificacion y promocion de alumnos (as) de 3º y 4º aÑo de enseÑanza media, ambas modalidades, y establece disposiciones para que los establecimientos educacionales elaboren su reglamento de evaluacion.
https://www.bcn.cl/leychile/navegar?idNorma=182968.

Ministry of Education (2003). Ley 19876 - reforma constitucional que establece la obligatoriedad y gratuidad de la educacion media.
https://www.bcn.cl/leychile/navegar?idNorma=210495.

Ministry of Education (2010). Decreto n° 289 - fija normas generales sobre calendario escolar.
https://www.bcn.cl/leychile/navegar?idNorma=208721.

NSCH (2021). Child and adolescent health measurement initiative. 2020-2021 national survey of children's health (nsch) data query. data resource center for child and adolescent health supported by the u.s. department of health and human services, health resources and services administration (hrsa), maternal and child health bureau (mchb). *Retrieved 08/28/2023 from https://www.childhealthdata.org/browse/survey/allstates?q=9463*.

Özek, U. (2015). Hold back to move forward? early grade retention and student misbehavior. *Education Finance and Policy*, 10(3):350–377.

Roderick, M. (1994). Grade retention and school dropout: Investigating the association. *American Educational Research Journal*, 31(4):729–759.

Rosa, W. (2017). Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. *A new era in global health: Nursing and the United Nations 2030 agenda for sustainable development*, 283.

Rowland, J. (2014). Number of instructional days/hours in the school year. *Education Commission of the States*.

Walsh, J., Kemerer, F., and Maniotis, L. (2014). *The educator's guide to Texas school law*. University of Texas Press.

7 Tables and Figures

Table 1: Summary Statistics

	All students			Attendance sample			GPA sample		
Grades	1-4	5-8	9-11	1-4	5-8	9-11	1-4	5-8	9-12
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Student Characteristics									
Female (%)	48.71	48.96	50.05	48.19	47.59	51.95	37.97	39.66	41.03
	(49.98)	(49.99)	(50.00)	(49.97)	(49.94)	(49.96)	(48.53)	(48.92)	(49.19)
Age (years)	8.22	12.36	15.88	8.28	12.49	15.96	8.51	12.63	15.83
	(1.32)	(1.38)	(1.11)	(1.35)	(1.42)	(1.12)	(1.47)	(1.43)	(1.17)
Grade Retained (%)	3.66	4.59	8.21	5.93	6.47	9.42	29.52	15.87	23.12
	(18.79)	(20.93)	(27.45)	(23.63)	(24.60)	(29.21)	(45.61)	(36.54)	(42.16)
Attendance (%)	93.32	92.45	90.67	87.35	87.04	86.83	89.32	89.80	88.34
	(6.77)	(7.68)	(9.54)	(2.64)	(2.82)	(2.90)	(9.42)	(9.03)	(10.02)
GPA	5.94	5.51	5.43	5.75	5.33	5.31	4.73	4.78	4.76
	(0.66)	(0.62)	(0.66)	(0.68)	(0.58)	(0.59)	(0.27)	(0.23)	(0.25)
Education Outcomes									
Reaches 12th Grade (%)	74.93	76.38	86.39	67.29	67.49	83.39	41.66	52.31	70.60
	(43.34)	(42.47)	(34.29)	(46.91)	(46.84)	(37.22)	(49.30)	(49.95)	(45.56)
Enrolls in Adult Education (%)	17.61	17.38	10.23	22.90	24.17	12.77	37.79	35.21	22.89
	(38.09)	(37.89)	(30.31)	(42.02)	(42.81)	(33.37)	(48.49)	(47.76)	(42.01)
Takes PSU (%)	70.29	71.89	78.79	63.32	64.35	74.46	34.53	48.71	60.71
	(45.70)	(44.95)	(40.88)	(48.19)	(47.90)	(43.61)	(47.55)	(49.98)	(48.84)
Spanish PSU Performance	492.04	492.23	494.49	482.02	479.64	481.58	392.88	424.37	431.16
	(109.58)	(109.12)	(108.42)	(107.89)	(105.45)	(104.75)	(86.55)	(89.17)	(88.22)
Math PSU Performance	498.69	498.57	500.25	484.41	479.97	480.82	426.87	439.89	442.42
	(108.53)	(108.40)	(108.19)	(103.41)	(101.20)	(100.69)	(82.24)	(84.60)	(83.52)
Number of Students	734,784	725,396	675,533	324,471	338,265	309,223	153,816	291,965	268,466

Notes: The statistics above reflect my analysis sample, which consists of students who entered first grade from 2005 to 2007, were born between 1998 and 2001, in general, and in particular for those who are close to one of the promotion cutoffs. Statistics are pooled by cycle in intervals of four grades. The attendance sample includes students who have an attendance level up to five percentage points away from the attendance promotion threshold, while the GPA sample includes students who have a GPA up to 0.5 points away from the GPA promotion threshold. For more details, see the text.

Table 2: The Effect of Grade Retention on School Continuation

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.041	-0.012	-0.016	0.064	-0.096**	-0.057	-0.060	-0.181	-0.124*	-0.201**	-0.178**
	(0.076)	(0.021)	(0.024)	(0.043)	(0.045)	(0.050)	(0.062)	(0.165)	(0.068)	(0.079)	(0.072)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.989	0.986	0.990	0.990	0.989	0.984	0.983	0.940	0.963	0.961	0.980

Notes: This table reports estimates of the effect of grade retention on the probability of continuing school the following year, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 5 provides a graphical summary of this table.

Table 3: The Effect of Grade Retention on School Continuation

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.112**	0.059*	0.008	-0.012	-0.021***	-0.031***	-0.039***	0.058***	-0.046***	-0.009	-0.136***
	(0.044)	(0.032)	(0.020)	(0.013)	(0.007)	(0.007)	(0.006)	(0.011)	(0.010)	(0.017)	(0.020)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.958	0.970	0.980	0.979	0.982	0.975	0.974	0.909	0.951	0.937	0.955

Notes: This table reports estimates of the effect of grade retention on the probability of continuing school the following year, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 5 provides a graphical summary of this table.

Table 4: The Effect of Grade Retention on Future Retention

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.601*	-0.473***	-0.238**	-0.410**	0.041	-0.298*	-0.168	-0.187	0.229*	0.290**	0.133*
	(0.307)	(0.083)	(0.103)	(0.179)	(0.188)	(0.176)	(0.199)	(0.273)	(0.128)	(0.113)	(0.074)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.328	0.408	0.389	0.384	0.363	0.344	0.307	0.276	0.179	0.089	0.023

Notes: This table reports estimates of the effect of grade retention on the probability of ever being retained in the future, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 6 provides a graphical summary of this table.

Table 5: The Effect of Grade Retention on Future Retention

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.079	-0.082	-0.291***	-0.267***	-0.245***	-0.250***	-0.182***	-0.246***	-0.124***	-0.014	0.058***
	(0.082)	(0.069)	(0.055)	(0.037)	(0.021)	(0.018)	(0.017)	(0.019)	(0.020)	(0.025)	(0.022)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.729	0.691	0.660	0.661	0.581	0.520	0.450	0.432	0.264	0.168	0.060

Notes: This table reports estimates of the effect of grade retention on the probability of ever being retained in the future, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 6 provides a graphical summary of this table.

Table 6: The Effect of Grade Retention on Attending Senior Year

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.502*	0.188**	0.071	0.158	0.015	0.153	-0.159	-0.380	-0.382***	-0.684***	-0.676***
	(0.275)	(0.079)	(0.097)	(0.174)	(0.177)	(0.171)	(0.195)	(0.277)	(0.133)	(0.135)	(0.099)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.777	0.698	0.702	0.698	0.698	0.692	0.703	0.724	0.786	0.858	0.945

Notes: This table reports estimates of the effect of grade retention on the probability of ever attending senior year, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 7 provides a graphical summary of this table.

Table 7: The Effect of Grade Retention on Attending Senior Year

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.011	-0.115	0.051	0.055	0.007	-0.020	-0.058***	-0.012	-0.194***	-0.244***	-0.559***
	(0.085)	(0.072)	(0.054)	(0.036)	(0.020)	(0.017)	(0.015)	(0.017)	(0.018)	(0.025)	(0.028)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.434	0.451	0.477	0.478	0.539	0.566	0.598	0.604	0.724	0.761	0.866

Notes: This table reports estimates of the effect of grade retention on the probability of ever attending senior year, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 7 provides a graphical summary of this table.

Table 8: The Effect of Grade Retention on Enrolling in Adult Education

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.244	-0.172**	-0.046	-0.314*	0.015	-0.199	0.176	0.242	0.404***	0.436***	0.650***
	(0.253)	(0.076)	(0.092)	(0.167)	(0.169)	(0.169)	(0.188)	(0.265)	(0.124)	(0.122)	(0.103)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.177	0.230	0.231	0.237	0.239	0.246	0.239	0.226	0.178	0.120	0.052

Notes: This table reports estimates of the effect of grade retention on the probability of ever enrolling in adult education, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 8 provides a graphical summary of this table.

Table 9: The Effect of Grade Retention on Enrolling in Adult Education

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.145*	0.123*	-0.017	-0.049	-0.028	-0.004	0.053***	-0.002	0.172***	0.157***	0.402***
	(0.087)	(0.074)	(0.057)	(0.037)	(0.020)	(0.017)	(0.016)	(0.018)	(0.018)	(0.025)	(0.028)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.387	0.393	0.389	0.397	0.362	0.349	0.325	0.323	0.235	0.206	0.129

Notes: This table reports estimates of the effect of grade retention on the probability of ever enrolling in adult education, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 8 provides a graphical summary of this table.

Table 10: The Effect of Grade Retention on High School Graduation

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.274	0.079	-0.072	-0.260*	-0.056	-0.333**	-0.107	-0.407*	-0.222**	-0.386***	-0.092
	(0.201)	(0.062)	(0.077)	(0.136)	(0.141)	(0.133)	(0.153)	(0.215)	(0.089)	(0.088)	(0.069)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.900	0.851	0.857	0.857	0.860	0.860	0.873	0.889	0.923	0.956	0.982

Notes: This table reports estimates of the effect of grade retention on the probability of obtaining a high school diploma, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 9 provides a graphical summary of this table.

Table 11: The Effect of Grade Retention on High School Graduation

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.024	0.027	0.042	0.015	-0.051***	-0.067***	-0.056***	-0.038***	-0.086***	-0.180***	-0.105***
	(0.089)	(0.073)	(0.052)	(0.034)	(0.017)	(0.015)	(0.013)	(0.015)	(0.014)	(0.020)	(0.020)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.664	0.687	0.719	0.729	0.778	0.802	0.825	0.835	0.904	0.928	0.959

Notes: This table reports estimates of the effect of grade retention on the probability of obtaining a high school diploma, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 9 provides a graphical summary of this table.

Table 12: The Effect of Grade Retention on Taking the College Admissions Test (PSU)

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.225	0.142*	0.015	-0.092	-0.011	-0.047	0.093	-0.384	-0.251*	-0.254*	0.097
	(0.280)	(0.078)	(0.095)	(0.168)	(0.178)	(0.162)	(0.195)	(0.283)	(0.137)	(0.153)	(0.172)
Observations	94,491	120,399	127,331	129,008	134,723	130,628	139,298	147,636	150,316	153,798	145,790
F-stat 1st stage	219	402	264	112	63	69	48	37	59	68	54
Mean Dep. Var.	0.748	0.654	0.661	0.660	0.660	0.655	0.664	0.682	0.720	0.767	0.811

Notes: This table reports estimates of the effect of grade retention on the probability of ever taking the college admissions test, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 10 provides a graphical summary of this table.

Table 13: The Effect of Grade Retention on Taking the College Admissions Test (PSU)

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-0.003	-0.103	0.054	0.068*	0.011	-0.004	-0.021	0.025	-0.033*	-0.034	-0.028
	(0.079)	(0.066)	(0.050)	(0.035)	(0.019)	(0.016)	(0.015)	(0.017)	(0.018)	(0.027)	(0.032)
Observations	40,474	44,735	56,938	59,021	107,868	119,864	135,858	117,679	156,553	113,889	78,575
F-stat 1st stage	150	220	480	1,413	5,817	8,401	9,984	10,535	4,820	2,242	1,333
Mean Dep. Var.	0.329	0.356	0.395	0.411	0.478	0.511	0.546	0.555	0.639	0.640	0.669

Notes: This table reports estimates of the effect of grade retention on the probability of ever taking the college admissions test, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 10 provides a graphical summary of this table.

Table 14: The Effect of Grade Retention on Spanish PSU Performance

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.761	62.010	39.500	149.159	-32.947	-0.397	23.862	-188.937	27.852	125.232	169.871*
	(139.188)	(48.071)	(69.795)	(112.657)	(141.146)	(131.076)	(122.724)	(186.227)	(71.766)	(82.942)	(94.996)
Observations	74,740	84,389	90,205	91,457	95,684	92,318	100,159	108,972	117,259	127,231	126,766
F-stat 1st stage	174	198	93	52	19	20	19	13	30	38	31
Mean Dep. Var.	469.691	447.946	447.132	445.066	444.080	443.032	440.981	444.060	442.326	446.101	452.555

Notes: This table reports estimates of the effect of grade retention on Spanish performance on the college admissions test, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 11 provides a graphical summary of this table.

Table 15: The Effect of Grade Retention on Spanish PSU Performance

	Dependent Variable: Still in School in t + 1										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	-25.639	-53.333	22.885	6.483	19.921**	13.346*	9.670	15.132*	24.297***	43.735***	89.335***
	(51.748)	(39.615)	(28.936)	(18.462)	(9.884)	(7.813)	(7.073)	(8.263)	(8.152)	(12.803)	(14.425)
Observations	14,488	17,701	25,147	27,184	57,889	68,638	82,817	72,929	111,395	81,961	59,480
F-stat 1st stage	58	95	210	675	2,718	4,298	5,266	5,504	2,833	1,227	904
Mean Dep. Var.	331.349	333.751	342.788	346.653	366.166	374.262	382.752	385.054	390.869	381.032	378.980

Notes: This table reports estimates of the effect of grade retention on Spanish performance on the college admissions test, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 11 provides a graphical summary of this table.

Table 16: The Effect of Grade Retention on Math PSU Performance

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	0.256	128.745**	76.979	141.072	30.542	-8.754	132.140	-111.695	71.063	144.301	275.295***
	(145.551)	(52.013)	(76.731)	(122.454)	(149.838)	(143.111)	(134.630)	(193.667)	(78.483)	(89.254)	(105.186)
Observations	74,740	84,389	90,205	91,457	95,684	92,318	100,159	108,972	117,259	127,231	126,766
F-stat 1st stage	174	198	93	52	19	20	19	13	30	38	31
Mean Dep. Var.	462.549	442.914	440.760	438.628	436.886	435.039	432.844	435.099	434.015	438.478	444.861

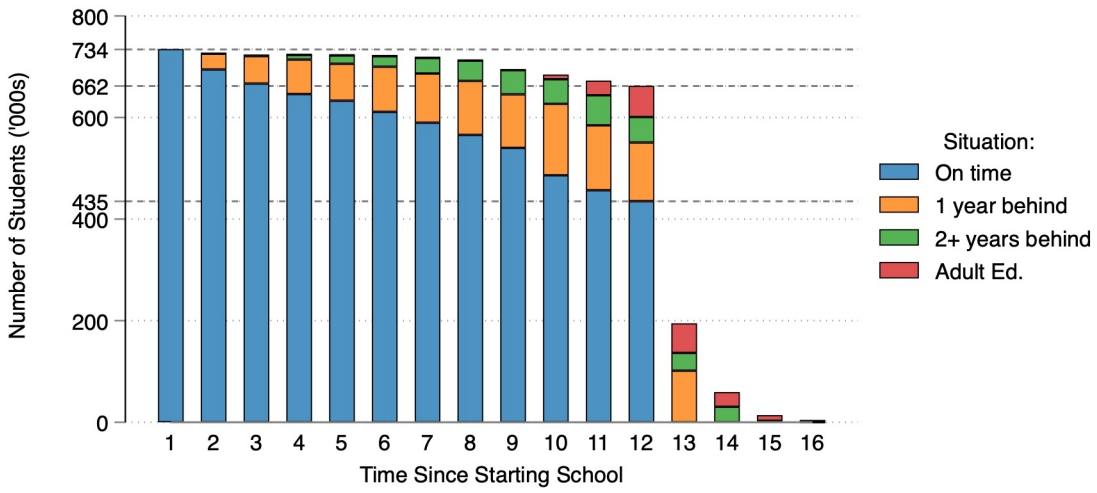
Notes: This table reports estimates of the effect of grade retention on math performance on the college admissions test, as described in section 4, with attendance as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged attendance; current, lagged, and twice lagged GPA; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 12 provides a graphical summary of this table.

