The Uneven Implementation of Universal School Policies: Maternal Education and Florida's Mandatory Grade Retention Policy

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Abstract: Universal educational policies are a popular tool to address inequalities in educational achievement. These policies may be ineffective, and may actually exacerbate inequality, if families of high socioeconomic status are better able to advocate for their children, make informed decisions, or circumvent policy to their child's benefit. We examine whether a statewide policy enacted in Florida in 2002, mandating that promotion to the fourth grade be conditional upon meeting a minimum standard of reading, resulted in differential retention and later achievement dependent on mothers' level of education. Because the Florida policy relies on a strict score cutoff for determining retention, we employ a regression-discontinuity design to look at differences in the implementation and effect of the policy for the marginal student. We find that students who score just below the cutoff for promotion are much less likely to be granted an exemption from the retention policy if they have a less educated mother. Scoring below the promotion cutoff results in an increase in retention probability that is 20 percent larger for students whose mothers have less than a high school degree than for students whose mothers have a bachelor's degree or more. We do not find consistent evidence that students are differentially impacted by the policy dependent on maternal education. Short term achievement gains were found for all students which faded to insignificance.

Introduction

Research consistently demonstrates a strong, positive relationship between parents' socioeconomic status and children's educational achievement. While the last half-century has seen a slow narrowing of the achievement gap between black and white students, the gap between students of high- and low-socioeconomic status has remained persistent, actually increasing by approximately 40% over the last 30 years (Reardon, 2011). This achievement gap is already present when children enter school in kindergarten and, despite the numerous policies aimed at leveling the educational playing field for disadvantaged students, it does not dissipate as children progress in their schooling (Duncan & Magnuson, 2011).

Universal educational policies are a popular tool to address inequalities, with the underlying belief being that disparities can be overcome by holding all students to the same high standards and ensuring that all families have access to the same opportunities. However, these policies may be ineffective – and may actually exacerbate inequality – if families of high-socioeconomic status are better able to advocate for their children, make informed decisions, circumvent policy, or take advantage of opportunities in their children's schooling. We investigate this possibility in the context of a statewide grade retention policy aimed at ensuring that all students enter the fourth-grade proficient in reading.

There is mounting evidence across social science disciplines that parents' behavior regarding their child's schooling does in fact differ depending on socioeconomic status. Parents of lower-socioeconomic status have been found to be less likely to request a specific teacher (Jacob & Lefgren, 2005), challenge their child's placement into a lower curriculum track (Barg, 2012), and question the pedagogical authority of their child's teacher during parent-teacher

conferences (Weininger & Lareau, 2003). Ethnographic work by Lareau and Calarco (2012) found that compared to lower-class parents, middle-class parents had greater knowledge of their child's school environment and experiences, and were aware of a much wider variety of opportunities for intervention in their child's schooling. Where middle-class parents "approached interactions with the school as an ongoing negotiation" (Lareau & Calarco, 2012, p. 74) lower-class parents rarely asked for any educational modifications even when they felt that their child might benefit from one. Furthermore, on the rare occasions that lower-class parents did try to engage the school they used less successful strategies, often approaching school staff in an angry confrontational manner, whereas middle-class parents were more apt to calmly but firmly try to engage school personnel in a partnership.

These differences in parents' behavior can amount to real impacts on the effectiveness of educational policy, and have important educational consequences for children. One prominent example is school choice. Heralded as a mechanism to level the playing field between children in different neighborhoods, school choice policies allow children living in neighborhoods with poorer performing schools to have options beyond their neighborhood school. The evidence suggests, however, that less-educated and lower-income parents respond differently than middle-class parents when presented with a choice among schools, resulting in increased segregation by socioeconomic status without improved academic performance for disadvantaged students (Hsieh & Urquiola, 2006; Fiske & Ladd, 2000; Cullen et al., 2005). Hastings, Kane, and Staiger (2006a) specifically find that the preference for school's mean test score increases with parent's income while preference for proximity decreases, resulting in two distinct types of parents – those with a preference for test scores regardless of proximity, who are more likely to be higher-

income, and those with a preference for proximity regardless of test scores, who are more likely to be lower-income. These differences in preferences among parents translate into differences in academic achievement by socioeconomic status. Children of parents who placed high weights on academics experienced academic gains when randomly assigned to their first-choice school, while children of parents who placed a low weight on academics experienced academic losses (Hastings, Kane & Staiger, 2006b).

Despite the potential for socioeconomic differences in parental knowledge, preferences, and behaviors to exacerbate inequality, there is little large scale empirical evidence on the impact of parents' socioeconomic status in the face of a broad policy that is intended to be enforced universally. The current examples from the literature have consisted of situations that either *require* an active choice by parents, in the case of school choice, or are cases where parents can choose to intervene regarding discretionary school decisions not based on formal policy. This paper builds upon the prior research into socioeconomic status, parental behavior, and academic achievement, by exploring the idea that due to these socioeconomic differences in behavior, seemingly universal educational policies may be differentially enforced and/or differentially effective for students of different backgrounds.

We examine this question in the context of a statewide grade retention policy enacted by the Florida state legislature in 2002. The Florida policy mandated that, in the absence of a specific exemption, promotion from the third grade to the fourth grade would be conditional upon meeting a minimum standard of reading. This policy presents an ideal opportunity to study the importance of family socioeconomic status in the face of a broad universal policy for a number of reasons. In particular, although the policy allowed for exemptions in order to provide

schools flexibility in cases where there were extenuating circumstances rendering retention inappropriate, a large proportion of students – over 40 percent – were granted an exemption. By allowing exemptions to the rule, this program provides a natural measure of differential enforcement: whether children were more likely to be granted an exemption based upon their socioeconomic background.

The Florida setting is particularly advantageous because we have had the unusual opportunity to link educational records to birth record data.[1] Doing so is essential in order to deeply investigate the role of socioeconomic status on the implementation of a universal educational policy. Administrative data in education are limited to measures of race and free/reduced price lunch status and do not include other types of background or parental characteristics. National longitudinal data, while containing a broad range of background information, do not have sufficient numbers of observations, even if they happen to be timed in such a way as to observe children when a particular policy is implemented. Linking educational records to birth records, however, allows us to examine the relationship between maternal characteristics including education, marital status, place of birth, and age, and the implementation and effectiveness of the Florida retention policy.

Furthermore, because the Florida policy relies on a strict score cutoff for determining retention we are also able to rely on a regression discontinuity design to look at the implementation of the policy for the marginal student. This approach allows us to difference out any retention rate differences among students who just make the cutoff and are therefore not affected by the retention policy, but are impacted by any inherent biases teachers or school

[1] For more information on the quality of the match between birth and school records see Figlio, Guryan, Karbownik & Roth (2013).

personnel might have which would cause them to differentially retain students based on socioeconomic status in the absence of the policy. It also allows us to examine impacts on later achievement without the worries of omitted variable bias inherent in traditional ordinary least squares analyses.

We focus our analyses on differences in implementation and outcomes using maternal education as the defining indicator of socioeconomic status, while exploring implementation differences by other indicators as well. We focus on maternal education because it has been found to be the strongest predictor of children's academic achievement (Haveman & Wolfe, 1995) and we believe that the mechanisms which would likely lead to differential exemption, namely having the knowledge, agency, and desire to intervene in the policy's implementation, are most likely to be impacted by maternal educational attainment. We find that Florida's third-grade retention policy is in fact enforced differentially depending on children's socioeconomic background, particularly maternal education. Scoring below the promotion cutoff results in an increase in retention probability that is six-percentage-points larger for children whose mothers have less than a high school degree as compared to children whose mothers have a bachelor's degree or more, representing more than a 20 percent increase in retention probability at the margin. Smaller increases in retention probability are associated with being black, having a foreign born mother, and qualifying for free or reduced price lunch. These socioeconomic disparities are robust to a variety of different functional forms and bandwidths, and remain stable even when comparing children only to other children within the same school. They are similar for students of different races and across school characteristics. We do not, however, find clear evidence that students are differentially benefited or harmed by being retained depending on

their socioeconomic status. Short term achievement gains were found for all students which faded over time.

Policy Background

In 2002, as part of an increasingly popular nationwide movement toward early grade retention as a means to ensure reading proficiency (Rose & Schmike, 2012), the Florida legislature mandated that third-grade students meet the Level 2 benchmark or higher (the second lowest of five levels) on the Florida Comprehensive Assessment Test (FCAT) reading exam in order to be promoted to the fourth-grade.[2] The focus on third grade reading scores highlights the belief among educators that it is at this time when reading proficiency becomes crucial for success across subjects, and children transition from "learning to read" to "reading to learn". Students who do not score at a Level 2 or higher, and do not obtain an exemption, are subject to retention in conjunction with a number of other interventions intended to ensure that they are able to be promoted the following year. Retained students must also be assigned to a high performing teacher, receive intensive reading instruction during their retained year, and be given the opportunity to attend a summer reading program prior to the next school year.[3]

There are a number of 'good cause exemptions' that allow students to be promoted to the fourth-grade despite failing to score at the Level 2 benchmark or above. Students are eligible for an exemption if they have limited English proficiency and have received fewer than two years of instruction in English for Speakers of Other Languages Program, have certain disabilities and an Individualized Education Program (IEP) stating that the test is an inappropriate measure of

[2] During the two years prior to the implementation of Florida's mandatory grade retention policy 24% of the state's third-graders scored a Level 1 on the third-grade FCAT reading exam. By 2009 this percentage dropped to below 15%.

[3] For more detailed information on the Florida policy see http://justreadflorida.com/docs/read_to_learn.pdf, accessed 9/12/13.

achievement for the student, or have received intensive reading remediation for two years and have already been retained twice between kindergarten and third grade. Additionally, students are able to obtain an exemption by demonstrating that they are reading at a level equal to or above a Level 2 on the FCAT by performing at an acceptable level on an alternative standardized reading assessment approved by the State Board of Education (51st percentile or above on the Stanford-10 reading exam[4] – a level of proficiency much higher than that needed to meet a Level 2 on the FCAT), or by demonstrating proficiency through a teacher-developed portfolio[5]. The first group of exemptions is based upon the assumption that despite their lack of reading proficiency some students would be harmed by being retained and retention is not an appropriate educational strategy. The second group of exemptions, on the other hand, is for students who, in spite of their low FCAT scores, are actually proficient in reading and able to be successful in fourth grade. By including controls for having a disability, limited English proficiency (LEP), and scoring in the 51st percentile or above on the Stanford-10 reading exam, which are then interacted with scoring below the promotion cutoff, our analyses will focus on differences in retention probability taking into account any differences in the proportion of students who fall into one of these exemption categories.

In spite of the intended benefits of the program and the extra services that retained children receive, there are numerous reasons why parents may prefer not to have their child retained. Perhaps most importantly, there is no clear evidence that retaining a child improves her

[4] Until 2008, the state administered both the FCAT and the Stanford 10 to all students in grades 3-10.

[5] Although we do not have access to the specific exemption specified in our data, previous research by Greene and Winters (2009) examined the codes listed for exemption during the first year after the policy was enacted. They found that of the 44% of students who scored below the promotion cutoff and were observed in the fourth-grade the following year, over 17% were academically promoted (which they should not have been able to be according to the policy given their FCAT reading score), 2% had no code listed, and 3% were passed based on their student portfolio – totaling to half of all promoted students. The remaining 22% of students were promoted due to LEP status (6%), disability (8%), passing an alternative test (7%), or having already been retained twice (1%).

academic outcomes.[6] Parents may also be concerned about the effects that grade retention will have on their child's social and emotional wellbeing. They may worry about their child having to adjust to a new peer group or being stigmatized by teachers and peers. Parents may also be concerned that being retained will make their children view themselves and their abilities more negatively, harming their self-esteem and decreasing their school engagement. These objections are likely to be particularly pronounced for more educated parents. More educated parents are likely to have greater personal resources at their disposal to assist their child at home and are likely more inclined to uncover and better able to process research on the impacts of grade retention. Furthermore, they may view grade retention as particularly stigmatizing due to its extreme uncommonness among the children of parents in their social class - during the two years before Florida's mandatory grade retention policy was enacted fewer than 1% of students whose mother had a Bachelor's degree or more were retained as compared to over 6% of students whose mother had less than a high school degree.

Data and Empirical Strategy

Data

The data for our analyses are drawn from two sources. The first are natality data provided by the Florida Department of Health. These data cover the universe of births in the state of Florida between the years of 1992 and 2002. At the time of each birth the mother and

[6] The overwhelming majority of the earlier literature found that students perform significantly worse than their promoted peers in the years following their retention. Holmes (1989) and Jimerson (1999) provide high-quality meta-analysis of earlier research on grade retention. These studies were unable, however, to account for omitted variables bias, making it likely that some of the perceived negative impact of grade retention was due not to retention itself, but instead to the fact that students who were retained were more likely to perform poorly in the future due to some other factors about themselves which also influenced the decision to retain them in the first place. More recent work using quasi-experimental designs to better address these identification challenges have found that, especially in early grades, retention may have a positive impact on test scores in the short term (Roderick & Nagaoka, 2005; Jacob & Lefgren, 2004; Jacob & Lefgren, 2009; Greene & Winters, 2007; Greene & Winters, 2012; Schwerdt & West, 2012).

her health care provider complete a survey which covers maternal demographic information, pregnancy behaviors, and infant health at birth. The data report the mother's age, years of education, race, place of birth, place of residence, and marital status; behaviors during pregnancy such as tobacco and alcohol usage and prenatal care; information on prior births (if any); and information on birth outcomes.[7]

These data are then matched (79% matched)[8] to educational data containing information on all Florida students attending public schools from the 2000-01 through 2009-2010 school years.[9] The educational data include information on the school the child attended, student characteristics such as ethnicity, gender, free or reduced price lunch eligibility, special education classification, English proficiency, and FCAT reading and math scores. Unlike other studies relying solely on educational records, the matching of these data to birth records gives us a unique opportunity to explore whether maternal education and other socioeconomic characteristics including marital status, age, and country of origin, impact children's likelihood of receiving a retention exemption or the effectiveness of the policy. Of the data used to create variables for our analyses the following come from children's birth records: maternal education, maternal country of origin, maternal marital status, maternal birth date, child birth date, and child birth weight. Child race, free or reduced price lunch status, disability, limited English

[7] Birth outcome data include birth weight, gestational weeks, congenital anomalies and complications of labor and delivery.

[8] Figlio et al., 2013 analyzed data from the Census Bureau's American Communities Survey (ACS) to estimate that they would have expected an 80% match rate given in- and out-migration to and from Florida. Our 79% match is therefore nearly perfect, matching almost all children who were both born in Florida and attended a public school in the state of Florida.

[9] Because we only have access to birth records starting in 1992, we do not have a full cohort of students from the 2000 third-grade cohort (who would normally be born between September 1, 1991 and August 31, 1992. This results in our 2000 cohort consisting only of the approximately three-quarters of students we would expect to be born January 1, 1992 or after, therefore make the included students from the 2000 cohort slightly younger on average than students from full cohorts. We include this cohort in spite of this limitation in order to include more students and lend power in our comparisons between the before and after policy time periods. Because this cohort is from before the policy was enacted they are not included in any regression discontinuity analyses.

proficiency, and all test score data come from educational records. Because maternal education and marital status may change over time it is important to note that our measures are taken at the time the child was born, not at the time they entered third-grade.

Regression discontinuity analyses will be conducted upon students entering third grade for the first time between 2002 and 2009 (930,606 students), all of whom were subjected to the retention policy. Additional analyses will compare students entering third grade for the first time during the two years prior to the retention policy (2000 and 2001) to those after. The total number of third-graders in our population over the 10 cohorts is 1,097,703[10]. Table 1 shows the proportion of students who failed to reach Level 2 proficiency on the third grade FCAT reading exam each year, the proportion retained, and the proportion retained separately for those who scored below versus above the cut-point. Figure 1 presents this information graphically. During the first year of the policy the proportion of students retained increased from 3.37% to 15.04%. Among students who scored below the promotion cutoff the percentage grew from 11.16% to 67.13%. Over the eight years of policy implementation that we have data for, the proportion of students retained dropped from a high of 15.04% the first year, to a low of 6.75% during 2005, and has increased slightly since, hovering between seven- and nine-percent. Some of the decrease in retention stems from a decrease in the proportion of students scoring below the cut-off (a decrease from over 21 percent to between 11 percent and 16 percent for many of the later cohorts). The remainder is due to a decrease in the proportion of failing students who are

[10] Observations were not included for three main reasons related to the design of, and questions put forth by, the study: 1) The student was not observed in the data the year after their first appearance as a third-grader, rendering it impossible to know what grade the child was in the following year (1%); 2) The student did not have a third-grade FCAT reading score, rendering it impossible to know whether the child was subject to the policy (4%); 3) Data was missing on years of maternal education at birth (<1%). Observations were also not included if the child was born more than two-years before or after the appropriate range of birthdates for first-time third-graders for that cohort (<1%).

retained. During the first year of the policy over 67 percent of students scoring below the cutoff were retained. That proportion has remained below 60 percent for all subsequent cohorts and below 50 percent for three cohorts.

The proportion of students scoring a Level 1 on the FCAT reading exam differs dramatically by maternal education (Table 2). During the two years prior to the implementation of the policy nearly 39 percent of children whose mothers had less than a high school degree scored at this level, less than 8 percent of children whose mothers had a Bachelor's degree or more did. These percentages have dropped to 28 percent and 4 percent respectively over the eight years since the retention policy was introduced (Figure 2). The proportion of students retained naturally differs by maternal education as well. For students with the least educated mothers retention rates increased from approximately six percent before the retention policy to 16 percent after. For students with the most educated mothers this increase was from less than one percent to just over two percent.

Table 3 presents descriptive statistics for the entire sample (column 1), the 2002-2009 cohorts who were subject to the retention policy (column 2), retained students who scored below the cutoff during the policy period (column 3) and promoted students who scored below the cutoff during the policy period (column 4). Students who scored below the promotion cutoff but obtained an exemption were more advantaged than students who were retained. Compared to retained students, promoted students were older, less likely to be eligible for free or reduced price lunch, more likely to be white, more likely to have been born to a married mother, less likely to have a foreign born mother, and more likely to have a mother who had at least some college education at the time of their birth. Promoted students also had higher FCAT reading

scores (they scored closer on average to the promotion cutoff), FCAT math scores, and SAT10 scores. When all demographics are included simultaneously in an OLS regression examining the association between student background characteristics and the likelihood of being retained for all students who failed to meet the promotion cutoff (Table 4 Column 1) these patterns all hold. Once we condition on students' standardized test performance many of these associations decrease substantially (Table 4 Column 2). This is because the further a students' score is below the cutoff the more likely they are to be retained, and less advantaged students are more likely to score farther below the cutoff. Yet even accounting for test scores the association between maternal education and retention remains substantial; children of mothers with a bachelor's degree or more who score below the promotion cutoff remain 6.6 percentage points less likely to be retained than children of mothers with less than a high school degree, even after controlling for differences in achievement.