Table 17: The Effect of Grade Retention on Math PSU Performance

	Dependent Variable: Still in School in $t+1$										
Grade:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Retention	1.365	-18.310	48.138	6.026	22.299**	14.425	12.373	16.871*	27.538***	19.770	75.361***
	(59.023)	(45.993)	(32.764)	(21.366)	(10.935)	(8.858)	(7.927)	(8.736)	(9.007)	(13.969)	(15.381)
Observations	14,488	17,701	25,147	27,184	57,889	68,638	82,817	72,929	111,395	81,961	59,480
F-stat 1st stage	58	95	210	675	2,718	4,298	5,266	5,504	2,833	1,227	904
Mean Dep. Var.	346.698	350.617	358.386	361.083	374.193	378.930	383.905	385.336	390.022	382.143	384.001

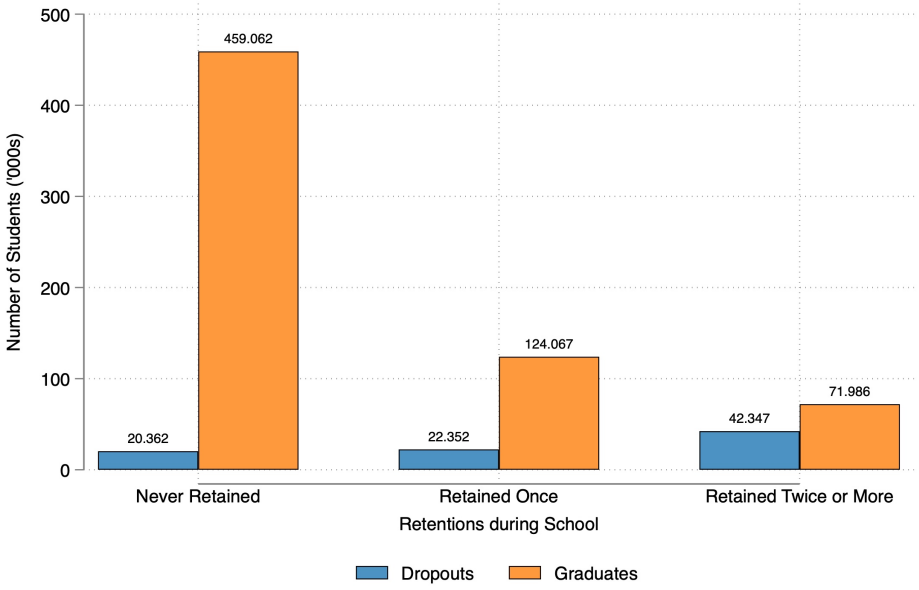
Notes: This table reports estimates of the effect of grade retention on math performance on the college admissions test, as described in section 4, with GPA as the relevant threshold. Each column presents the results for a grade-specific estimation, where the number in parentheses at the top of each column indicates the grade coursed by the sample considered in the analysis. The controls for each estimation include: lagged and twice lagged GPA; current, lagged, and twice lagged attendance; gender; dummies for the year of birth; and school fixed effects. Grade 1 does not include any lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. Figure 12 provides a graphical summary of this table.

Figure 1: Educational trajectory of followed cohort in time, by progression status.



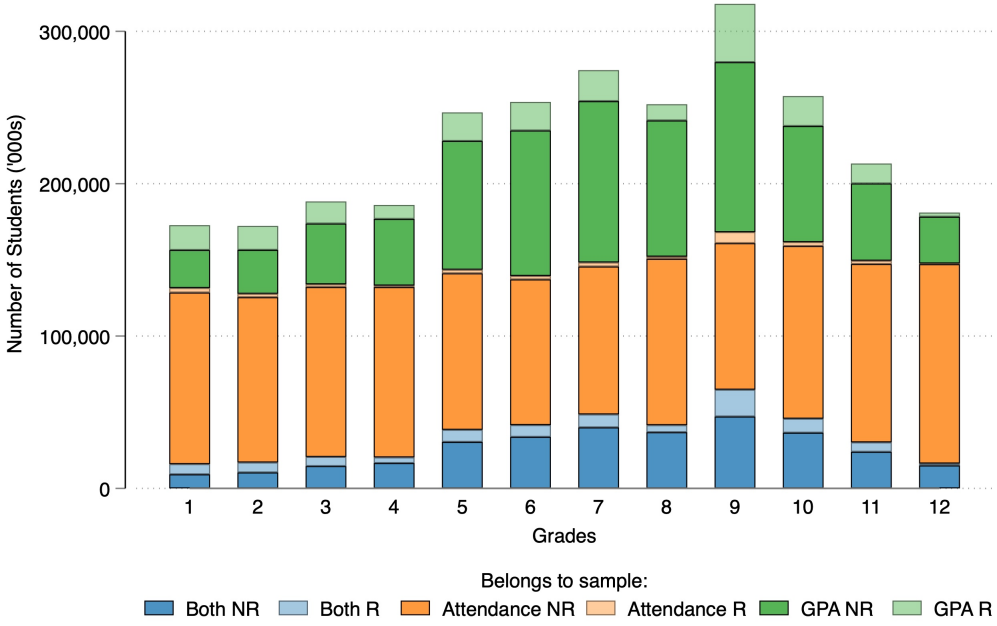
Notes: This figure shows the year-to-year progression of each student entering first grade in the years 2005 to 2007, born years 1998 to 2001. The height of each bar indicates, for each year after starting school, the number of students who are enrolled in any educational program. The blue portion of the bar indicates the number of students who have an on-time progression, being always promoted. The orange portion indicates the number of students who have repeated one year, while the green portion indicates the number of students two or more grades behind. The red portion of the bar indicates the number of students switching to adult education.

Figure 2: Retention Distribution by End of High School Status



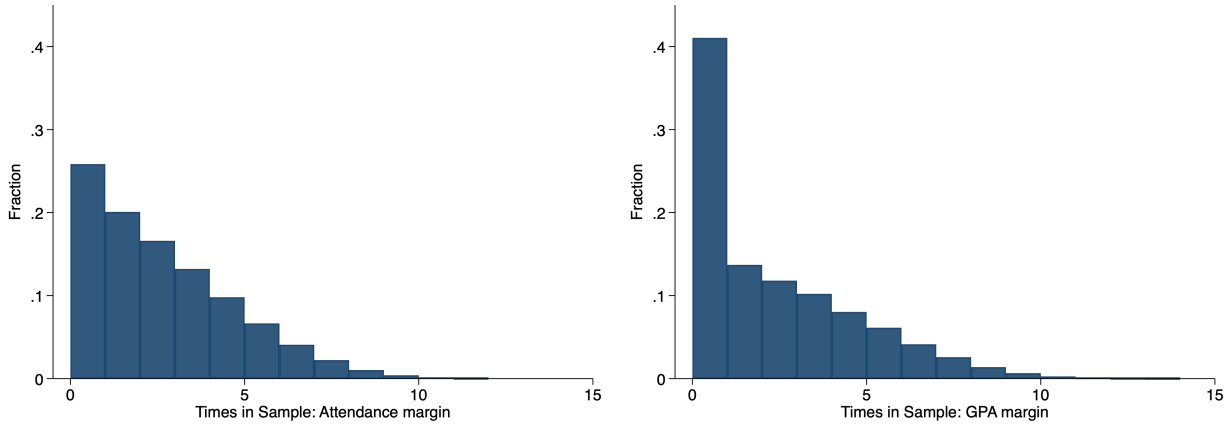
Notes: This figure shows the incidence of retention for students entering first grade in the years 2005 to 2007, born years 1998 to 2001. Each bar indicates the number of students who ended up in each academic situation with respect to retention (never, once, or more than twice) and school graduation (whether they dropped out before the senior year).

Figure 3: Educational trajectory of followed cohort in time, by progression status.



Notes: This figure shows the number of students in the sample that are at risk of retention on each grade by promotion threshold and how many of them are actually retained. The blue section of the bar represents the number of students who are at risk of retention on both margins in the same year, while the orange and blue bars indicate the number of students at risk of retention uniquely for either low attendance or low GPA, respectively. The high-transparency fraction of each colored portion corresponds to the number of students who are held back.

Figure 4: Sample Composition: Times in Sample by Threshold

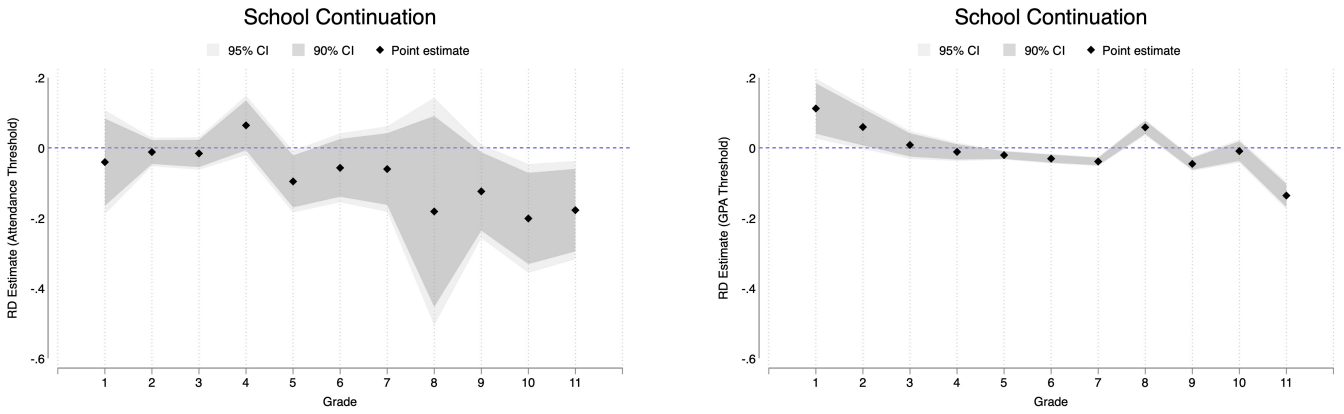


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure shows the frequency with which students end up close to the grade retention threshold for students entering first grade from 2005 to 2007, born from 1998 to 2001. Subfigure (a) shows the frequency distribution with which each student ends up less than 5 percentage points away from the attendance threshold. Subfigure (b) shows the frequency distribution with which each student ends up less than 0.5 points away from the GPA threshold.

Figure 5: The Effect of Grade Retention on School Continuation

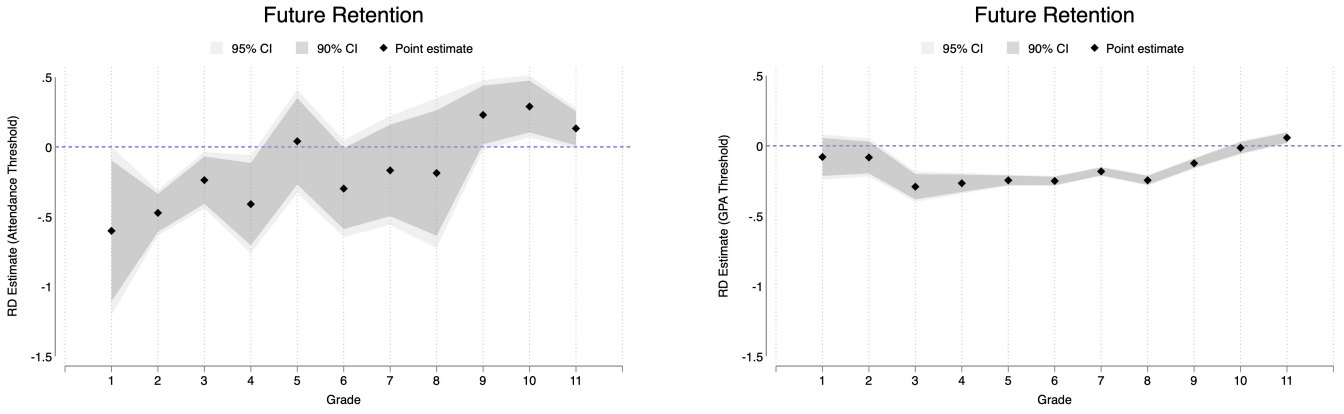


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 2 and 3. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 6: The Effect of Grade Retention on Future Retention

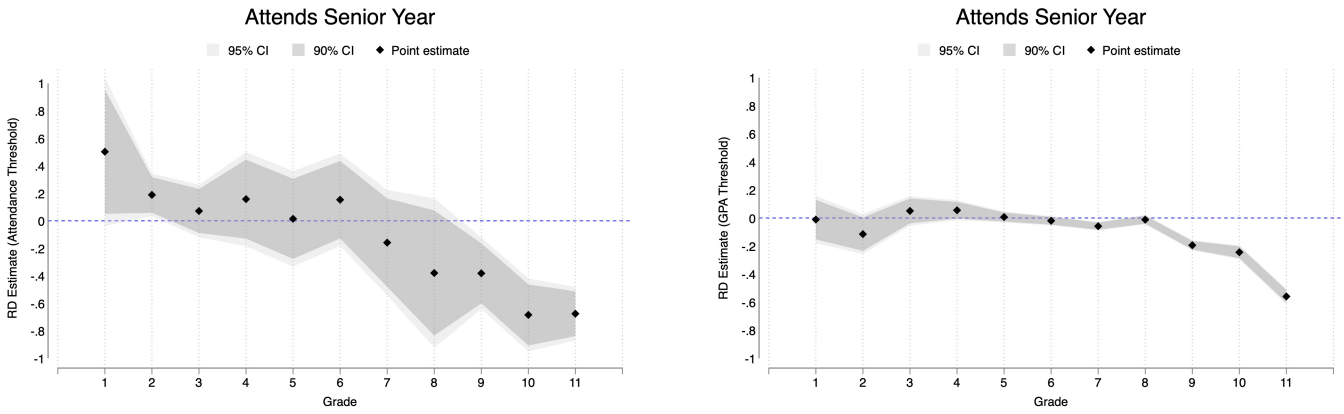


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 4 and 5. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 7: The Effect of Grade Retention on Attending Senior Year

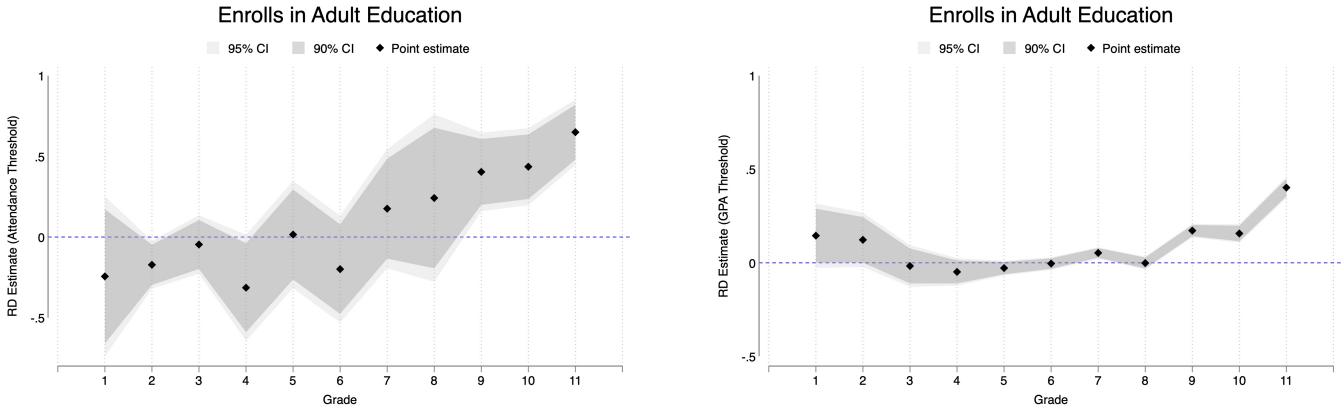


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 6 and 7. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 8: The Effect of Grade Retention on Enrolling in Adult Education

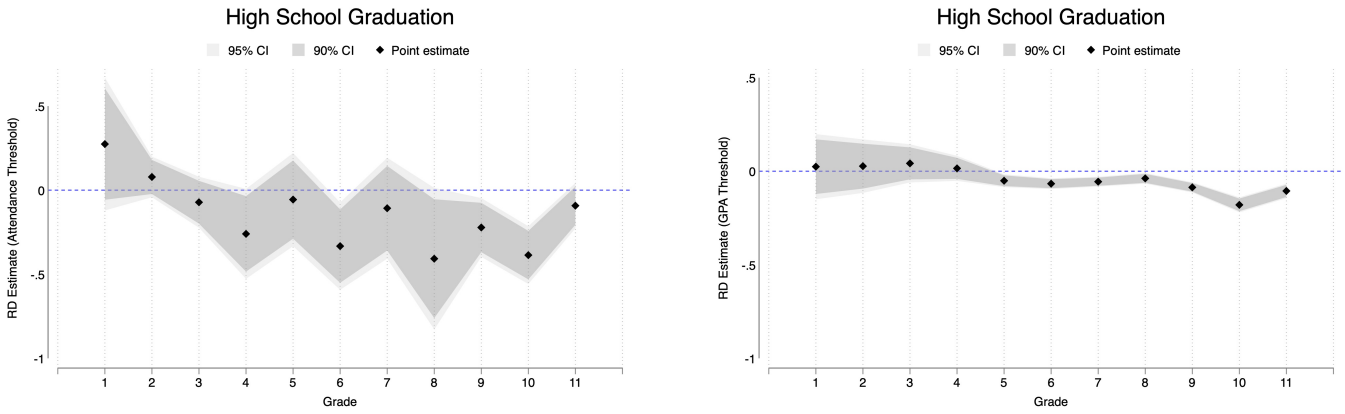


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 8 and 9. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 9: The Effect of Grade Retention on High School Graduation

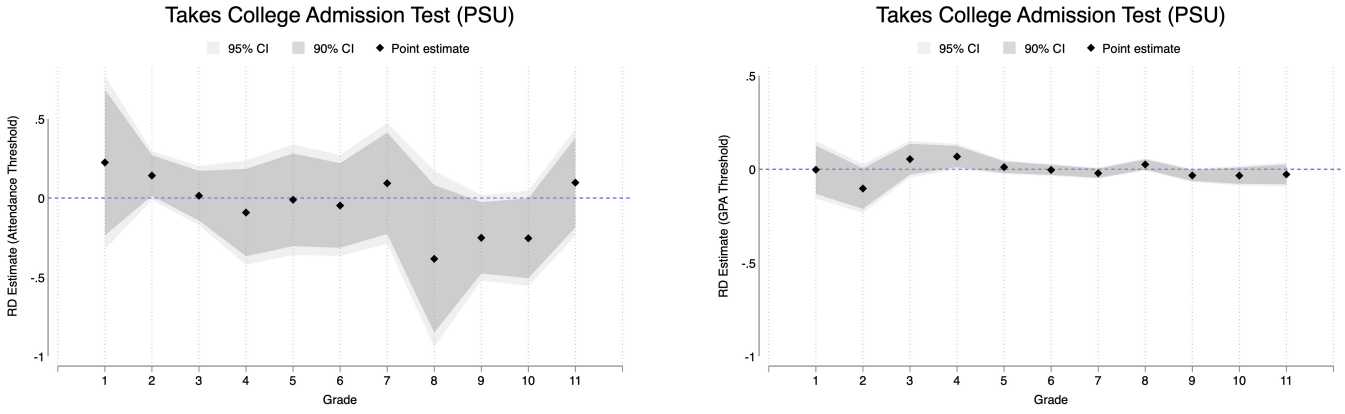


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 10 and 11. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 10: The Effect of Grade Retention on Taking the College Admissions Test (PSU)