Empirical Strategy

In order to examine whether Florida's retention policy is differentially enforced depending on maternal education, we present both graphical evidence and difference-in-difference estimates of the impact of scoring below the promotion cutoff for students with mothers of differing levels of education, subtracting out differences in retention probabilities between maternal education groups above the promotion cutoff. This allows us to look at differences in the impact of scoring just below the promotion cutoff on retention, with differences between groups just above the promotion cutoff serving as a counter-factual for what we would expect to see in the absence of the policy. We estimate these impacts with the following equation:

$$(1) \quad R_{i=}\phi + \delta F_i + k(S_i) + k(S_i) * F_i + \gamma E_i + \lambda E_i * F_i + k(S_i) * E_i + k(S_i) * F_i * E_i + \xi X_i + \psi X_i * F_i + k(S_i) * X_i + k(S_i) * F_i * X_i + Year * School + \nu_i$$

where R_i is the probability of retention for student *i*, F_i is an indicator for failing to meet the promotion cutoff, $k(S_i)$ is a polynomial function of the relative reading score, E_i is a set of indicators for the level of education of student *i*'s mother, X_i is a vector of student demographic and academic characteristics, and ν_i is an error term.[11]

Using this framework the estimates of interest are δ and λ. δ can be interpreted as the percentage point increase in retention probability associated with falling below the promotion cutoff, or the jump in probability of retention at the discontinuity, for students whose mothers have less than a high school degree. λ is the percentage point difference in the jump in probability of retention at the discontinuity for students whose mothers have higher levels of education, as compared to the rate for students with mothers who have less than a high school degree – the difference-in-difference estimate for each of the maternal education groups. A λ of -0.01 for the High School Degree dummy would indicate that the jump in retention rate at the discontinuity is one-percentage-point smaller for students whose mothers have a high school degree as compared to students whose mothers have less than a high school degree. γ provides the counterfactual of the difference in retention probability for students of differing maternal education whose score just makes the promotion cutoff.

In this preferred specification X_i includes all demographic variables listed in Table 3 Panel 1, third grade FCAT math score and third grade SAT10 reading score. These are then

[11] Indicators for the level of maternal education were created in the following way: 11 or fewer years of education reported is coded as less than a high school degree, 12 years of education is coded as a high school degree, 13-15 years of education is coded as some college, and 16 or more years of education is coded as a Bachelors degree or more.

interacted with the cutoff to reduce omitted variable bias and explore differences in policy enforcement by other demographic variables. This specification also includes school by year fixed effects to take into account differences by school and cohort, and to determine, when compared to a specification without fixed effects, the level to which differences in retention rates by maternal education are happening within schools or between schools.

In addition to examining differential enforcement of Florida's retention policy by maternal education, this paper also seeks to determine whether Florida's policy has differential impact on later achievement dependent on maternal education. We present graphical evidence and two-stage-least-squares (2SLS) estimates of the impact of being retained on test scores one to seven years after retention. The preferred specification of the first stage is presented by equation 2. It is similar to that presented in equation 1 with the exception that additional demographics are included to increase precision of estimates and are not interacted with reading score or the cut point.

$$(2) \qquad R_{i=}\,\phi + \delta F_i + k(S_i) + k(S_i) * F_i + \gamma E_i + \lambda E_i * F_i + k(S_i) * E_i + k(S_i) * F_i * E_i + \xi X + Year * School + \nu_i$$

The corresponding second stage of our 2SLS model is as follows:

$$(3) \qquad Y_{i=}\,\alpha + \beta_1 \hat{R}_i + k(S_i) + k(S_i) * F_i + \beta_2 E_i + \beta_3 E_i * \hat{R}_i + k(S_i) * E_i + k(S_i) * F_i * E_i + \beta_4 X + Year * School + \nu_i$$

where Y denotes achievement test score for student i and $\hat{R}$ is the predicted probability of retention for student i. We arrive at estimates of β_1 and β_3 by instrumenting for grade retention in third-grade with scoring below the promotion cutoff for fourth grade, and by instrumenting for the interaction between maternal education and being retained with the interaction between

maternal education and failing to meet the promotion cutoff.

There are two broad strategies for specifying the underlying function form: parametric strategies, which use all of the data and try to find the right functional form to fit the data, and non-parametric strategies which choose data in some range close to the cut point which best fit a linear or higher-order polynomial functional form. There are tradeoffs to consider when choosing between these two strategies. Parametric strategies borrow strength from data further away from the treatment cut point in order to gain precision when estimating the impact at the cut point, yet if the functional form is wrong estimates will be biased. Non-parametric strategies reduce the misspecification bias yet rely solely on data close to the treatment cut point, thus reducing power. In our preferred specifications we estimate both first stage and 2SLS effects using a linear specification, allowing for differences in slope on either side of the discontinuity, and limiting the analysis to students within a bandwidth of 20 points on either side of the cutoff. We present graphical evidence that this specification appears to fit the data well, and check the robustness of our findings using different bandwidths (5, 10, 50, and all) and polynomial orders (1, 2, and 3). We also present subgroup analyses to explore whether maternal education has a differential impact on rates of retention or the impact of retention by child race or free/reduced price lunch status, or by school characteristics.

While there is some debate regarding whether to measure outcomes at the same age (e.g. one year after promotion or retention) or the same grade, I follow a number of other researchers (Roderick & Nagaoka, 2005; Schwerdt & West, 2012) by using same age comparisons. The estimates we seek to find in this paper are of the effect of having students with varying maternal education repeat a grade, that is, the score obtained by students after being retained for one year

versus the counterfactual, what would have been obtained had the students been promoted. Therefore the appropriate comparison is between the scores x-years later of students who were retained for a year due to the policy and the scores the same number of years later for the control group, those who were not retained because they scored at or just above the promotion cutoff. Comparing children at the same-grade answers a different question, namely whether low-achieving students benefit from an additional year of instruction. Because retention is only one of many ways to increase instructional time, this paper will focus on same age comparisons[12].

To allow comparisons between students at the same point in time but who are in different grades achievement measures must place students in different grades on a common scale. Florida is one of a number of states that provides vertically equated developmental scale scores for students across all tested grades. Achievement gains are not, however, uniform across grades. These gain differences may arise either from imperfections in the vertical scaling or from true variation in the math or reading learning growth rate for students over time. In either case, estimates of the impact of retention may vary with the number of years since treatment either as a result of true fade out of effects, or because of differences in grade specific average score increases (for example if there is a large jump in average math test-scores in fifth grade compared to fourth grade, promoted students may seem to be making greater math gains two years after treatment due to this statistical artifact as opposed to a true treatment effect). In order to deal with this issue we rescale the developmental score as outlined in Schwerdt & West, 2012 (p. 10-11) to make achievement gains uniform across grades 3 through 10.

In order to perform a regression discontinuity analysis we first must check to make sure that there is a significant discontinuity in the probability of retention at the reading score

[12] Same grade estimates are included in Appendix Tables A6 and A7

promotion cutoff, and that we have selected the appropriate functional form for the relationship. Figure 3 presents the local linear smoothing of the probability of retention on the relative reading score for cohorts subjected to the retention policy, calculated separately for each side of the cutoff using the triangle Kernel and a bandwidth of five points, with the solid circles representing the retention rate for each test score. Figure 4 shows both the local linear smoothing of the retention probability within the 20 points on either side of the cutoff as well as the predicted values from a linear regression model with a 95% confidence interval. These figures show that students just below the promotion cutoff are approximately 35 percentage points more likely to be retained than students who score just at the promotion cutoff. Within the 20 point bandwidth the relationship between relative reading score and retention probability appears linear, with the local linear fit very closely aligned with the linear model, falling within the 95% confidence interval for nearly the whole 20 point range. Figure 5 presents the same graphical analysis as Figure 3 but for the cohorts entering third-grade during the two years before the policy was implemented. It is clear from these figures that while the retention rate is approximately the same before and after the policy for students scoring just at or above the promotion cutoff (approximately 5%) and in fact looks nearly identical to the right of the cutoff for Figures 3 and 5, there is no discontinuity at the cutoff before the policy. This makes us confident that the jump in retention at the cutoff that is seen after the policy is introduced is in fact due to the retention policy. Furthermore, for students who score above the cutoff the policy does not appear to have changed the likelihood of retention.

A chief concern in any regression discontinuity analysis is the possibility of manipulation of the forcing variable around the cutoff (Urquiola & Verhoogen, 2009). In this context, for

example, we would be concerned about the internal validity of our findings if teachers were able to manipulate students' reading scores to push them over the promotion cutoff. Because FCAT tests are scored objectively without teacher assistance this is unlikely, however, we also present graphical evidence to dispel any concerns. Figure 6 shows that the overall distribution of third-grade reading scores is smooth around the cutoff, with no indication of heaping observations around the cutoff.

The internal validity of a regression discontinuity also relies on the assumption that there are no discontinuities in other student characteristics associated with outcomes around the cutoff. Figure 7 addresses this concern by plotting the mean value of observable student characteristics against third grade reading scores close to the cutoff. The figure shows that there are no discontinuities in observed student characteristics at the cut point.

Another possible threat to internal validity in this study comes from the possibility that there is differential student attrition around the promotion cutoff. For example, if students who score just below and are therefore subject to the retention policy leave the Florida public school system in greater numbers than those who score just above. Figure 8 plots attrition rates two, four, and seven years later against third-grade test scores around the cutoff. Attrition rates increase as the number of years since third-grade increases, as would be anticipated, yet there is no indication of discontinuity at the promotion cut off.

Results

Differential Retention

Figures 9 and 10 use local linear regressions estimated separately on each side of the promotion cutoff to depict the relationship between relative reading score and retention around

the promotion cutoff for students with mothers of differing levels of education in the face of the policy and before its implementation respectively. Figure 9 shows that while retention rates above the promotion cutoff appear to be approximately the same regardless of maternal education, for students who fail to meet the promotion cutoff there are stark differences in retention rates by maternal education. Across reading scores, students with more highly educated mothers are less likely to be retained, and this relationship is monotonic, with each additional level of maternal education translating to a smaller fraction of students actually being retained in the event that they fail to meet the cutoff for promotion to fourth grade. Furthermore, the relationship between reading score and the fraction retained appears to be approximately linear within the 20 point range for each of the four subgroups, adding confidence that a linear specification is appropriate not only for all students together, but for each of the educational subgroups as well. Figure 10 provides a comparison by looking at the same relationship during the two years before the policy was implemented. Although there may be the same pattern, with children of more highly educated mothers facing lower retention rates these differences are much less pronounced or consistent.

Table 5 presents the effect of failing to meet the promotion cutoff for fourth grade on the likelihood of being retained. Note that all estimations are based on our preferred discontinuity sample within a 20 test-score-point bandwidth around the cutoff. Each subsequent column of the table adds additional child or family background characteristics which are interacted with the cutoff to unpack differences in the impact of failing to meet the promotion cutoff on the likelihood of retention for different groups of students. Column 2 adds interactions with maternal education, our variables of interest. Consistent with Figure 9, students whose mothers

had more education were less likely to be retained in the event that they scored below the promotion cutoff. Having a mother with a high school degree, some college, or a bachelor's degree resulted in students being 2.6, 5.5, and 11.0 percentage points less likely to be retained respectively, compared to students whose mothers had less than a high school degree. Taking into account differences in students' likelihood of being LEP, having a disability, or scoring in the 51st percentile or above on the SAT10 (all good cause exemptions from the policy) reduces these differences slightly to 2.5, 4.9, and 9.0 percentage points (column 3). After taking into account math achievement these estimates fall further to 1.6, 3.4, and 6.2 percentage points respectively (column 4). Adding additional interactions for other child and family characteristics does not change these estimates noticeably (column 5). There does however seem to be independent effects on the likelihood of retention of being a male (4.7 percentage point increase), Black (3.2 percentage point increase), older (0.07 percentage point decrease for each month of age), qualifying for free or reduced price lunch (3.3 percentage point increase), and having a foreign born mother (4.5 percentage point increase). The age and marital status of mothers are not related to the likelihood of retention. Introducing school by year fixed effects (column 6) does not change these estimates, indicating that the differences in retention rates are found between students in the same cohort in the same school, and are not due to retention rates differences across schools of high- or low-average socioeconomic status. Results broken out by cohort year can be found in appendix table A1.

In Table 6 we use the fully interacted fixed effects model and compare the estimates in the face of the policy to those during the two years before the policy's implementation. As we would expect, before the policy there is no jump in retention probability at the cutoff and there

are no differences in the jump by maternal education level. As the graphical presentation in Figure 10 showed, there are small differences in retention probability by maternal education level before the policy was implement of a magnitude ranging from 1.7 to 2.1 percentage points and increasing slightly in a monotonic fashion. We can interpret this comparison in the following way: for students falling within this 40 point range, before the policy students whose mothers had a bachelor's degree or more were, on average, 2.1 percentage points less likely to be retained than students whose mothers had less than a high school degree after controlling for all demographics and achievement, and there was no difference in this relationship for students with scores on one side of the cutoff versus the other. After the policy was enacted, students whose mothers had a bachelor's degree or more and who made the cutoff for promotion remained one percentage point less likely to be retained than students whose mothers had less than a high school degree. For students who scored below the promotion cutoff that difference was seven percentage points. Thus the difference in the jump at the cutoff, or the differential impact of the policy is the difference-in-difference, estimated to be six percentage points.

Table 7 presents subgroup analyses of the differential impact of maternal education on the policy implementation by student race and free/reduced price lunch status. Estimates are relatively consistent, though imprecisely estimated across race and free/reduced price lunch status. Table 8 presents subgroup analyses based upon school characteristics. Regardless of the average level of maternal education in the school or the proportion of students receiving free or reduced price lunch estimates follow the same pattern, though again the estimates lack precision. These results suggest that a student's mother being more educated decreases the likelihood that failing to meet the promotion cutoff will result in the student being retained to a similar degree

regardless of the student's race or economic background, and regardless of how educated mothers in the student's school are on average, or what fraction of students in the school are poor. We also look at school education level quintiles based on the proportion of students' mothers with at least a high school degree and the proportion of students' mothers with a bachelor's degree or more (Tables A2 and A3) with similar results.

Later Achievement

Previous research into Florida's third grade retention policy making use of the discontinuity in retention probability has found evidence that retention results in short-term academic gains that fade out over time (Greene & Winters, 2012; Schwerdt & West, 2012). In addition to the policy being differentially enforced dependent on socioeconomic status, there is also reason to believe that in spite of its intended universality the policy may be differentially beneficial depending on socioeconomic background, though it is unclear in which direction these differences might be. Because third-grade is the first time that students are given the statewide standardized test these results may serve as a shock to parents regarding their child's reading proficiency. More educated mothers may have more knowledge and resources at their disposal to privately help their child academically, leaving them less in need of intervention at the school level and better able to make gains in the absence of retention. Conversely, if students with less-educated mothers are particularly vulnerable to possible negative effects of grade retention such as decreased academic aspirations and self-esteem they may benefit from retention less than their higher-socioeconomic status classmates.

Figures 11 and 12 present graphical evidence of the reduced form relationship between students' third grade reading test scores and their future reading and math achievement by level

of maternal education, again using local linear regressions estimated separately on each side of the promotion cutoff, with the shaded area representing 95% confidence intervals for the estimates. These reduced form relationships can be interpreted as the intent-to-treat estimates. That is, a discontinuity in test scores at the cut point shows the impact of falling below the promotion cutoff, and therefore being within the group intended to be subject to the policy, not just those who were actually retained. Among students with the same third grade reading score students with more educated mothers outscore those with less educated mothers in both subjects at all later time periods. One year later, students scoring below the promotion cutoff are performing at higher levels than those above the cutoff and this increase looks to be of similar magnitude regardless of maternal education levels. These benefits shrink substantially by two-years-later in both subjects for all maternal education subgroups becoming insignificant for students with more highly educated parents (due more as a result of reduced precision as opposed to smaller gaps). Four-years-later no differences are apparent between students on either side of the promotion cutoff.

Tables 9 and 10 presents two-stage-least-squares estimates of the effect of grade retention on later reading and math achievement respectively, looking at the interaction between retention and maternal education using the fuzzy RD framework described earlier. All estimates use rescaled developmental scores as the outcome, are based on a linear specification within a bandwidth of 20 points, and include all covariates listed in Table 3 and school by year fixed effects. The estimated effects are similar to the graphical evidence from Figures 9 and 10 though stronger, as would be expected given that these estimates are the impact of grade retention for students who scored below the cutoff and were actually retained. Grade retention results in short

term gains in both reading and math achievement which fade out over time (after four-years in reading with some rebound by seven-years; and after three-years in math). There is no clear pattern suggesting that impacts differ significantly depending on maternal education. Tables A4 and A5 present these results without rescaling and very similar to the rescaled results presented in Tables 8 and 9. Tables A6 and A7 present these results using same grade comparison and find slower fadeout over time and some evidence, though not completely consistent, that less educated children may benefit slightly more from retention. Tables A8 and A9 present results through 7 years only for the cohorts of students who have seven years of test scores in order to check whether the appearance of fadeout is due to actual fadeout over time or different results for different cohorts of students (i.e. it is possible that what looked like fadeout over time was due instead to the policy being less effective initially and more effective over time. This would result in earlier cohorts, who are the only ones who can be tracked through 7 years, having smaller gains from retention, thus causing the appearance of test score gain fadeout). The results look similar to those using all cohorts of students, therefore the fadeout is true and not an artifact of cohort effects.

Robustness Analyses

To check the robustness of our findings, Table 11 presents the results of the interaction between maternal education and scoring below the promotion cutoff using various bandwidths and polynomial orders. The results in this table do not include any controls or fixed effects and can be interpreted as the basic underlying relationship. Estimated differences at the retention cutoff are very stable across bandwidths and specifications. Table 12 compares our preferred fully interacted fixed effects model with a linear specification and a 20 point bandwidth to the

same model with a five-point bandwidth and to a fully interacted cubic model with a 20-point bandwidth. Estimates are similar between the three models though imprecise for the five-point bandwidth and the cubic model.

Tables 13 and 14 present the two-stage-least-squares model from tables 9 and 10 estimating the differential impacts of retention on reading and math scores one-year-later for various bandwidths and polynomial orders. The estimated discontinuities are similar regardless of specification, with significant impacts that do not differ by maternal education subgroup. Table 15 shows that our results are robust in the absence of controls or school by year fixed effects.

Conclusion

Our analysis uses a fuzzy regression discontinuity design to study whether Florida's test-based promotion policy is differentially enforced and effective for students depending on their mother's socioeconomic background, in particular educational attainment. We find that the more educated a student's mother is the less likely she is to be retained due to the Florida policy, though the policy seems to have similar short term positive impacts for students regardless of their mother's educational attainment. Students are also more likely to be retained due to the policy if they are black, male, qualify for free or reduced price lunch, or if their mother is foreign born.