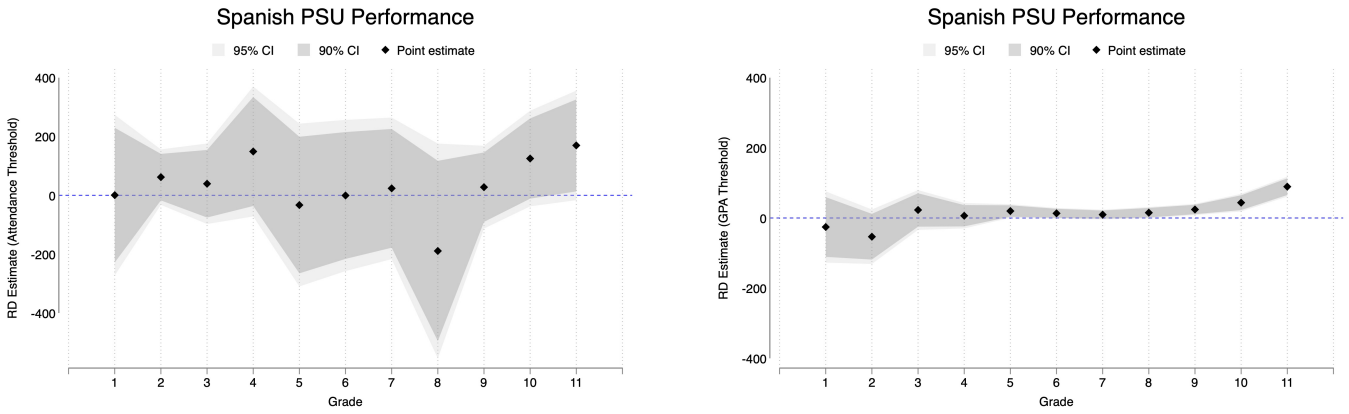


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 12 and 13. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 11: The Effect of Grade Retention on Spanish PSU Performance

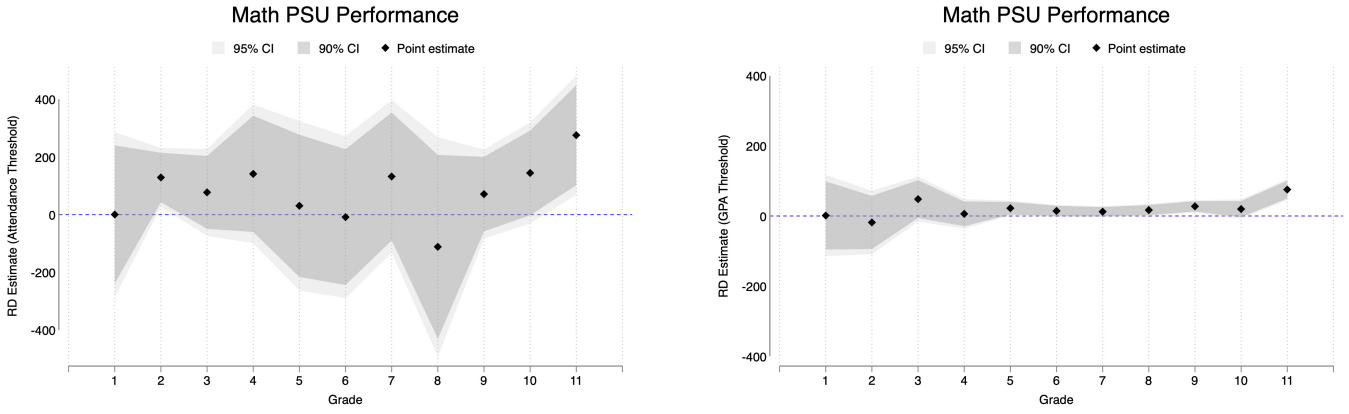


(a) Attendance Threshold

(b) GPA Threshold

Notes: This figure summarizes the results of Tables 14 and 15. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 12: The Effect of Grade Retention on Math PSU Performance



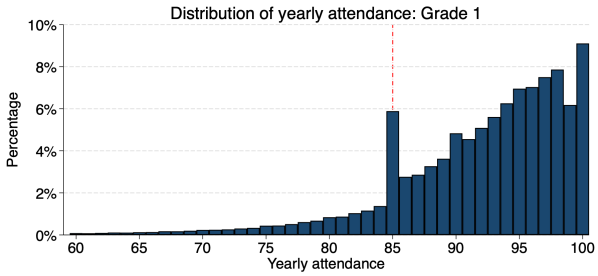
(a) Attendance Threshold

(b) GPA Threshold

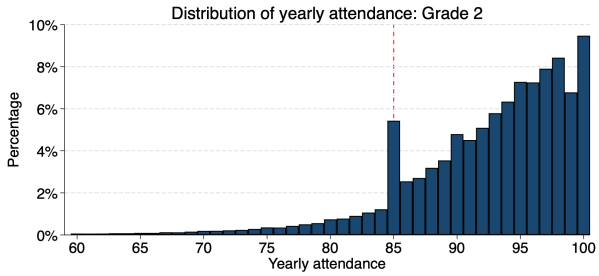
Notes: This figure summarizes the results of Tables 16 and 17. Each diamond marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Robust standard errors are clustered at the student level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

A Appendix

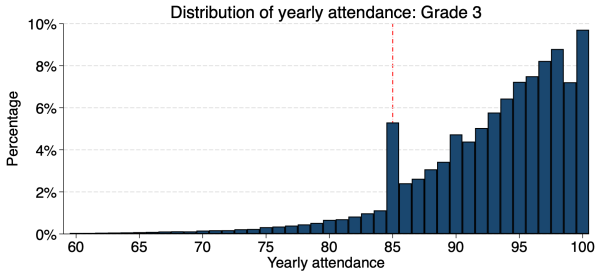
Figure A.1: Attendance Distribution for Grades 1 to 8



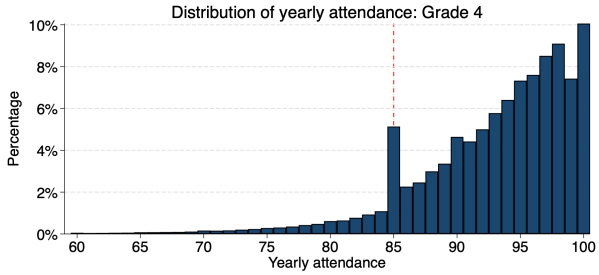
(a) Grade 1



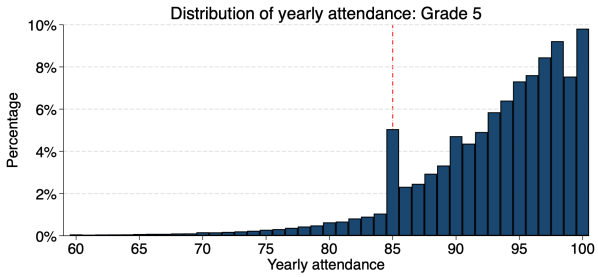
(b) Grade 2



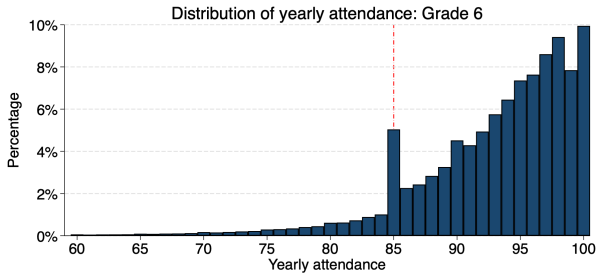
(c) Grade 3



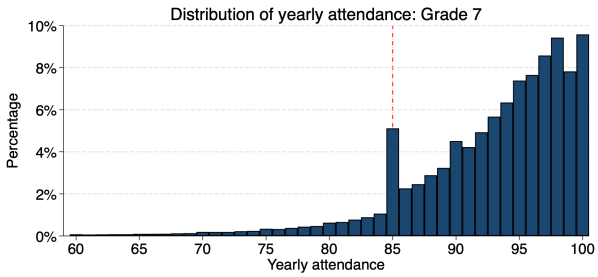
(d) Grade 4



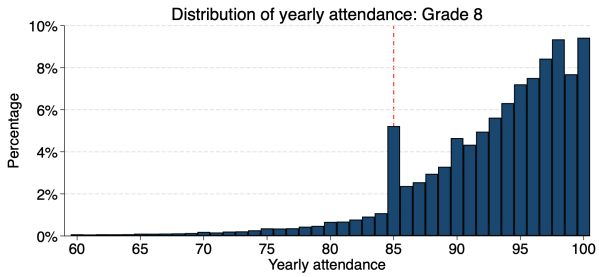
(e) Grade 5



(f) Grade 6



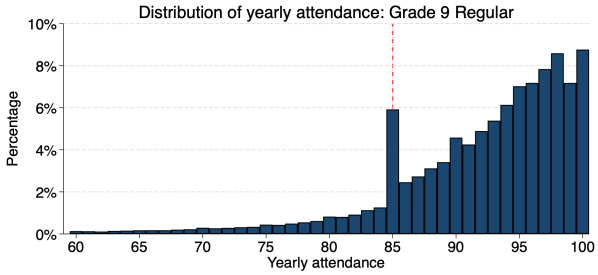
(g) Grade 7



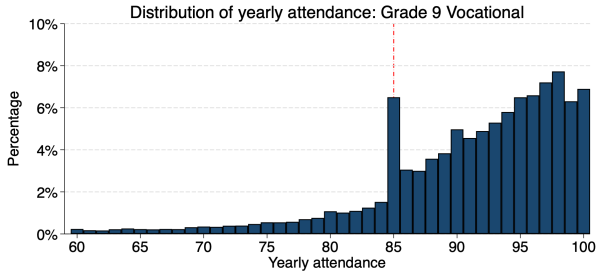
(h) Grade 8

Notes: These histograms show separately, for grades 1-8, the frequency of end-of-year attendance for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. The red vertical dashed line indicates the attendance threshold established by law for automatic grade promotion.

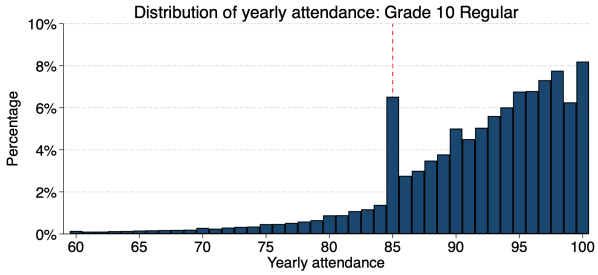
Figure A.2: Attendance Distribution for Grades 9 to 12



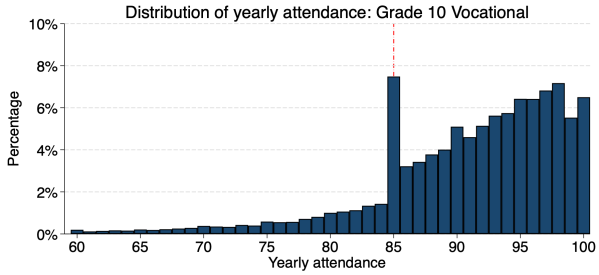
(a) Grade 9, Regular Education



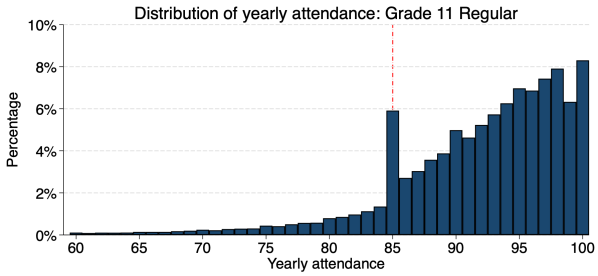
(b) Grade 9, Vocational Education



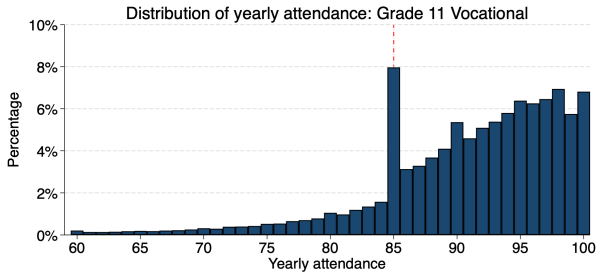
(c) Grade 10, Regular Education



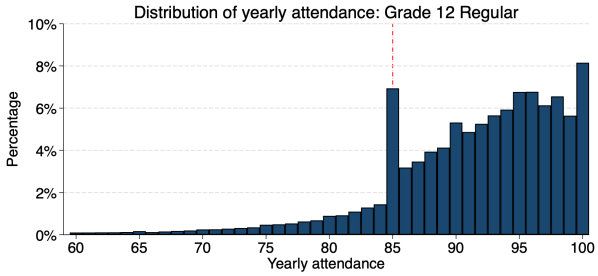
(d) Grade 10, Vocational Education



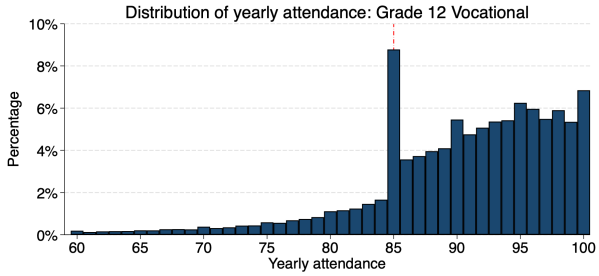
(e) Grade 11, Regular Education



(f) Grade 11, Vocational Education



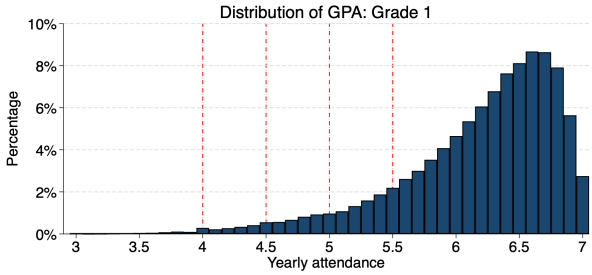
(g) Grade 12, Regular Education



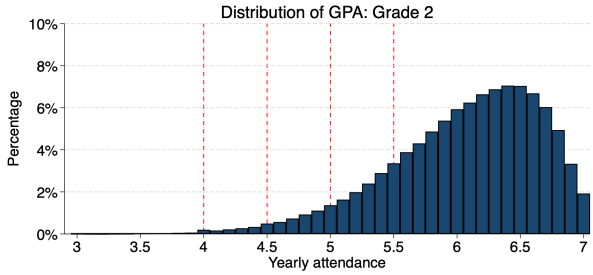
(h) Grade 12, Vocational Education

Notes: These histograms show separately, for grades 9-12 and by type of education, regular or vocational, the frequency of end-of-year attendance for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. The red vertical dashed line indicates the attendance threshold established by law for automatic grade promotion.