Our results have important implications for public policy. Broad, universal educational policies are often implemented to address inequalities in outcomes for students of differing backgrounds by holding all children to the same standards. Although the allowance for exemptions in the Florida retention policy is in place in order to avoid retaining students for

whom retention is seen to be harmful or inappropriate, it is important to understand whether an unintended consequence of this allowance is that children are being retained differentially based on their mother's education, or other characteristics which should not impact whether or not the policy is appropriate for them. Although we cannot discern the exact reason why Florida's retention policy is more strictly enforced for the children of less educated, poor, and foreign born women from our study, prior research findings that parents of lower socioeconomic status have less knowledge of their children's educational context and are less likely to intervene in school decisions lead us to hypothesize that these same dynamics are at play in this context. We are not able to completely rule out the possibility that there are unobservable differences in students that are related to their mothers' socioeconomic background and which influence whether teachers and school administrators grant students an exemption from the policy. By using a regression discontinuity design and looking at children just at the margin, however, our estimates provide the difference in retention probability for students of different backgrounds who are just impacted by the policy subtracting out any differences between those same groups of students who are just above the promotion cutoff. Differences by maternal education level are apparent but very small for children above the promotion cutoff though these children would be subject to any inherent socioeconomic differences in schools' or families' desire to retain the student. Furthermore, when examining differences in retention probability during the two-years before the policy was enacted we also find much smaller differences. It therefore appears that the allowance for exemptions into Florida's test-based promotion policy has resulted in differential policy implementation by socioeconomic status, allowing parents with greater knowledge,

agency, and resources the ability to circumvent the policy in greater numbers and exacerbating any differences in retention that are present in the absence of the policy.

Given that the test-based promotion policy was introduced under the assumption that students performing below the cutoff would benefit from being retained, it is unclear a priori whether the greater number of more educated parents circumventing the policy is actually helpful or harmful for their children. Our analyses find that being retained results in short term academic gains which fade out over time. These results suggests that children of lower socioeconomic status who are being retained in higher numbers are not reaping long-term academic benefits from their retention in spite of the additional services that they receive and the additional time they spend in the classroom. They are, however, losing future earnings as a result of the increased time they spend in school, if they spend an additional year in school. Prior research has found that retained students are more likely to drop out of high school (Jacob and Lefgren, 2009), though we are unable to examine that outcome in our data at the present time. Furthermore, there is evidence that grade retention increases the likelihood of disciplinary incidents and suspensions and that these negative effects are concentrated among Black and economically disadvantaged students (Ozek, 2013), suggesting that Florida's test-based promotion policy may in fact be harming, not helping, students of low-socioeconomic status.

It is important to stress however that our analyses compare retained students below the cutoff to promoted students above the cutoff, all of whom were subject to the *threat* of retention. It is possible, therefore, that because students were aware of the policy and feared retention, all students, particularly all low performing students – which would encompass both those below the cutoff as well as those above but close to the cutoff – performed better under the policy than

they otherwise would have. Although we cannot know for certain whether this happened, we compared the trajectory of average reading test scores, as well as the 10^{th} and 25^{th} percentile reading test score during the two years before the policy and the first three years after the policy to the corresponding math test score each year. Because being subject to retention is based on scoring a Level 1 on the reading FCAT, but there is no specific sanction for performing poorly on the math FCAT, if threat of retention is driving all students, or all low performing students test scores up we would expect to see bigger gains in average test scores, and perhaps particularly test scores at the 10^{th} and 25^{th} percentile, for reading but not for math during the year or two after the policy was enacted. In fact, the trajectory of student test score gains over these five years look similar for reading and for math. Student performance in both subjects improves each year through this time period, with no jump during the year after policy implementation.

This paper provides evidence that something is causing children to be differentially retained based upon their background characteristics, above and beyond differences in their reading achievement and whether they should qualify for a specific exemption based upon language skills, disability status, and test scores. Further research into what exactly is going on behind the scenes in the decision making process of teachers, principals, and superintendents is necessary to further understand better how this policy is being implemented. These results do suggest that policy makers need to be aware of the potential for students' background to influence decision making in ways that are not intended, and potentially harmful to equity and student achievement.

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Figures

Figure 1. *Percentage of Third Grade Students by Cutoff and Retention status*

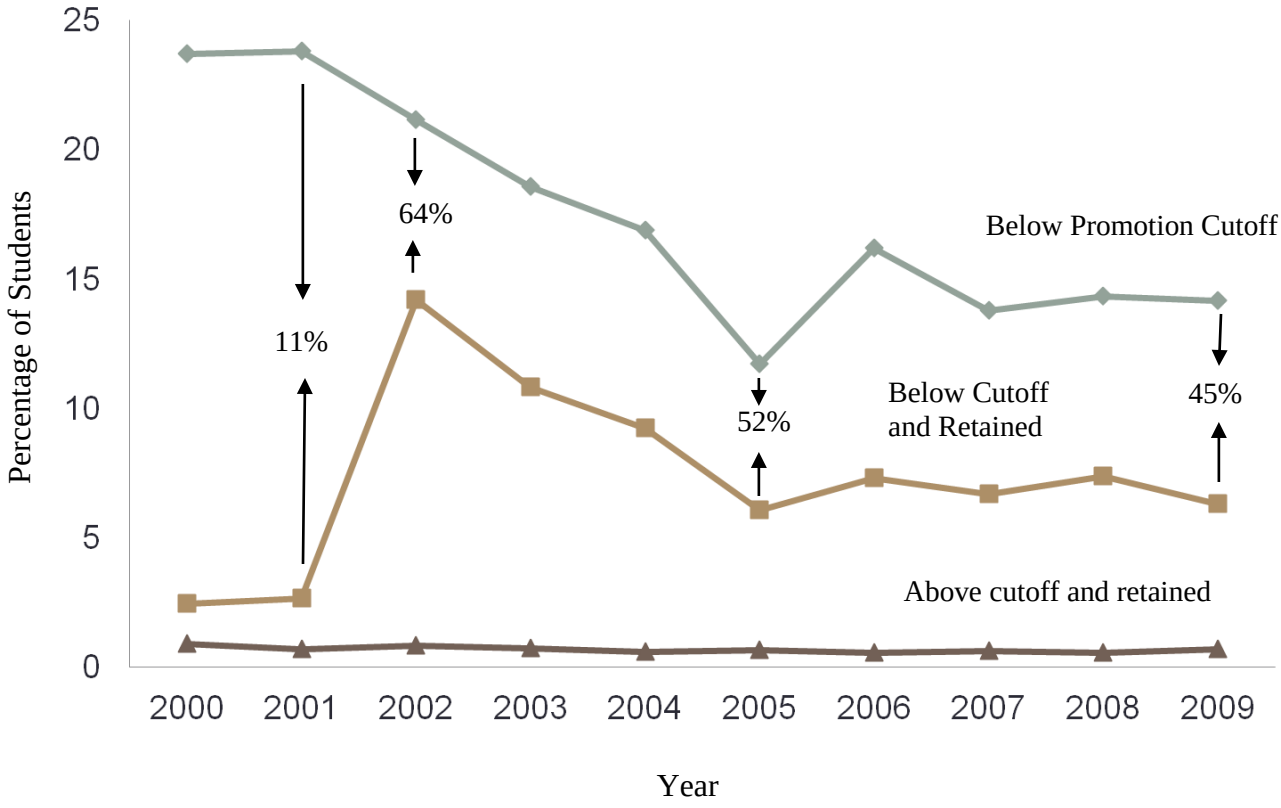
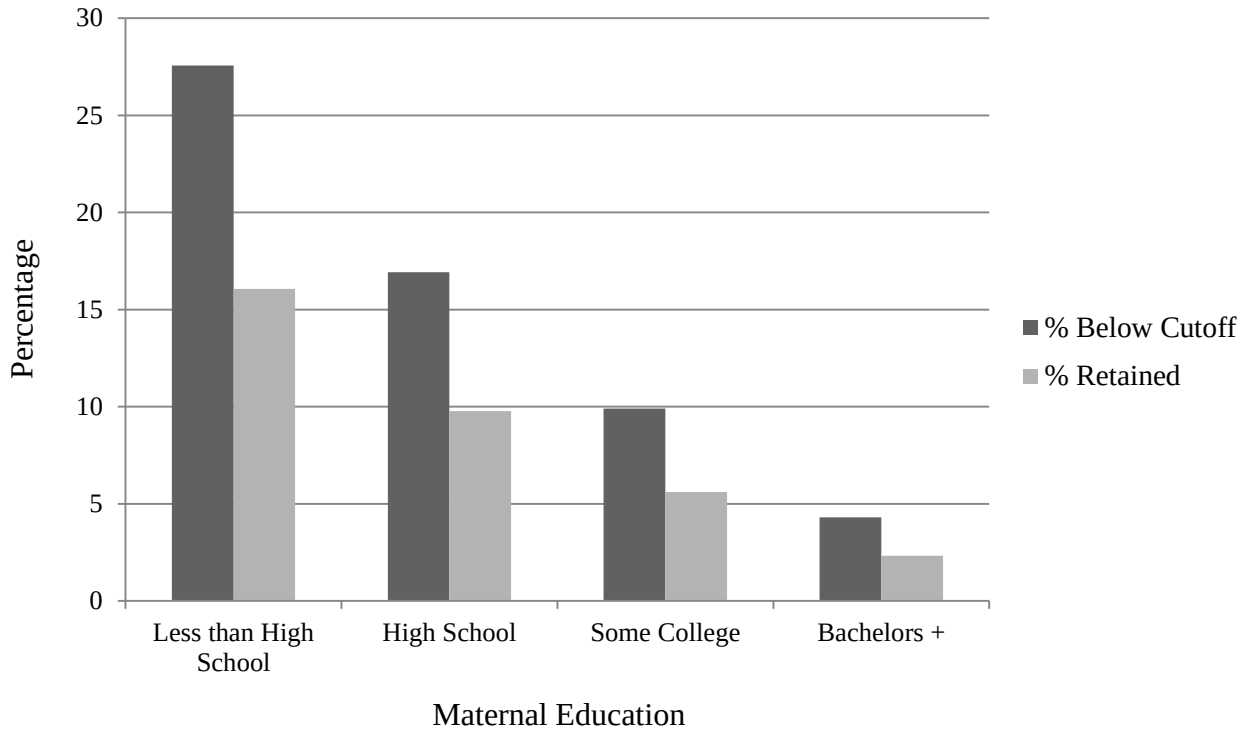


Figure 2. *Percentage of Third Grade Students Failing Promotion Cutoff and Retained by Level of Maternal Education – After Policy*