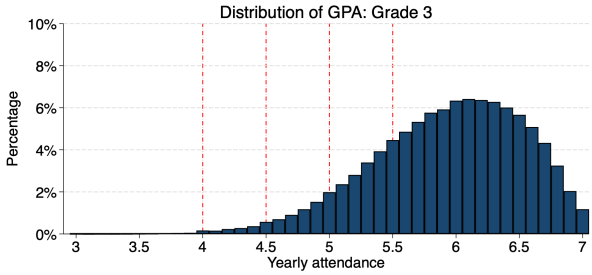
Figure A.3: Grade Point Average Distribution for Grades 1 to 8



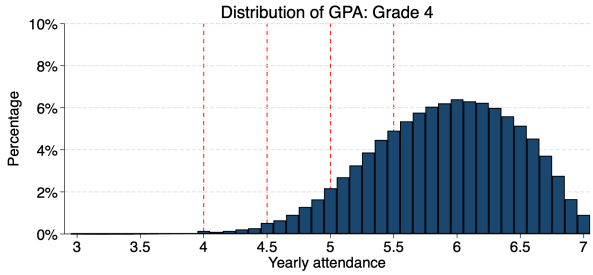
(a) Grade 1



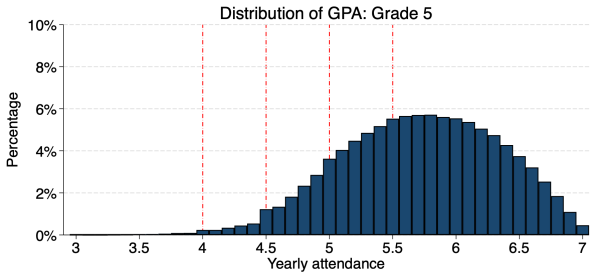
(b) Grade 2



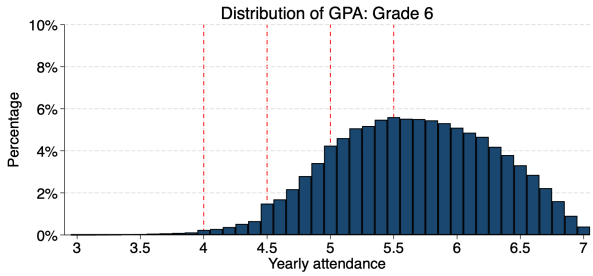
(c) Grade 3



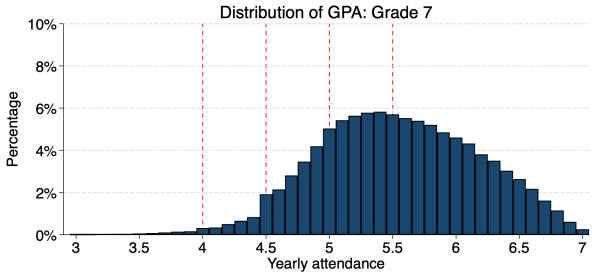
(d) Grade 4



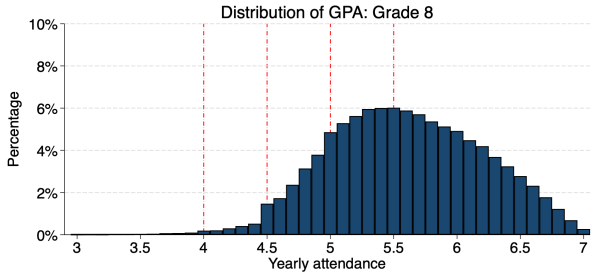
(e) Grade 5



(f) Grade 6



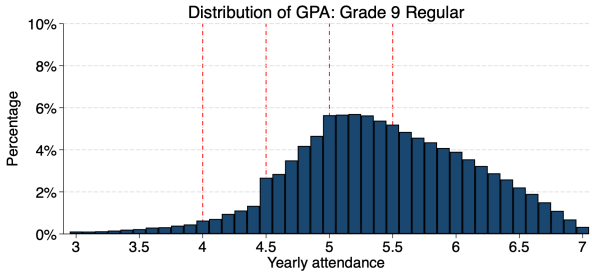
(g) Grade 7



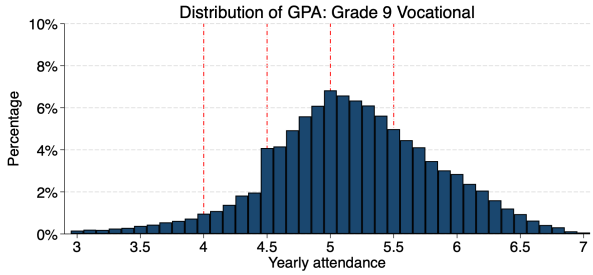
(h) Grade 8

Notes: These histograms show separately, for grades 1-8, the frequency of end-of-year GPA for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. The red vertical dashed lines indicate the GPA thresholds established by law for automatic grade promotion.

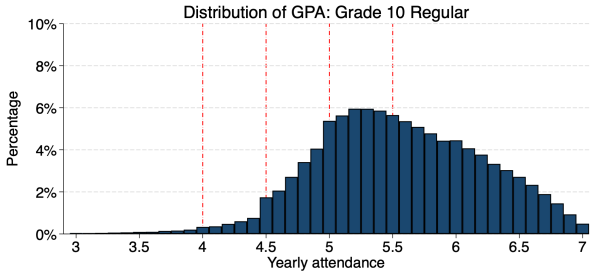
Figure A.4: Grade Point Average Distribution for Grades 9 to 12



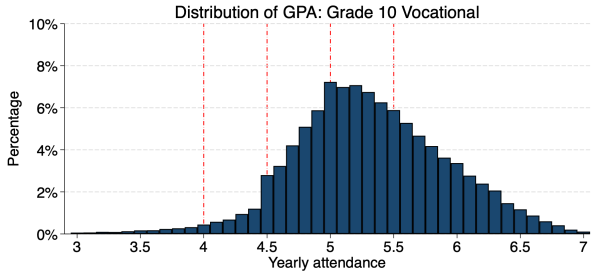
(a) Grade 9, Regular Education



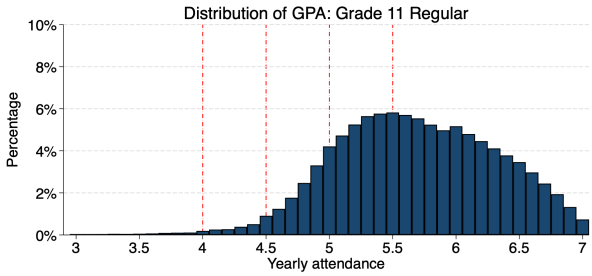
(b) Grade 9, Vocational Education



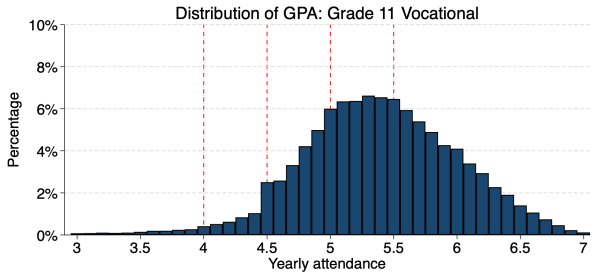
(c) Grade 10, Regular Education



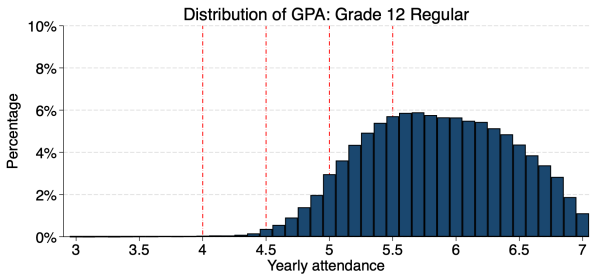
(d) Grade 10, Vocational Education



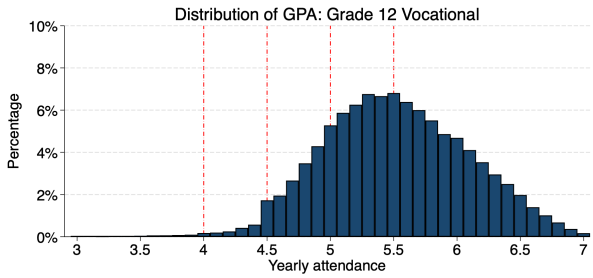
(e) Grade 11, Regular Education



(f) Grade 11, Vocational Education



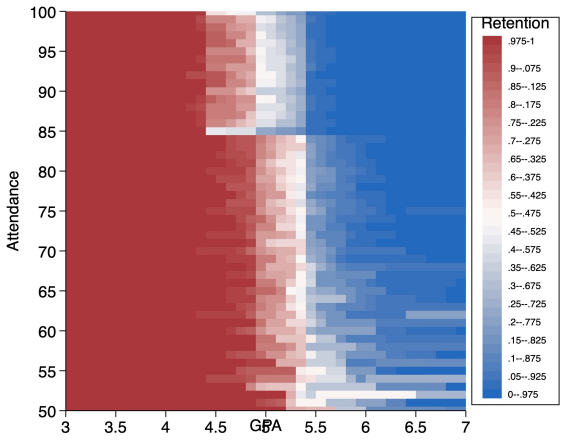
(g) Grade 12, Regular Education



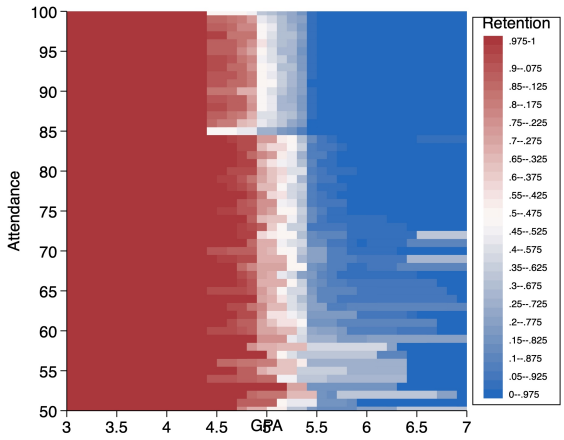
(h) Grade 12, Vocational Education

Notes: These histograms show separately, for grades 9-12 and by type of education, regular or vocational, the frequency of end-of-year attendance for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. The red vertical dashed lines indicate the GPA thresholds established by law for automatic grade promotion.

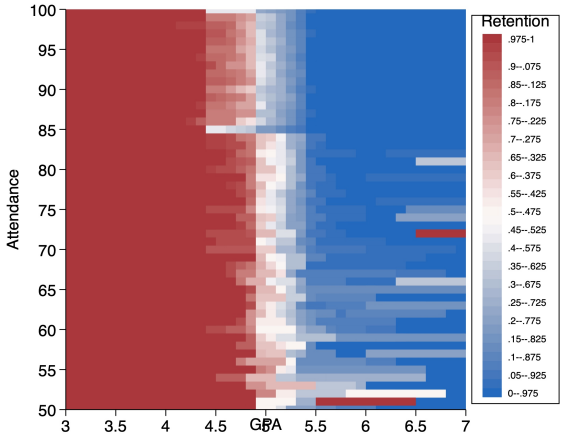
Figure A.5: Proportion of Retained Students by Attendance and GPA for Grades 1 to 6



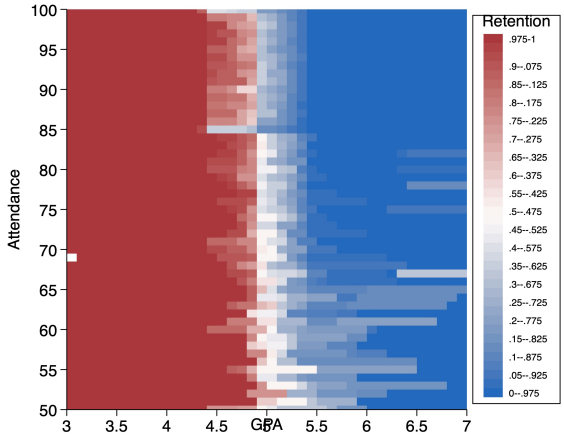
(a) Grade 1



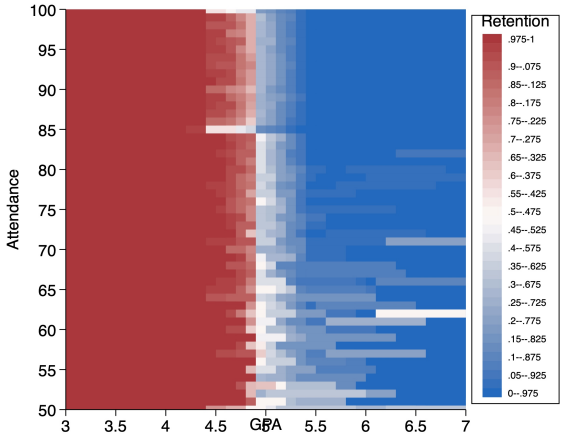
(b) Grade 2



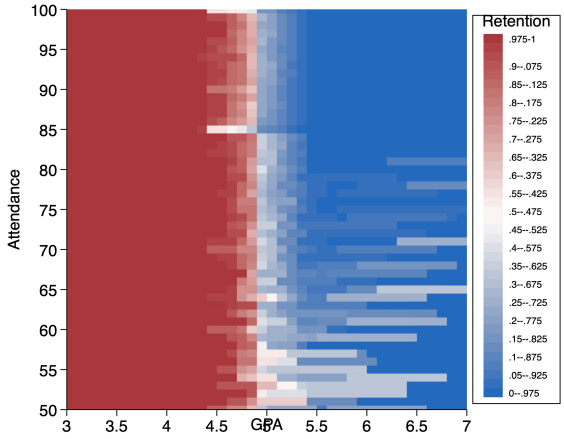
(c) Grade 3



(d) Grade 4



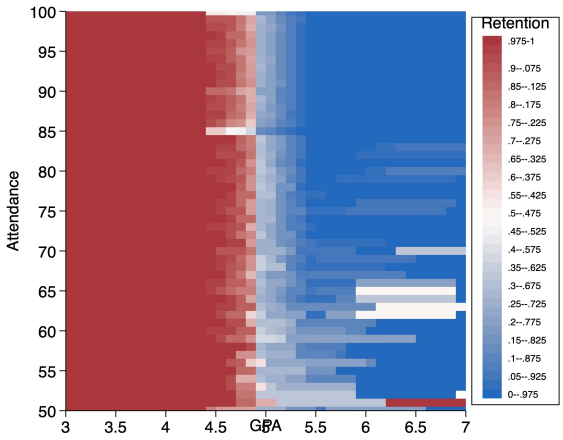
(e) Grade 5



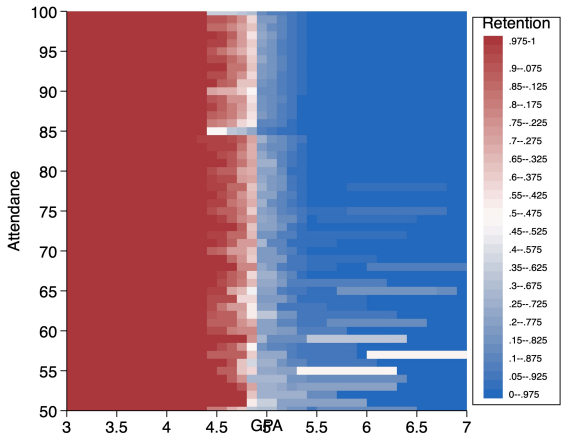
(f) Grade 6

Notes: These figures separately show, for grades 1-6, the proportion of students retained for each combination of attendance and GPA for students who entered the first grade from 2005 to 2007 and were born between 1998 and 2001. Each color represents the proportion of students retained, pooled in intervals with a 5-percentage point range. For visualization purposes, the sample is restricted to students with attendance between 50 and 100, and GPA between 3 and 7.

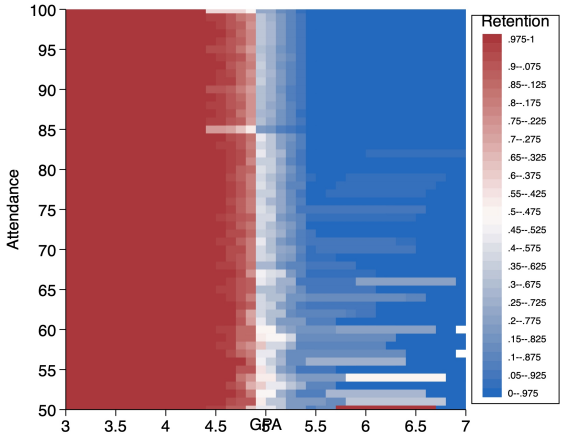
Figure A.6: Proportion of Retained Students by Attendance and GPA for Grades 7 to 12



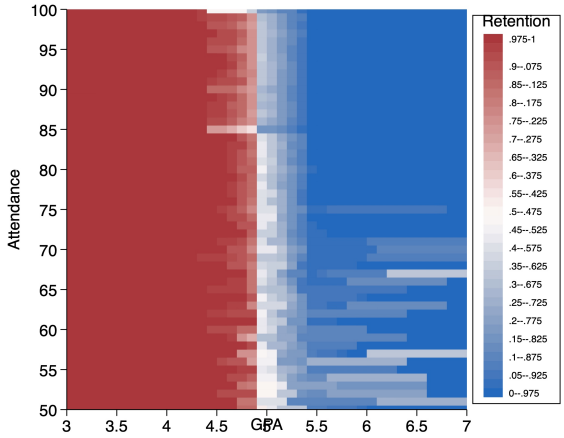
(a) Grade 7



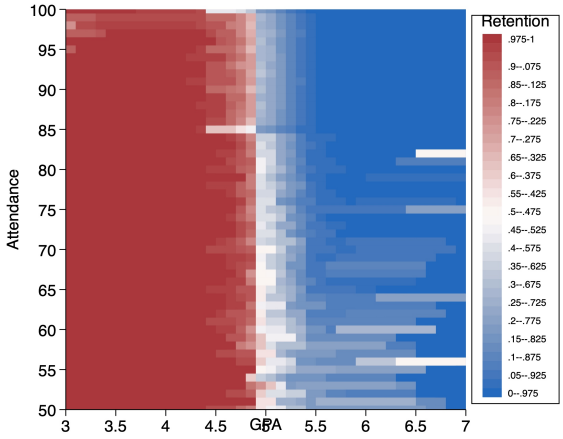
(b) Grade 8



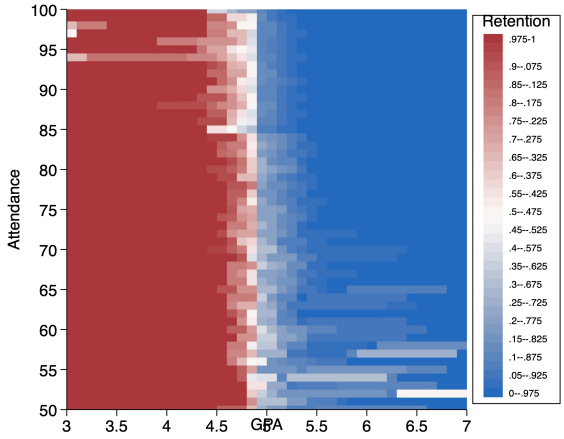
(c) Grade 9



(d) Grade 10



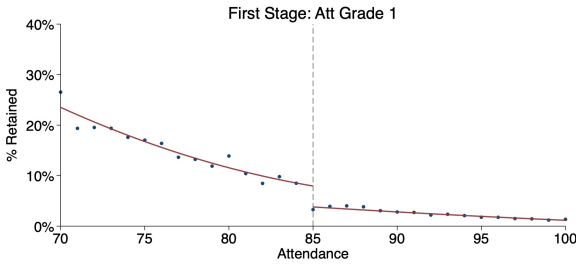
(e) Grade 11



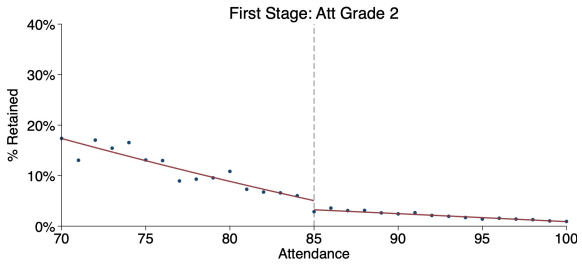
(f) Grade 12

Notes: These figures separately show, for grades 7-12, the proportion of students retained for each combination of attendance and GPA for students who entered the first grade from 2005 to 2007 and were born between 1998 and 2001. Each color represents the proportion of students retained, pooled in intervals with a 5-percentage point range. For visualization purposes, the sample is restricted to students with attendance between 50 and 100, and GPA between 3 and 7

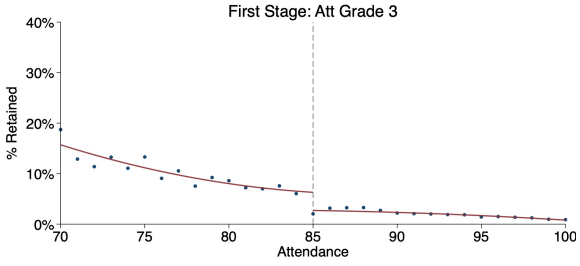
Figure A.7: Proportion of Retained Students by Attendance Level for Grades 1 to 8



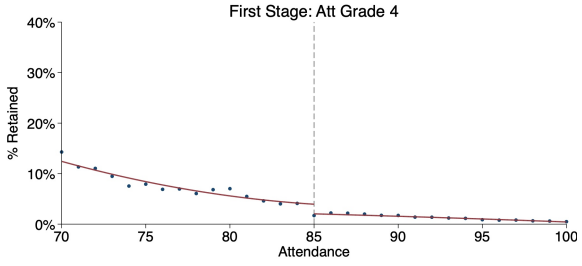
(a) Grade 1



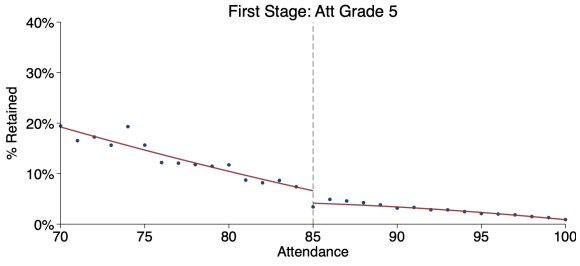
(b) Grade 2



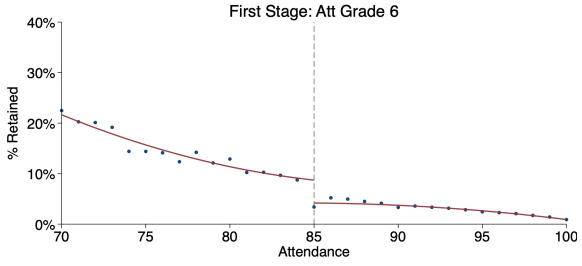
(c) Grade 3



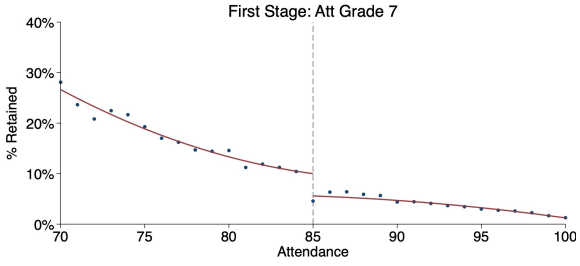
(d) Grade 4



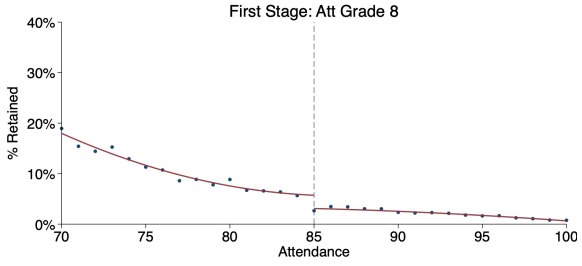
(e) Grade 5



(f) Grade 6



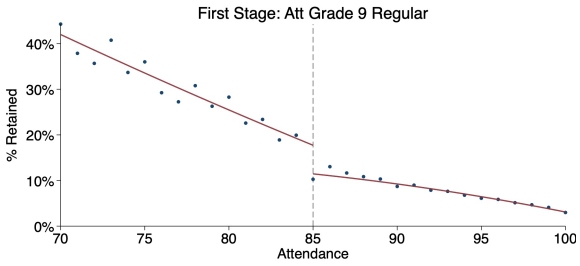
(g) Grade 7



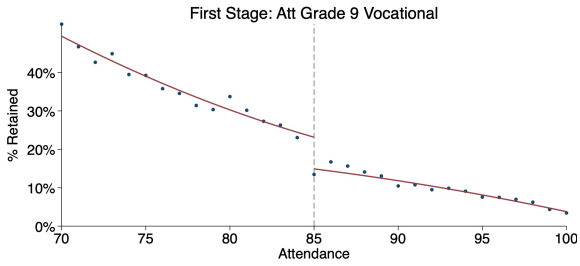
(h) Grade 8

Notes: These plots show separately, for grades 1-8, the proportion of students retained for each level of attendance at the end of the year for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. For visualization purposes, only students with attendance up to 15 percentage points away from the promotion cutoff are included. The vertical dashed line indicates the attendance threshold established by law for automatic grade promotion.

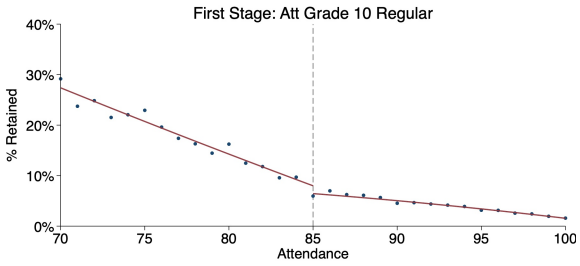
Figure A.8: Proportion of Retained Students by Attendance Level for Grades 9 to 12



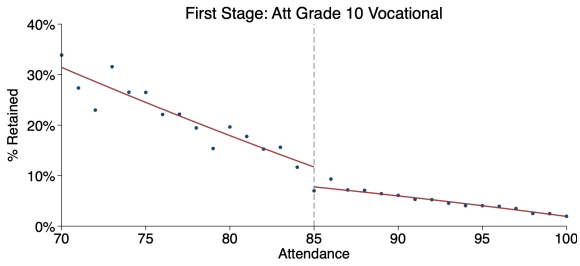
(a) Grade 9, Regular Education



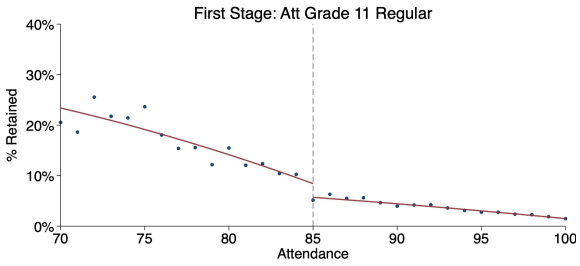
(b) Grade 9, Vocational Education



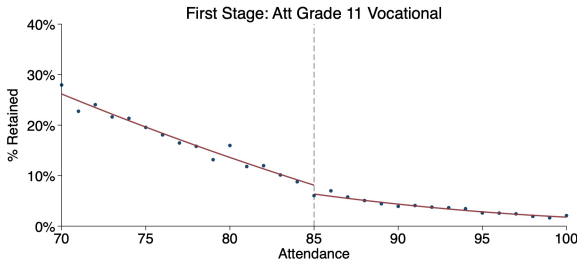
(c) Grade 10, Regular Education



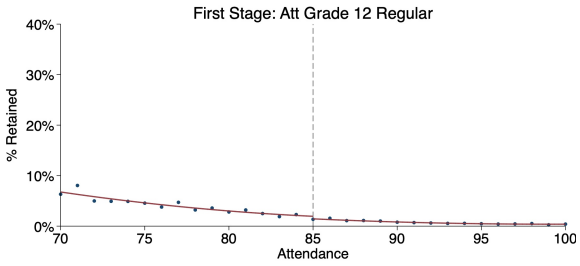
(d) Grade 10, Vocational Education



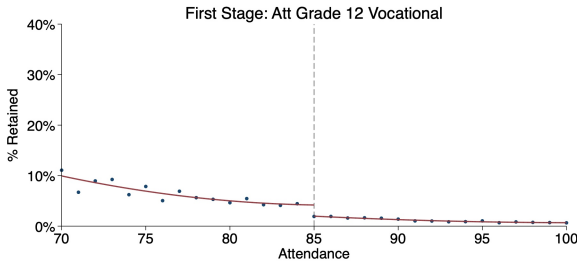
(e) Grade 11, Regular Education



(f) Grade 11, Vocational Education



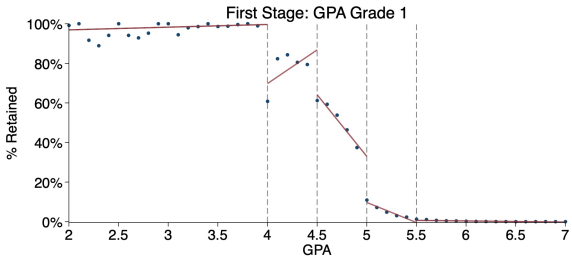
(g) Grade 12, Regular Education



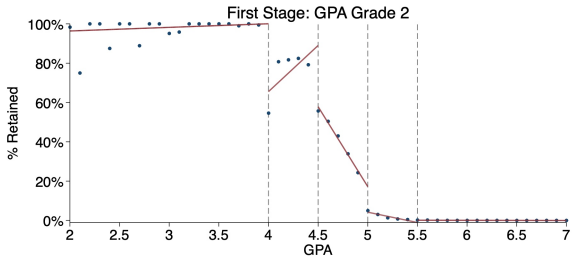
(h) Grade 12, Vocational Education

Notes: These plots show separately, for grades 9-12 and by type of education, regular or vocational, the proportion of students retained for each level of attendance at the end of the year for students who entered first grade from 2005 to 2007 and were born between 1998 and 2001. For visualization purposes, only students with attendance up to 15 percentage points away from the promotion cutoff are included. The vertical dashed line indicates the attendance threshold established by law for automatic grade promotion.

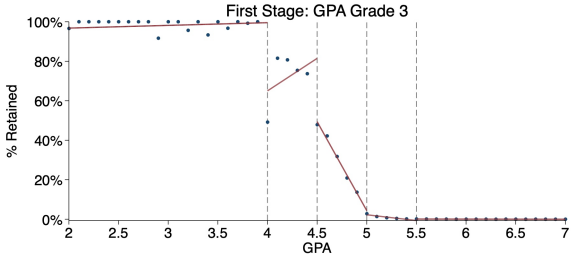
Figure A.9: Proportion of Retained Students by GPA Level for Grades 1 to 8



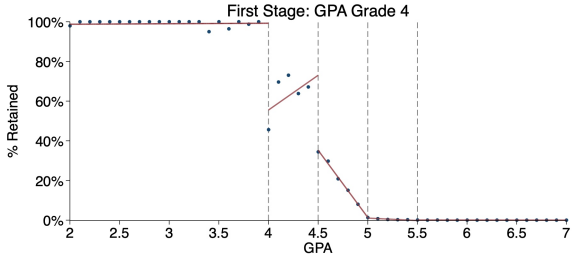
(a) Grade 1



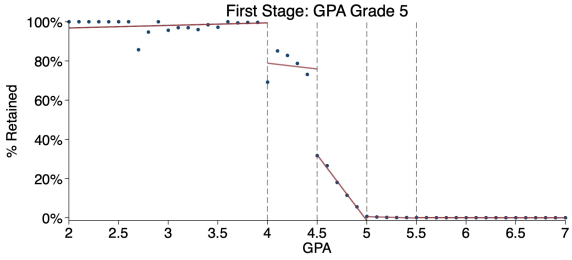
(b) Grade 2



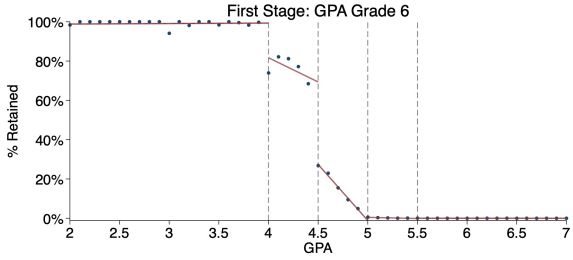
(c) Grade 3



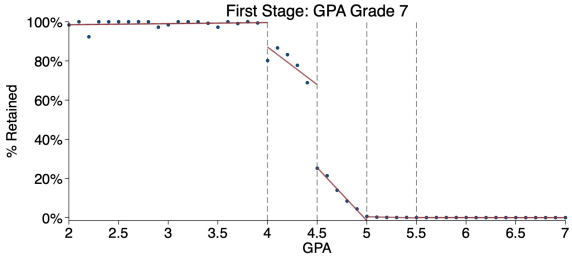
(d) Grade 4



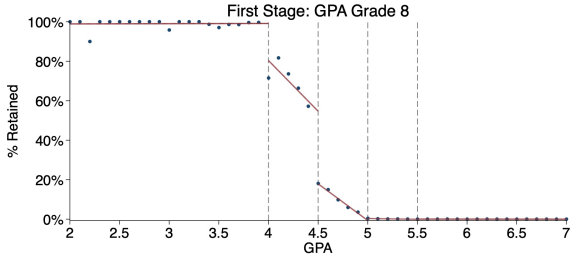
(e) Grade 5



(f) Grade 6



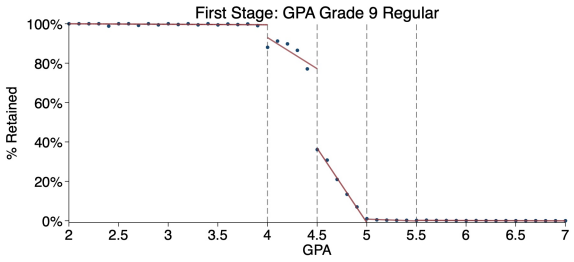
(g) Grade 7



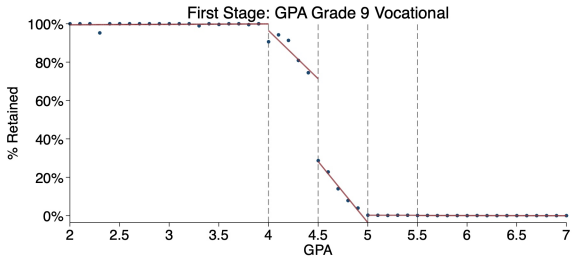
(h) Grade 8

Notes: These histograms show separately, for grades 1-8, the proportion of students retained for each level of attendance at the end of the year for students who entered the first grade from 2005 to 2007 and were born between 1998 and 2001. Vertical dashed lines indicate the GPA thresholds established by law for automatic grade promotion.

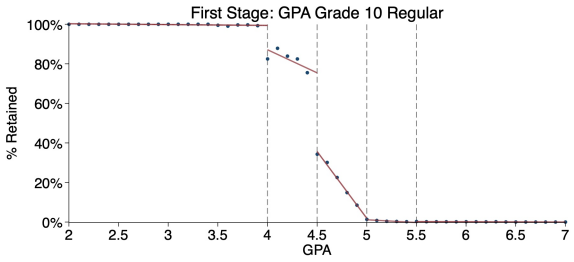
Figure A.10: Proportion of Retained Students by GPA Level for Grades 9 to 12



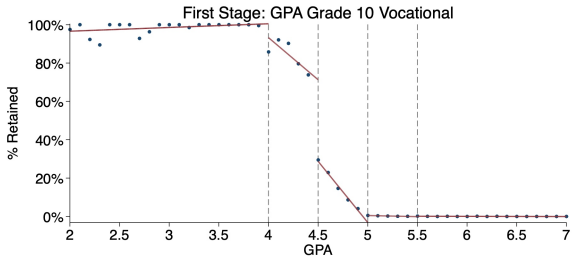
(a) Grade 9, Regular Education



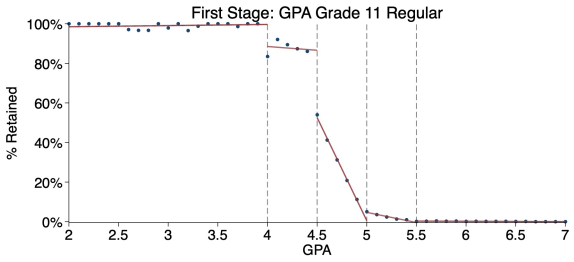
(b) Grade 9, Vocational Education



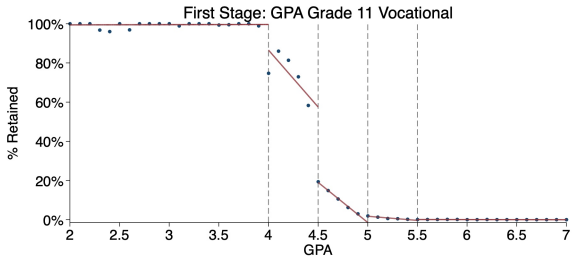
(c) Grade 10, Regular Education



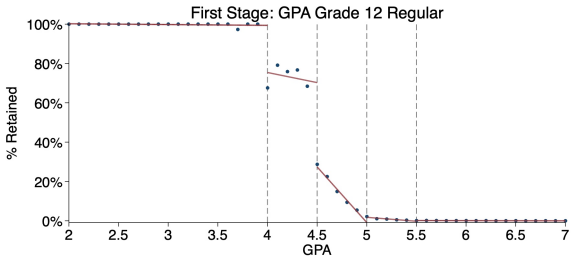
(d) Grade 10, Vocational Education



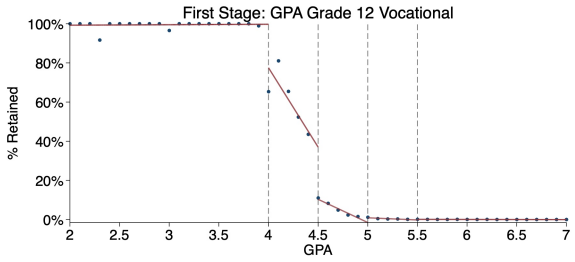
(e) Grade 11, Regular Education



(f) Grade 11, Vocational Education



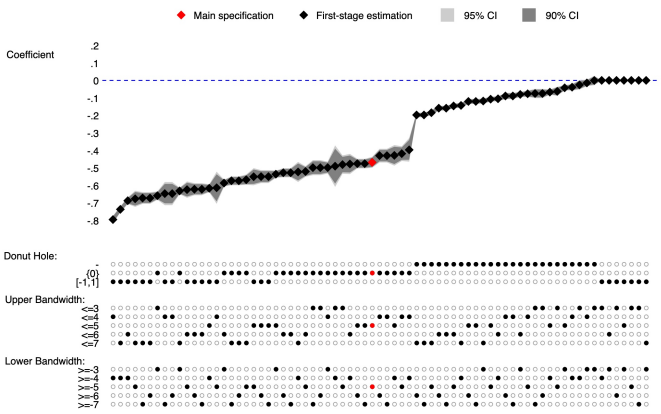
(g) Grade 12, Regular Education



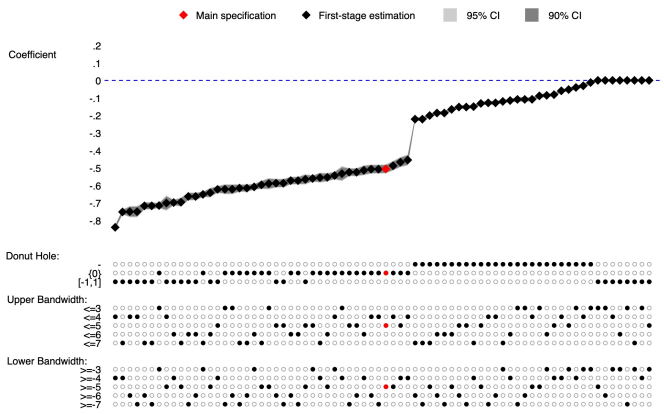
(h) Grade 12, Vocational Education

Notes: These histograms show separately, for grades 9-12 and by type of education, regular or vocational, the proportion of students retained for each level of attendance at the end of the year for students who entered the first grade from 2005 to 2007 and were born between 1998 and 2001. Vertical dashed lines indicate the GPA thresholds established by law for automatic grade promotion.