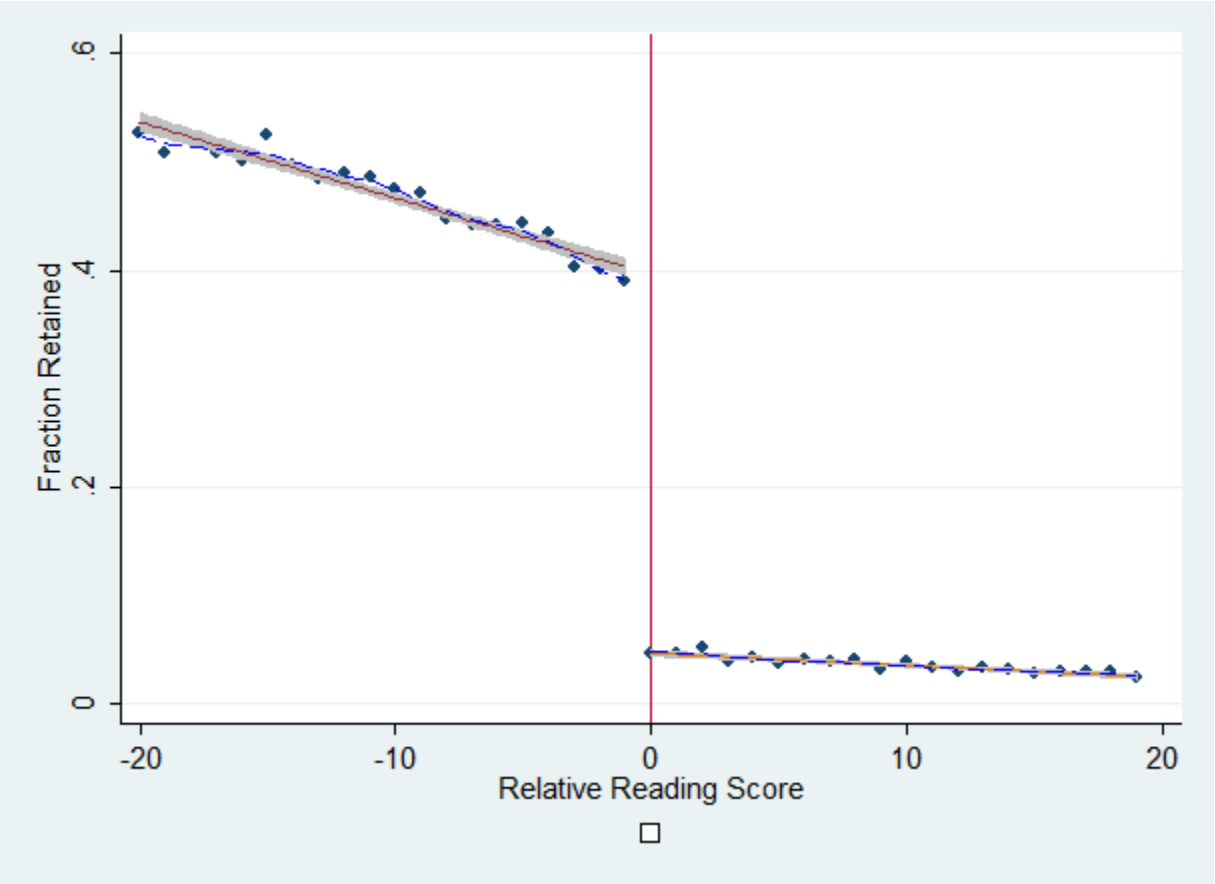


Note: Based on 2002-2009 Cohorts.

Figure 3. *Relationship Between Third Grade Reading Scores and Grade Retention – After Policy*

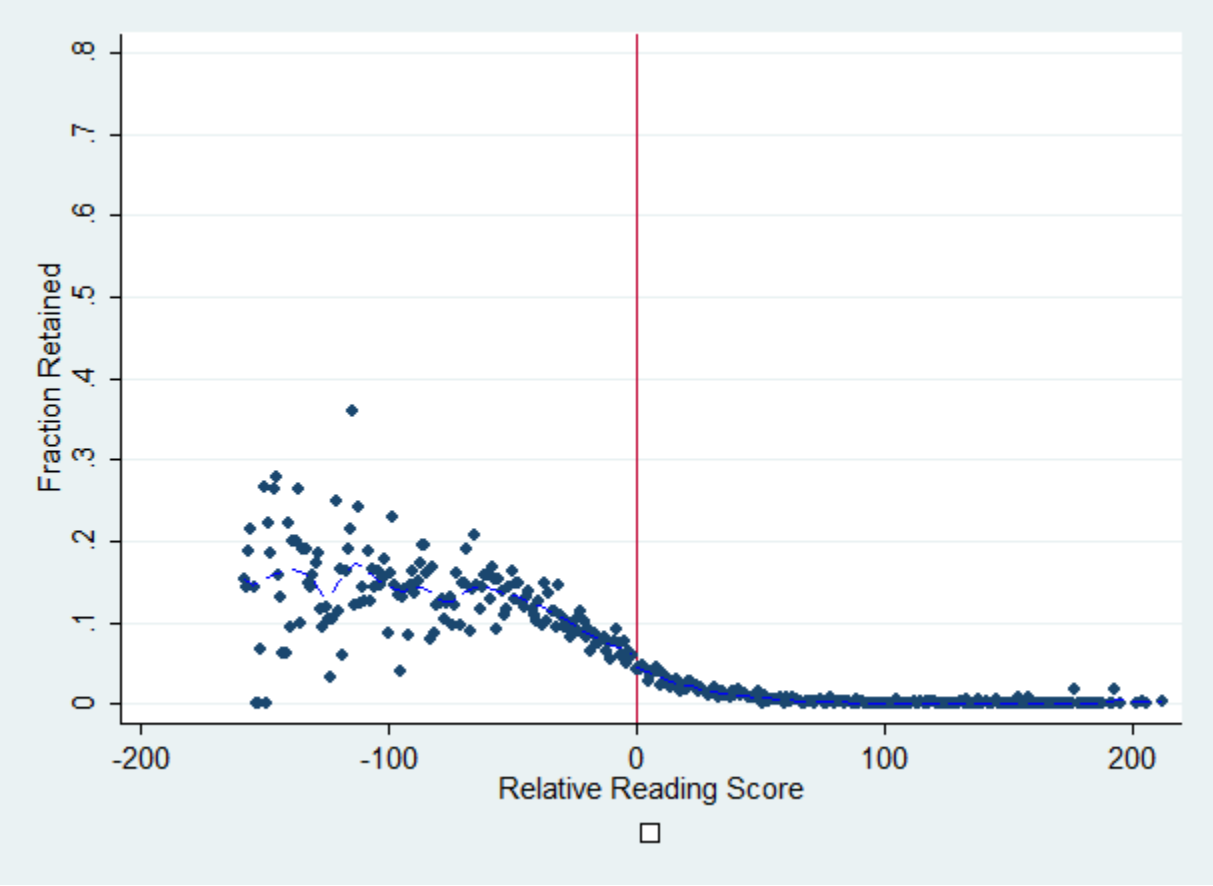
Note: Based on 2002-2009 Cohorts. Dashed-line represents local-linear regression on both sides of the cutoff.

Figure 4. *Relationship Between Third Grade Reading Scores and Grade Retention Around the Cutoff– After Policy*



Note: Based on 2002-2009 cohorts. Discontinuity sample within 20-point bandwidth. Solid line represents predicted values from linear regression and shaded area represents 95% confidence interval. Dashed line represents predicted values for local linear regression on both sides of the cutoff.

Figure 5. *Relationship Between Third-Grade Reading Scores and Grade Retention – Before Policy*



Based on 2000-2001 Cohorts. Dashed-line represents local-linear regression on both sides of the cutoff.

Figure 6. *Distribution of Third Grade Reading Scores*

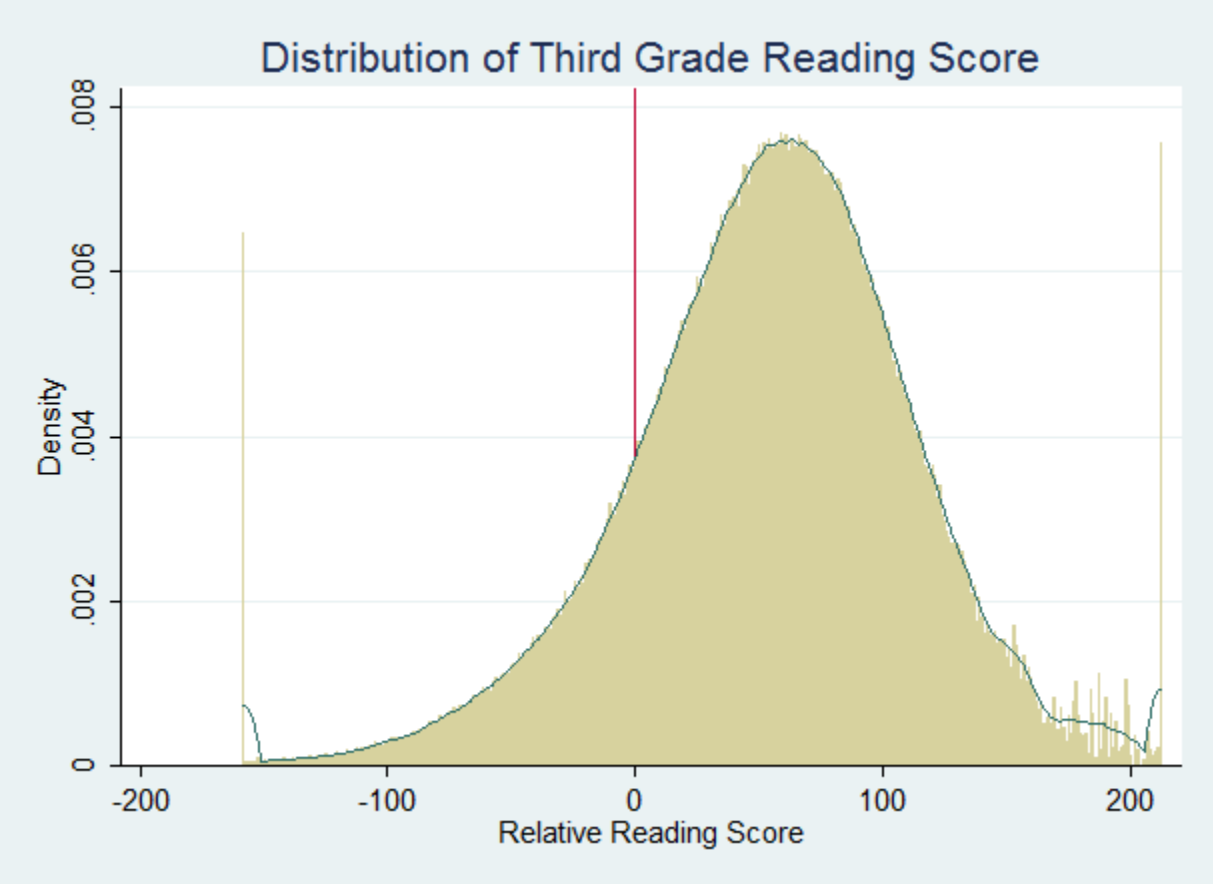
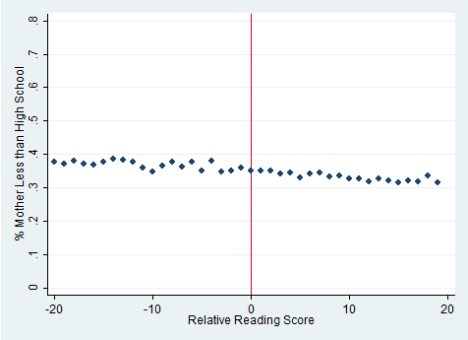
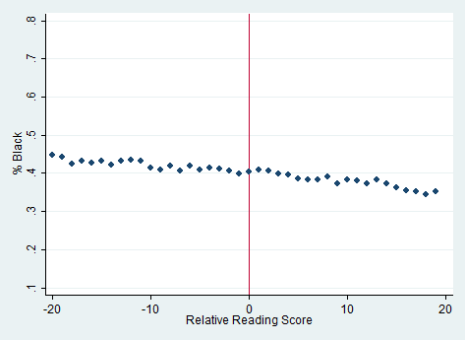


Figure 7. *Relationship Between Reading Scores in Third Grade and Student Characteristics*