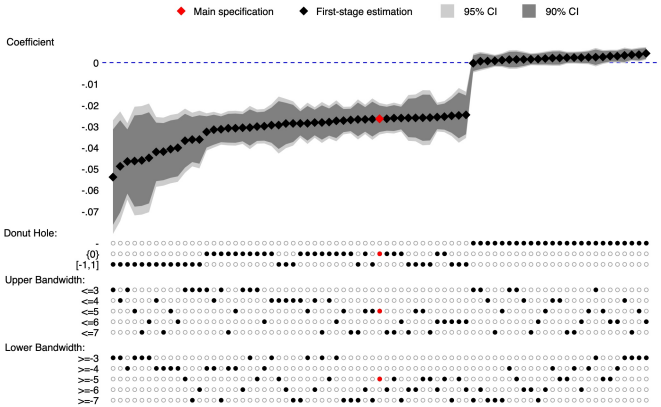
Figure A.11: Robustness to Parameter Selection



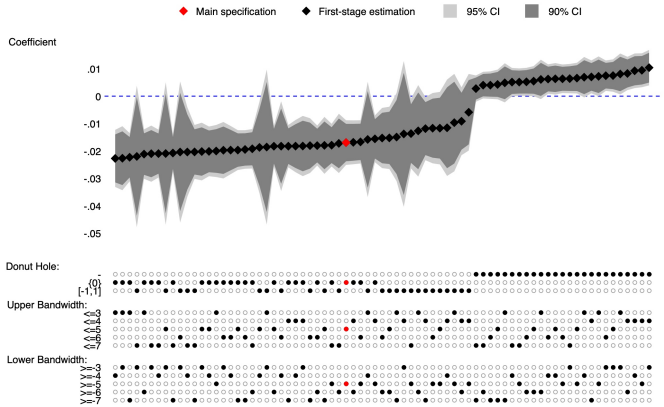
(a) Grade 4 - GPA



(b) Grade 9 - GPA



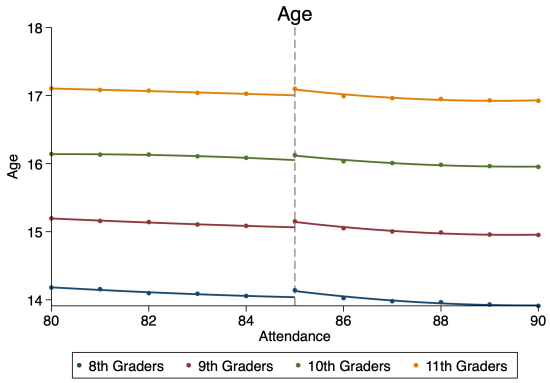
(c) Grade 4 - Attendance



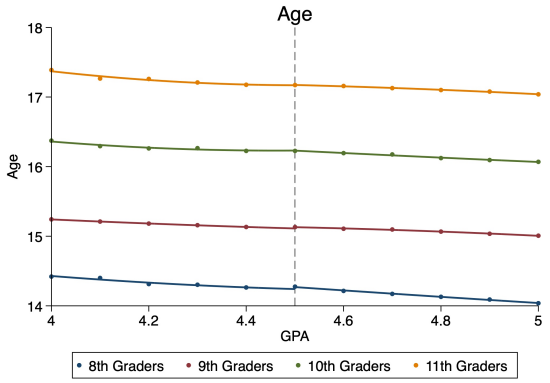
(d) Grade 9 - Attendance

Notes: These figures summarize the first-stage regression results, where each diamond marker represents the results for the first-stage jump for the fourth grade (top) and ninth grade (bottom) for different combinations of bandwidth and donut hole sizes, separately by estimation sample. Shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

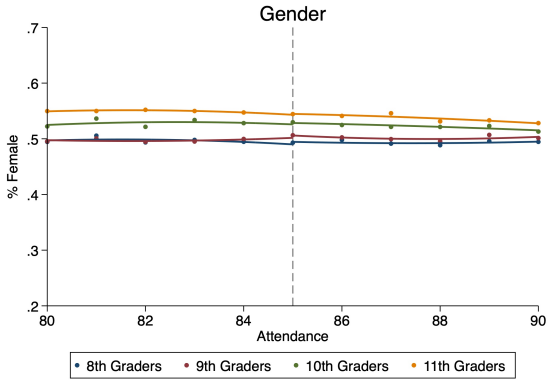
Figure A.12: Smoothnes of Covariates around the Retention Threshold



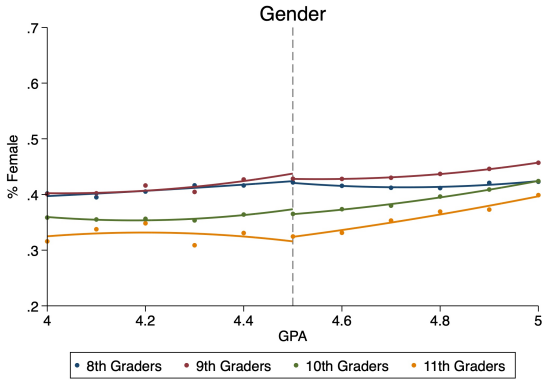
(a) Age



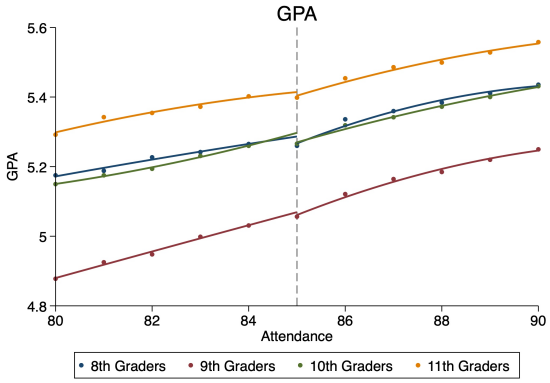
(b) Age



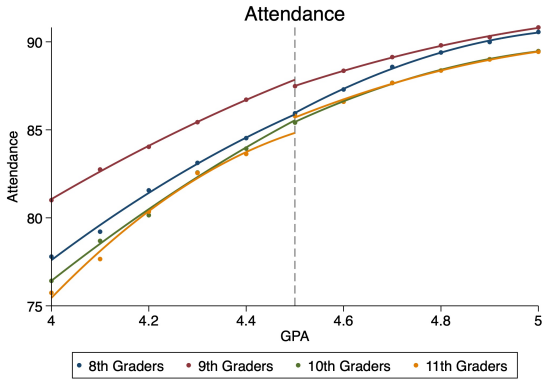
(c) Gender



(d) Gender



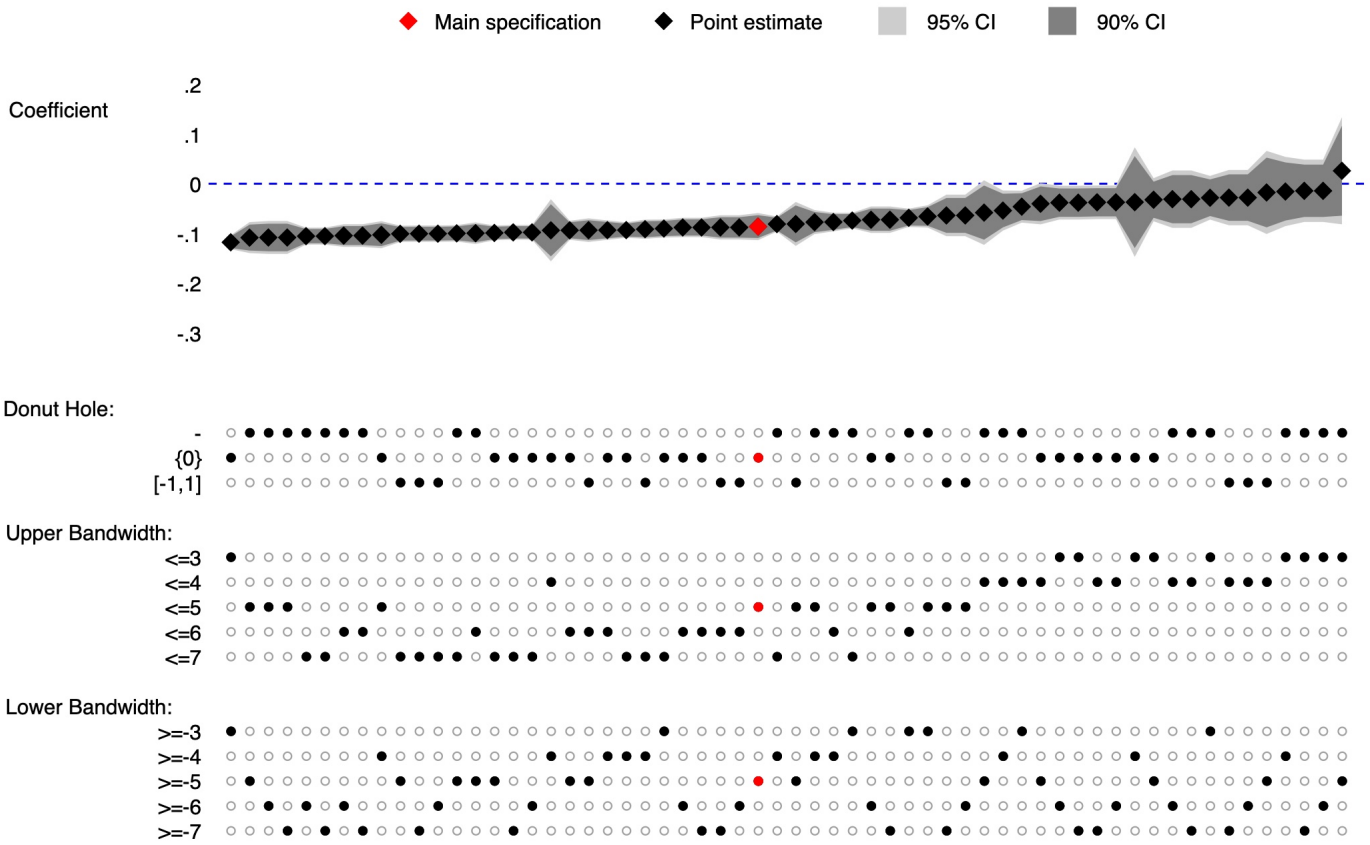
(e) GPA



(f) Attendance

Notes: These figures separately show the average characteristics of students who entered the first grade from 2005 to 2007, were born between 1998 and 2001, and are close to one of the promotion cutoffs. Subfigures on the left-hand side include students who have an attendance level up to five percentage points away from the attendance promotion threshold, while subfigures on the right-hand side include students who have a GPA up to 0.5 points away from the GPA promotion threshold. Average values are plotted in different colors for samples in each grade. Each color represents the proportion of students retained, pooled in intervals with a 5-percentage point range. Vertical dashed lines indicate the promotion threshold of relevance for each sample.

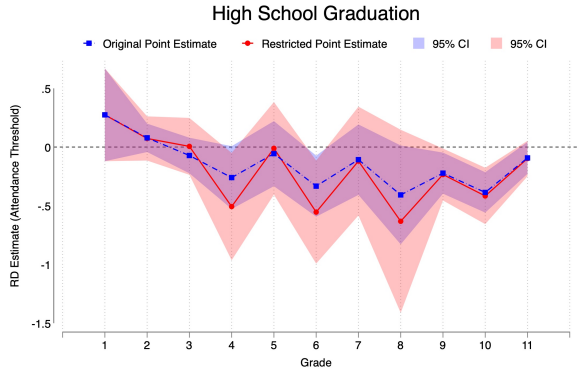
Figure A.13: Robustness to Bandwidth and Donut Hole Selection



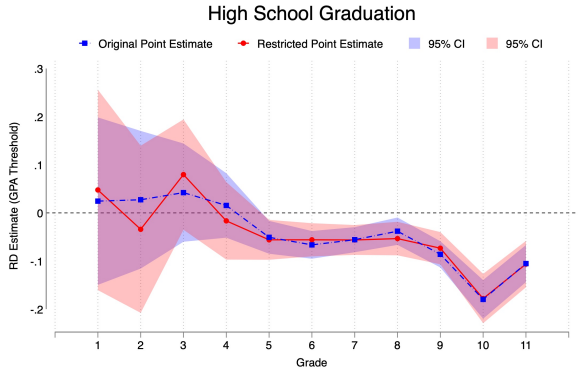
(a) High-school completion for ninth graders with GPA promotion threshold.

Notes: Each diamond marker represents the results for the effect of retention in the ninth grade on high school graduation for different combinations of bandwidth and donut hole sizes. Shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

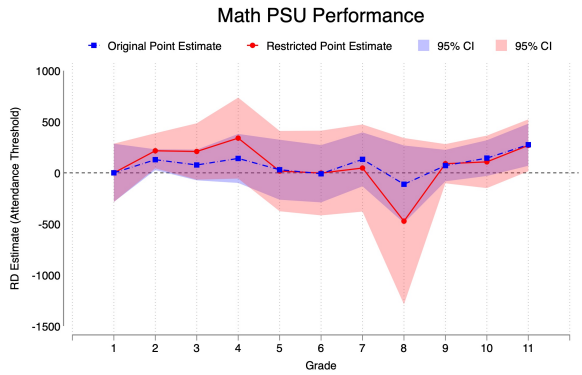
Figure A.14: Robustness to Exclusion of Students Simultaneously on Both Margins



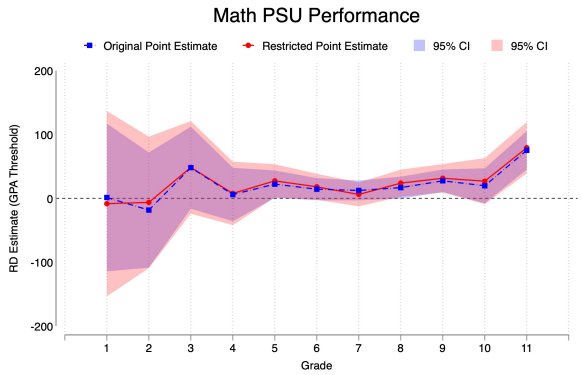
(a) Attendance Threshold



(b) GPA Threshold



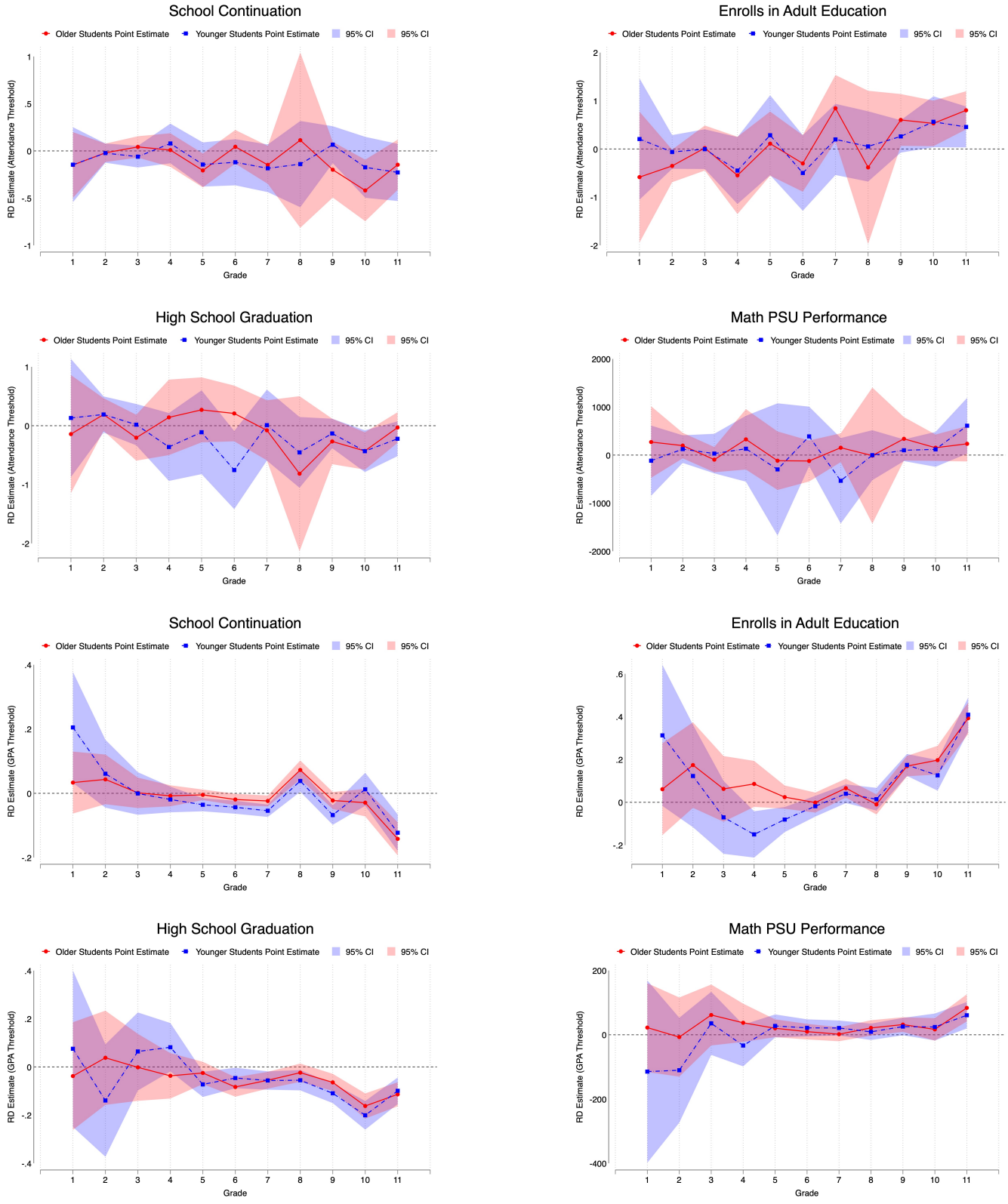
(c) Attendance Threshold



(d) GPA Threshold

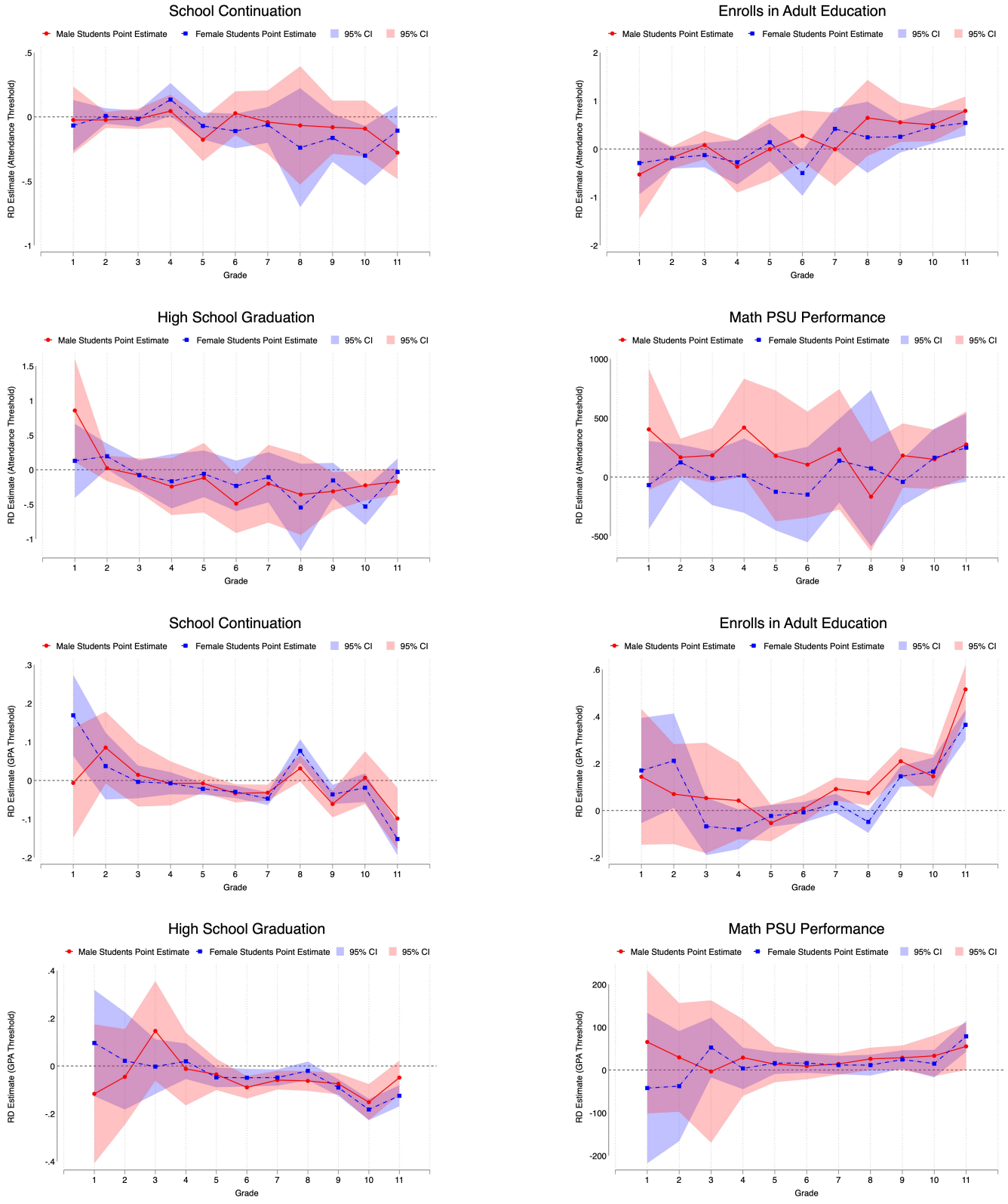
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are the original results and in blue, indicated with a dashed line and square markers, are the ones that exclude students who are on both retention risk samples. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.15: Heterogeneity in Results by Age



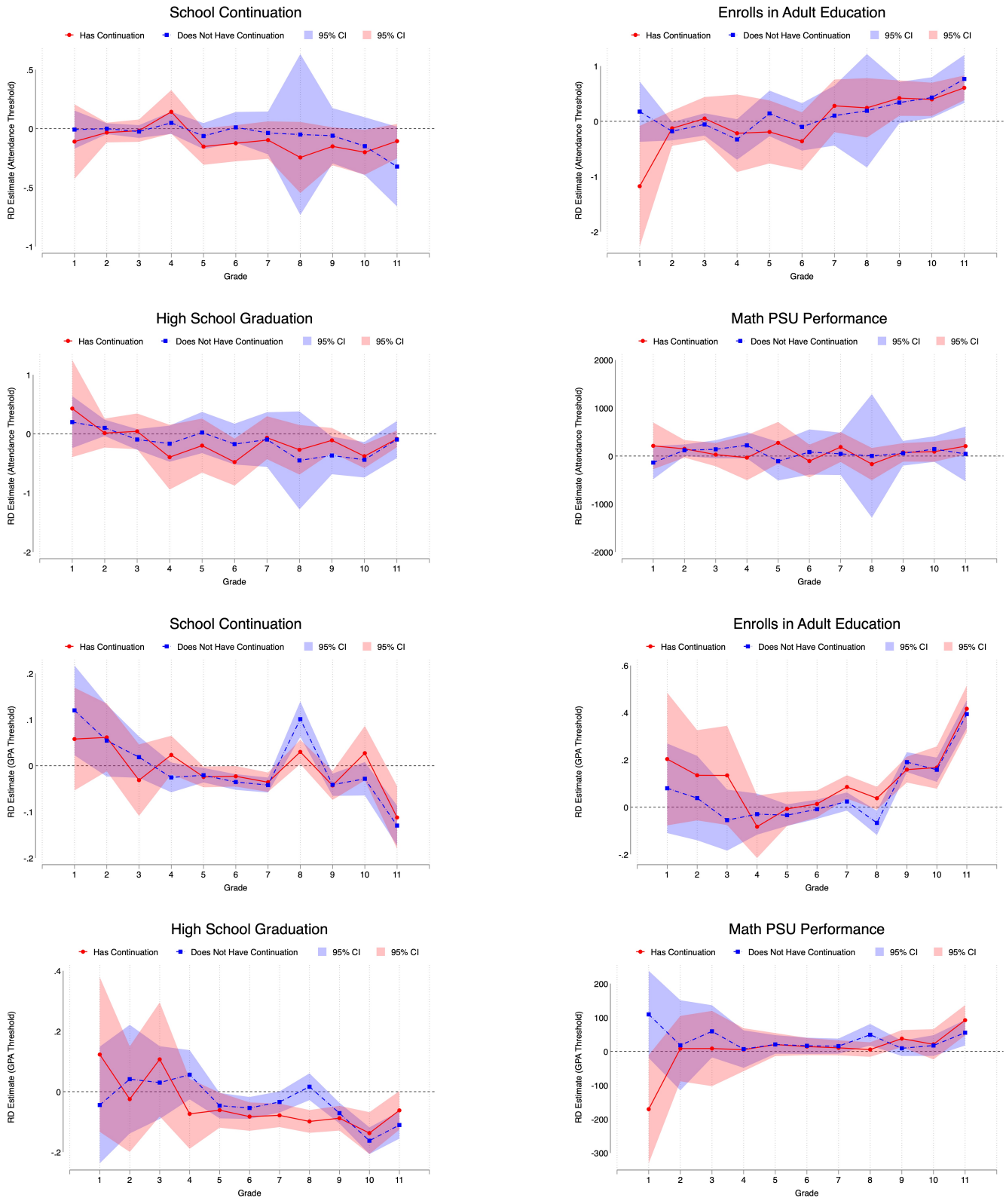
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for older students, and in blue, indicated with a dashed line and square markers, are results for younger students. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.16: Heterogeneity in Results by Gender



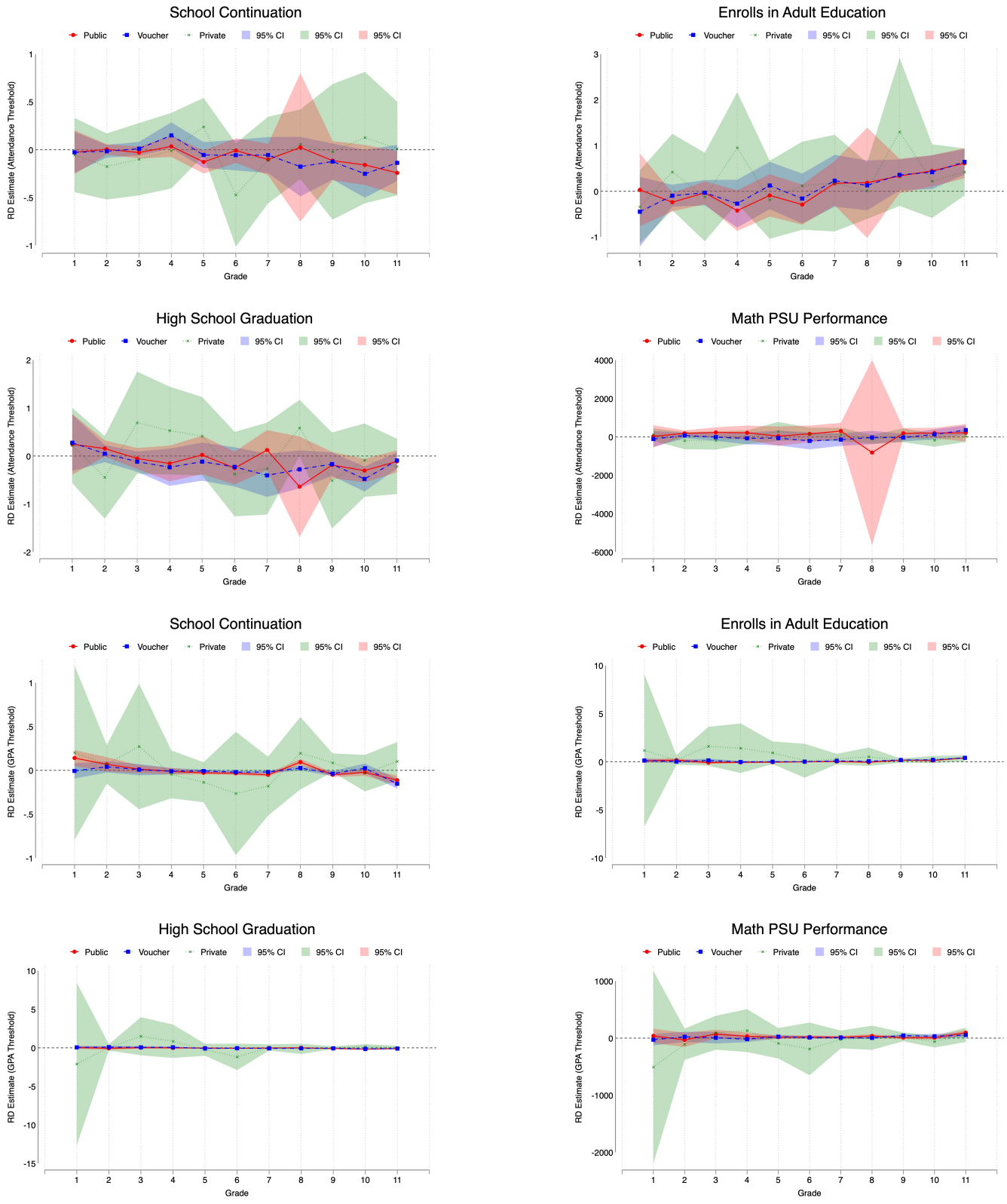
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for male students, and in blue, indicated with a dashed line and square markers, are results for female students. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.17: Heterogeneity in Results by School Educational Offer



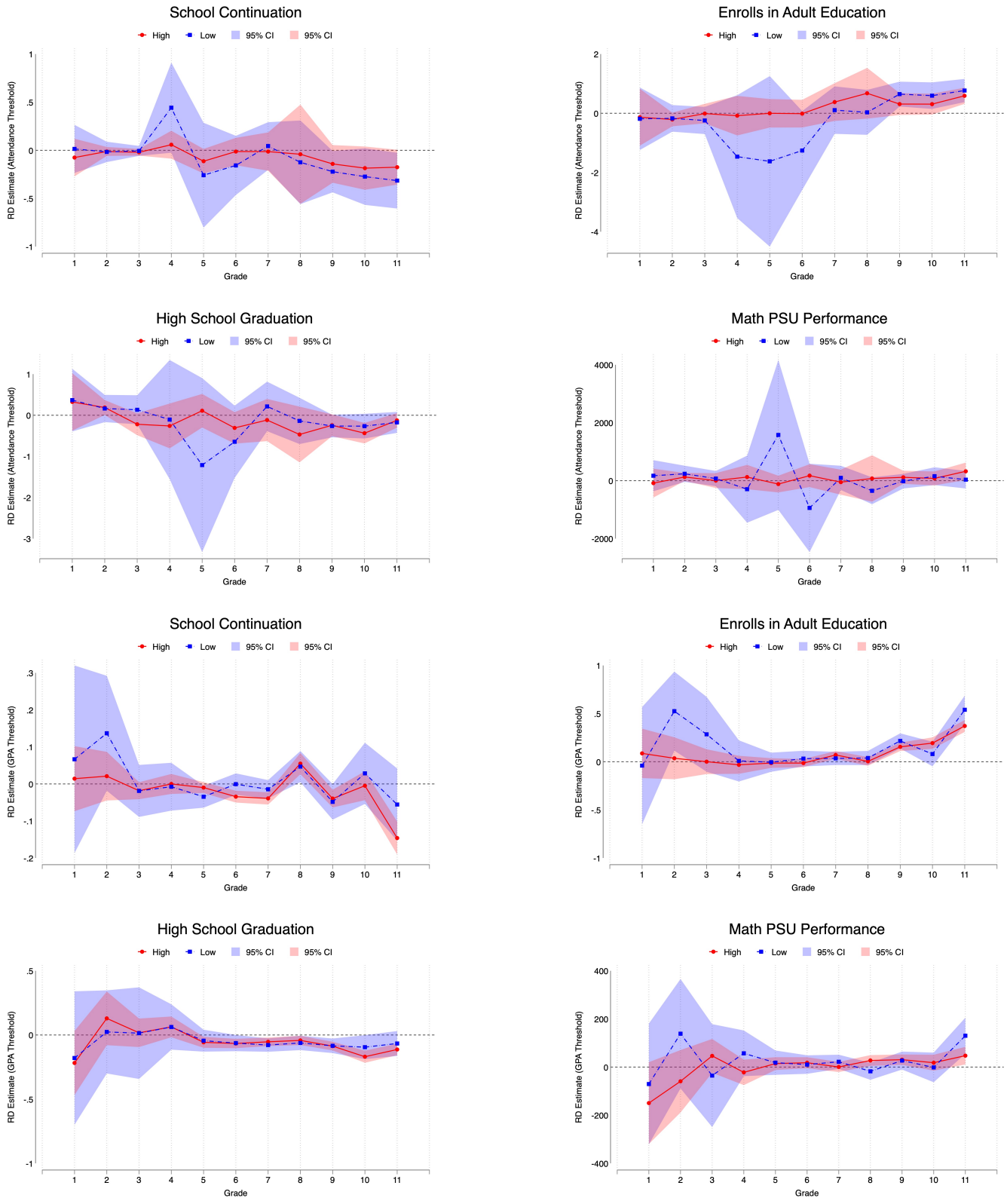
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students attending schools offering both primary and secondary education, and in blue, indicated with a dashed line and square markers, students in schools where only one of the two are offered. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.18: Heterogeneity in Results by Type of School



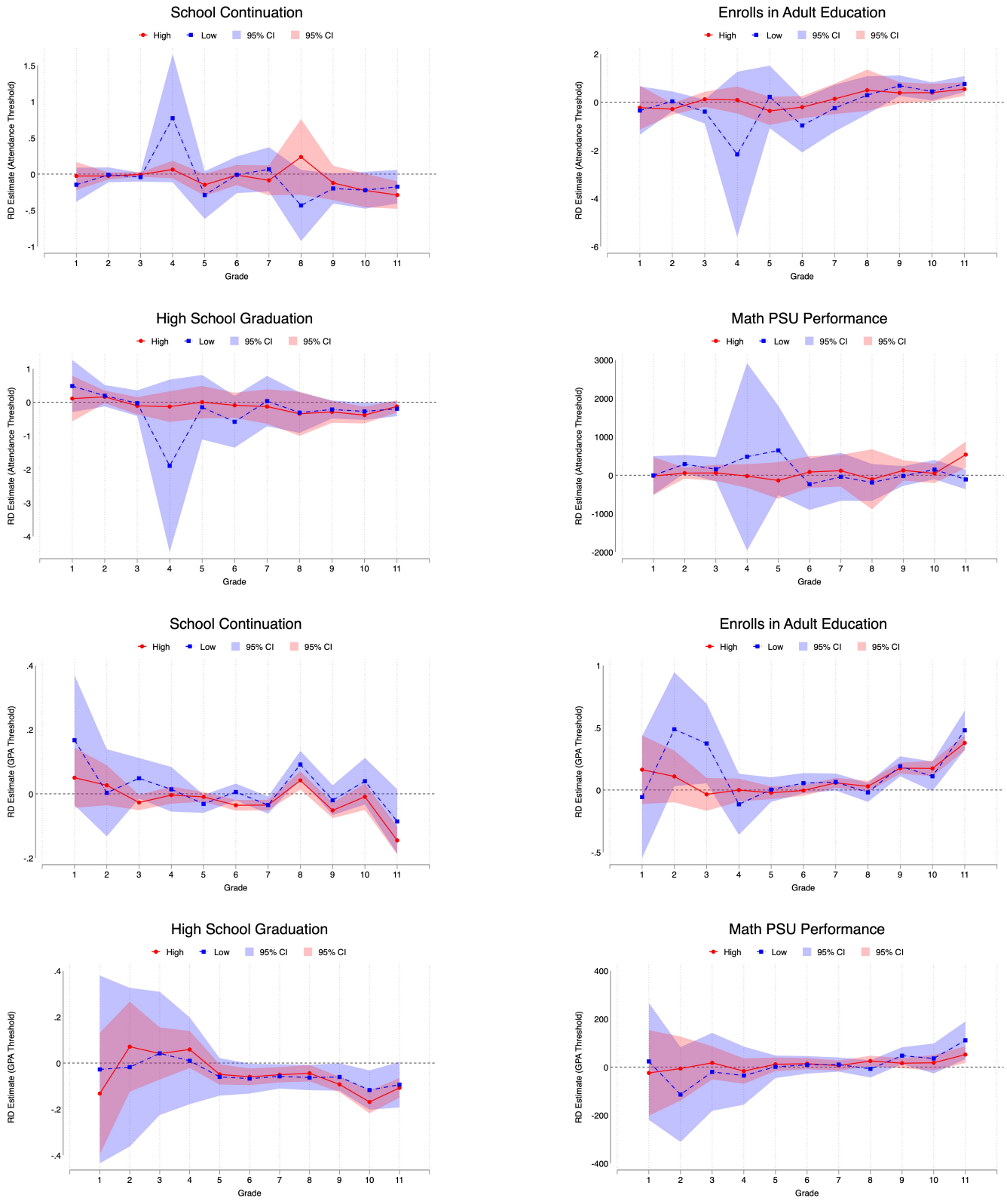
Notes: Three sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students attending public schools; in green, indicated by the dotted line and X-shaped markers, results for student attending private school, and in blue, indicated with a dashed line and square markers, results for students attending voucher schools. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.19: Heterogeneity in Results by 4th grade Spanish SIMCE results



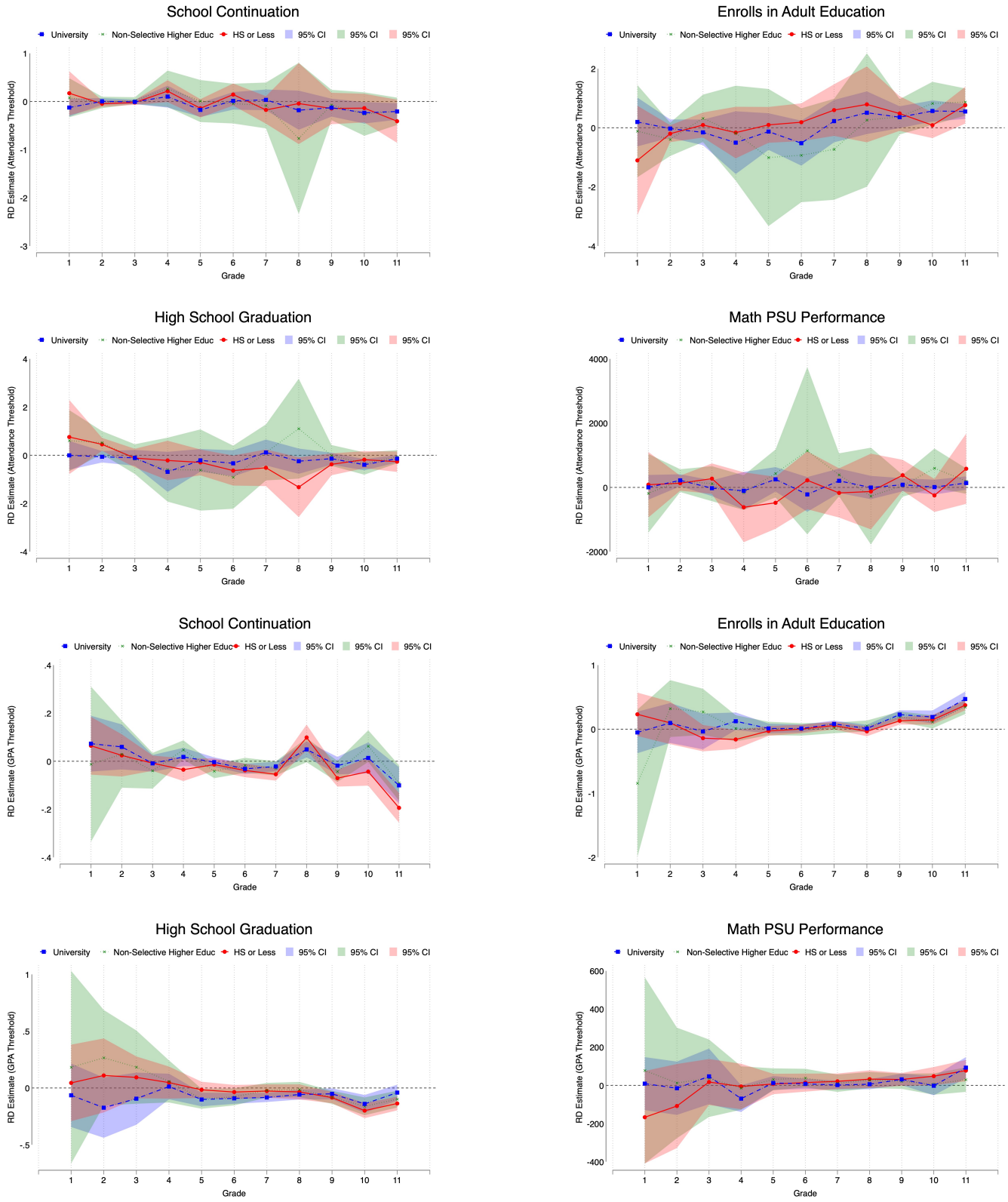
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students who scored above the median in the 4th-grade Spanish SIMCE test, and in blue, indicated with a dashed line and square markers, results for those who scored below the median. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Figure A.20: Heterogeneity in Results by 4th grade math SIMCE results



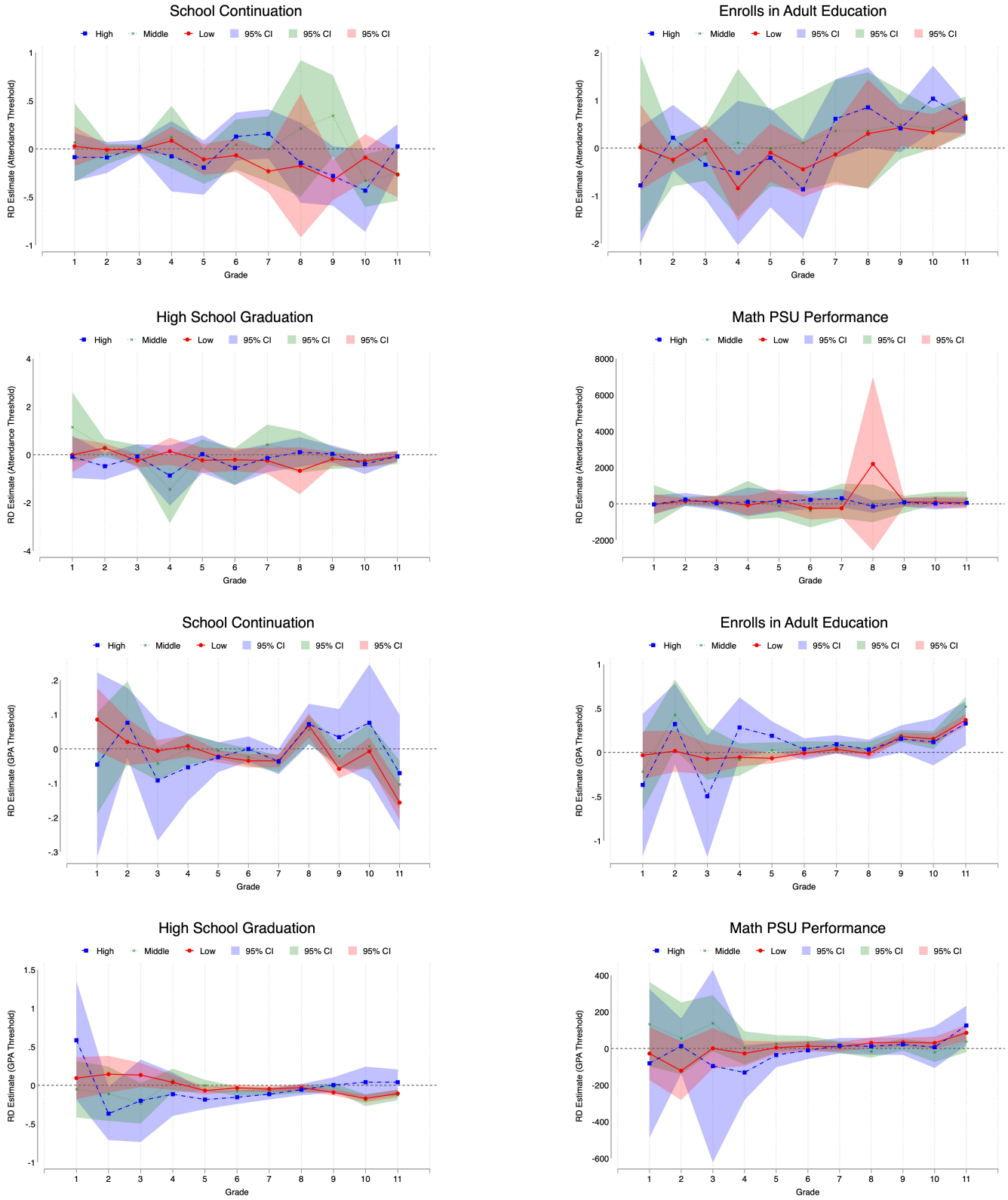
Notes: Two sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students who scored above the median in the 4th-grade math SIMCE test, and in blue, indicated with a dashed line and square markers, results for those who scored below the median. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.21: Heterogeneity in Results by Parental Expectations of Highest Degree to be Achieved by Student



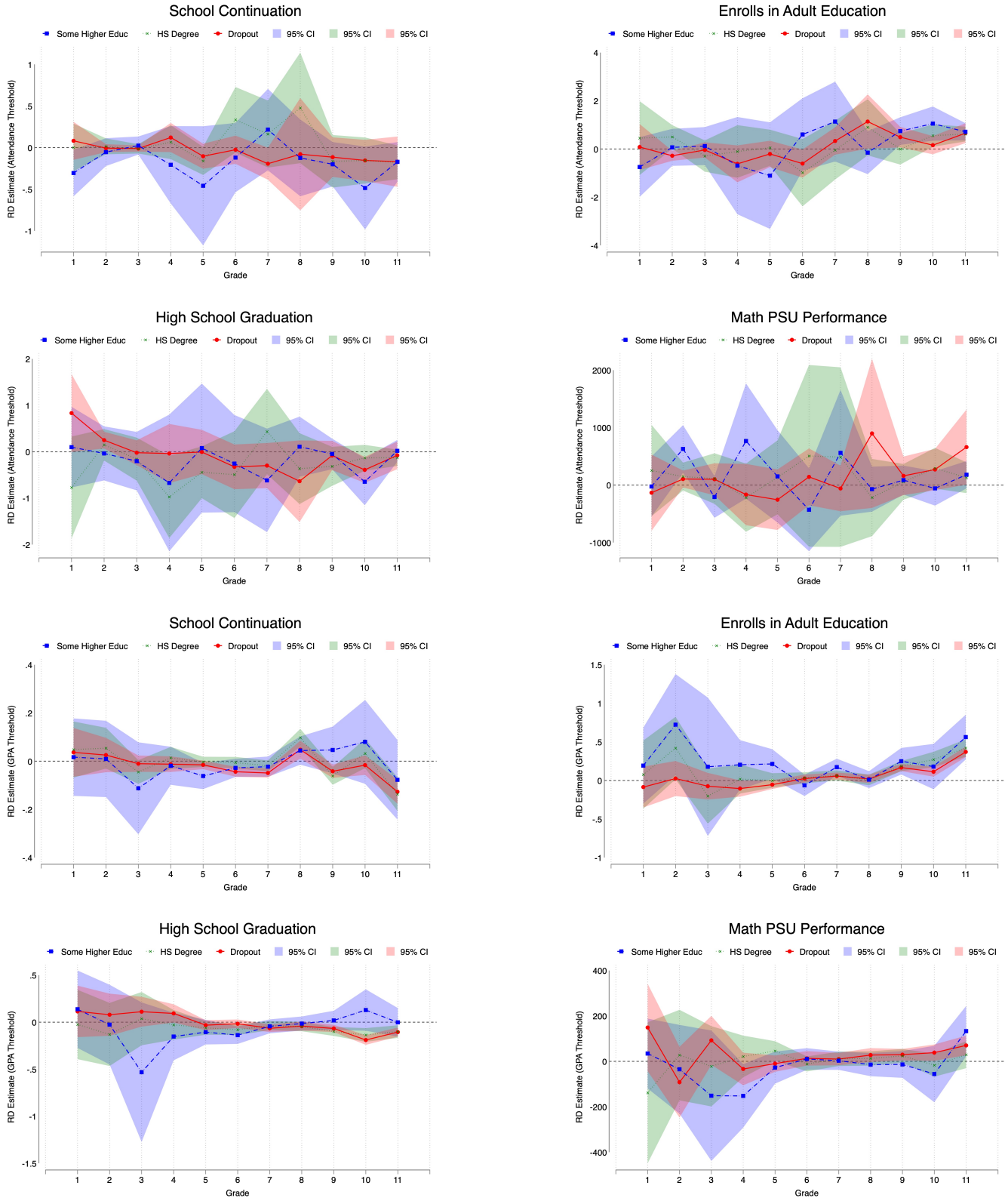
Notes: Three sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students whose parents expect them to at most graduate from high school; in green, indicated by the dotted line and X-shaped markers, results for student whose parents expect them to attend a non-selective higher education institution, and in blue, indicated with a dashed line and square markers, results for students whose parents expect them to attend a university. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.22: Heterogeneity in Results by Family Income



Notes: Three sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students whose family is in the top tercile of income; in green, indicated by the dotted line and X-shaped markers, results for student whose family is in the middle tercile of income, and in blue, indicated with a dashed line and square markers, results for students whose family is in the bottom tercile. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure A.23: Heterogeneity in Results by Highest Level of Maternal Education



Notes: Three sets of regression results are presented, replicating the results in Figures 5, 8, 9, and 12. In red, indicated with a solid line and circle markers, are results for students whose mothers did not finish high school; in green, indicated by the dotted line and X-shaped markers, results for student whose mothers have a high school degree, and in blue, indicated with a dashed line and square markers, results for students whose mother has some higher education. Each marker represents the results of a grade-specific estimation, with the grade indicated on the X-axis. The shaded areas represent the 90 and 95% confidence intervals associated with each estimate. Controls for each estimation include lagged and twice lagged GPA and attendance, gender, dummies for the cohort of school entry, and school fixed effects. Attendance or GPA is included if the estimation is for the other threshold sample. Grade 1 does not include lagged terms, while grade 2 does not include twice-lagged terms. Errors are bootstrapped within each outcome across all grades and presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10.