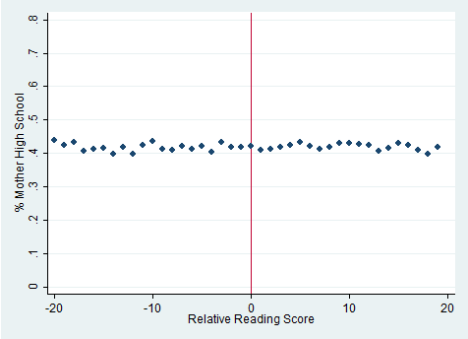
Fraction Mother < High School



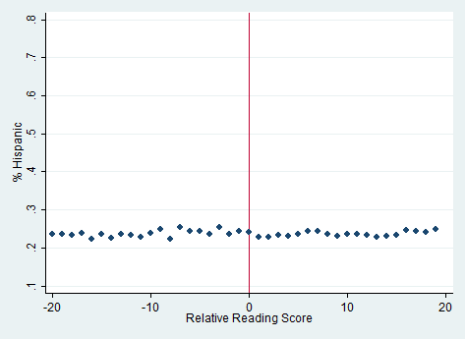
Fraction Black



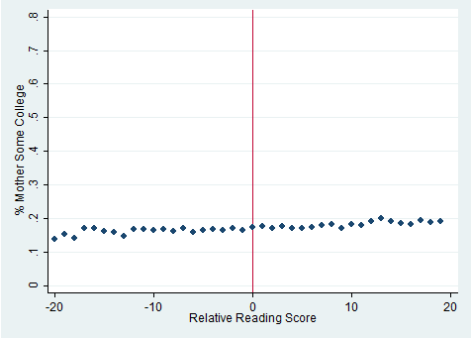
Fraction Mother High School



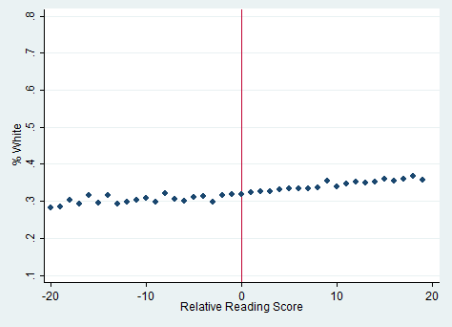
Fraction Hispanic



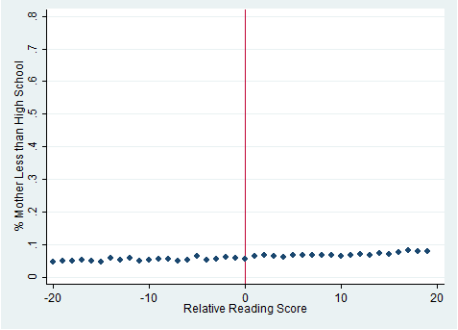
Fraction Mother Some College



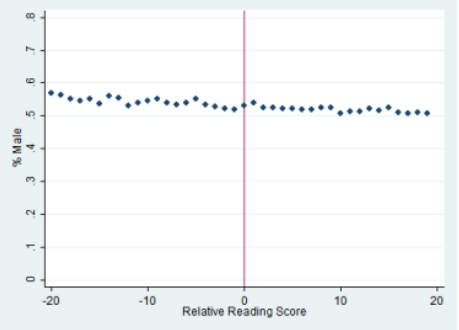
Fraction White



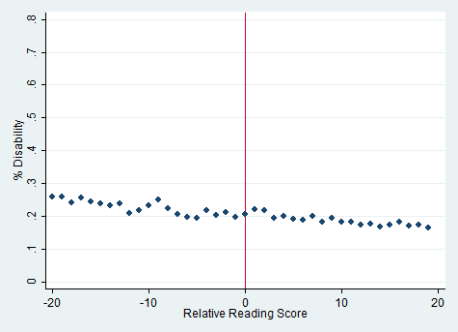
Fraction Mother Bachelor's Degree



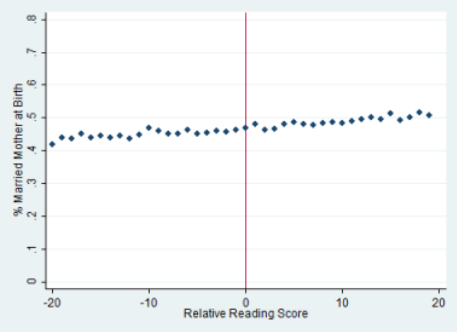
Fraction Male



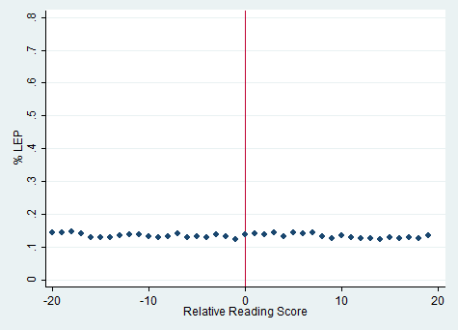
Fraction Disabled



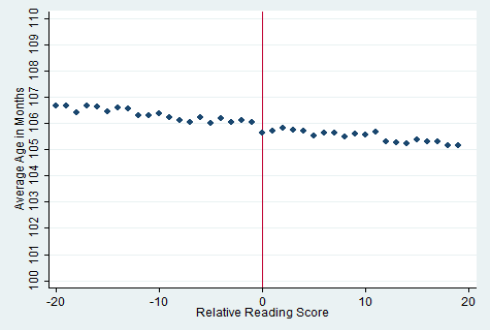
Fraction Married Mother



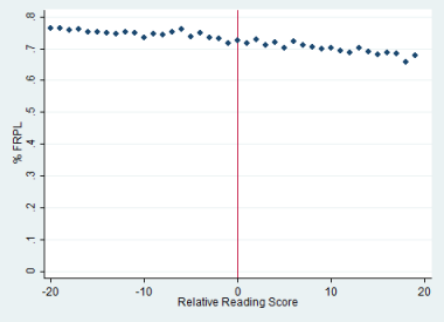
Fraction LEP



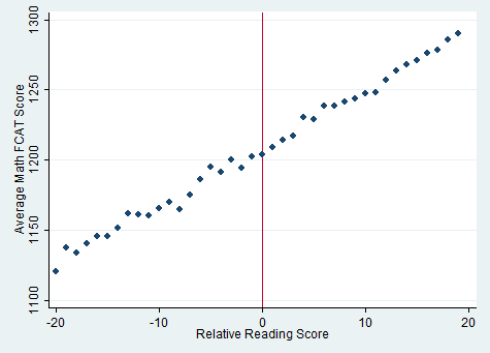
Average Age



Fraction Free/Reduced Price Lunch



Average Math Score



Average SAT10 Reading Score

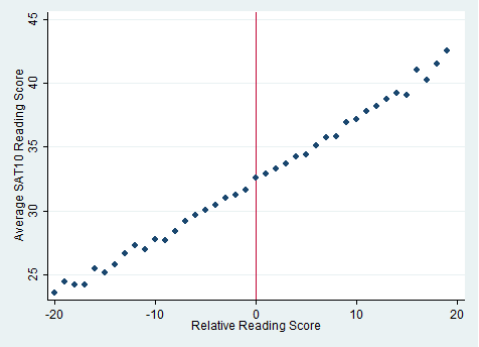
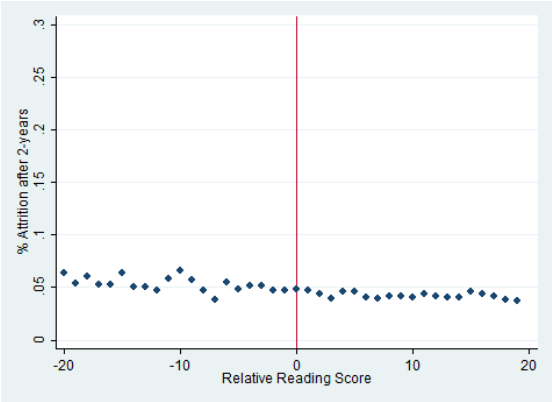
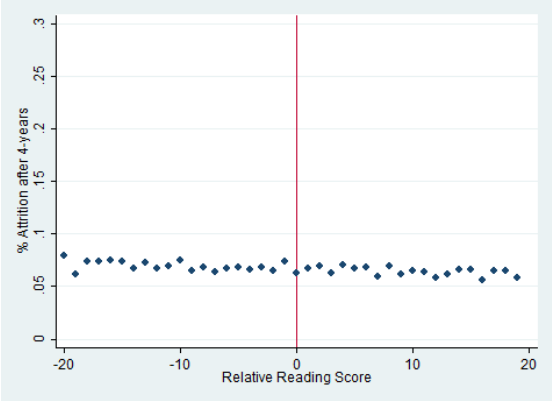


Figure 8. *Relationship Between Reading Scores in Third Grade and Later Attrition*

Attrition 2-Years Later



Attrition 4-Years Later



Attrition 7-Years Later

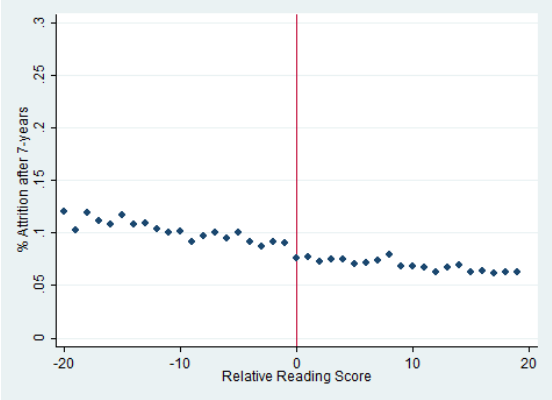
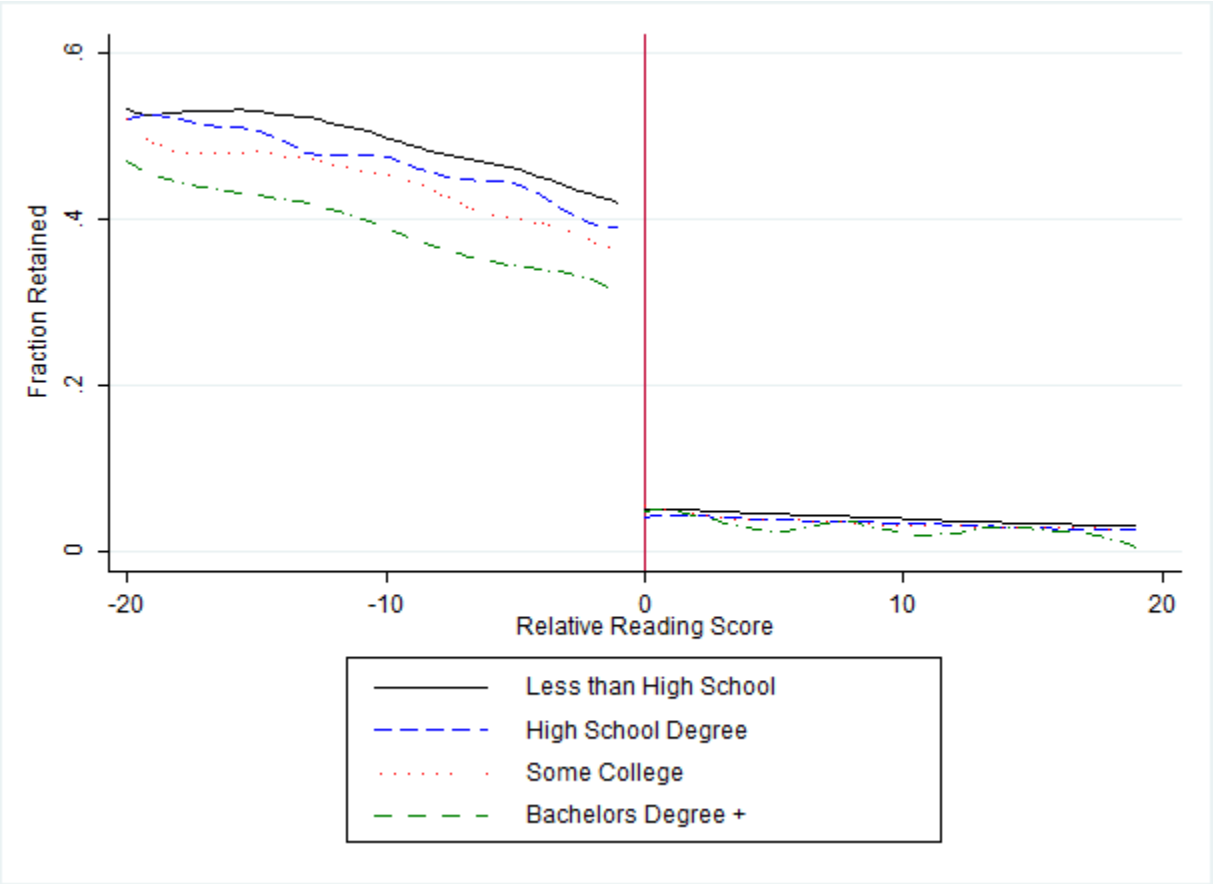
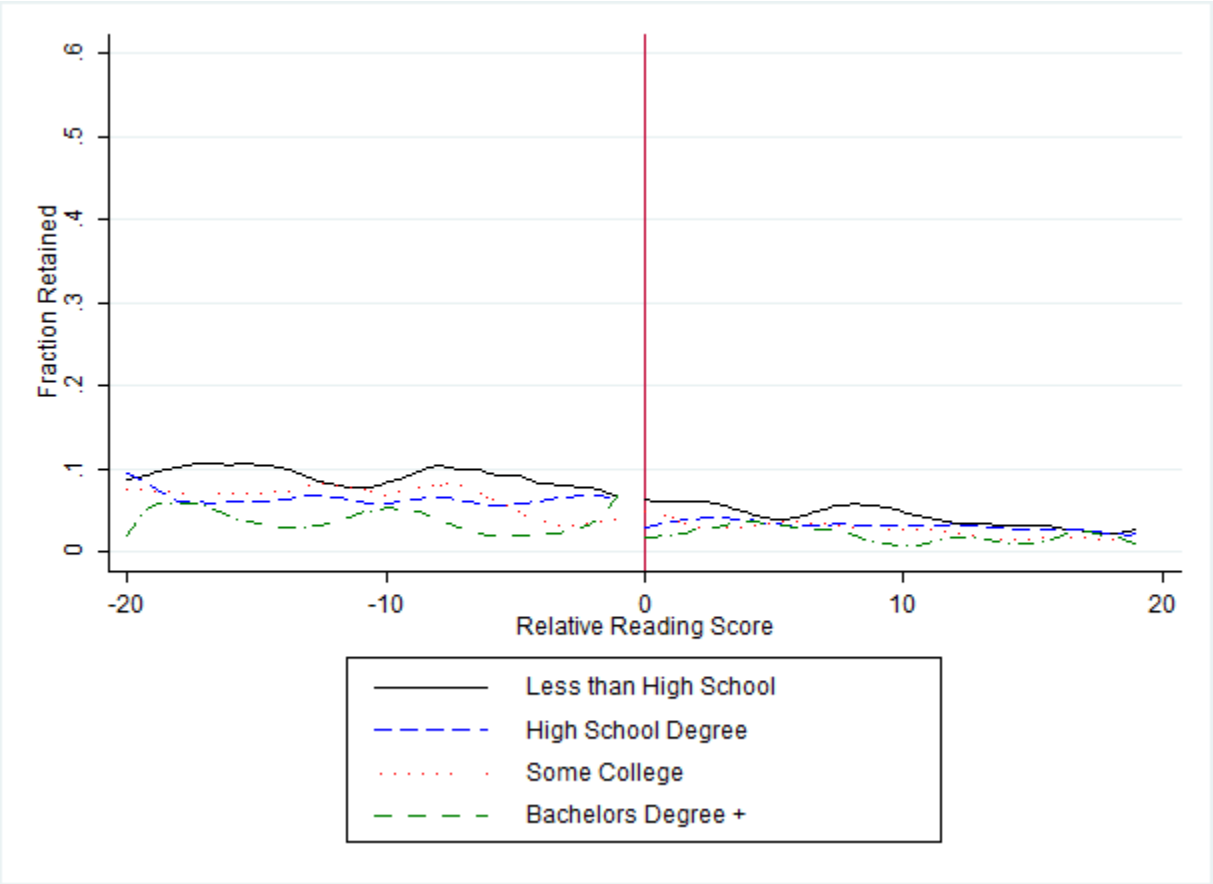


Figure 9. *Relationship between Third-Grade Reading Scores and Grade Retention Around the Cutoff by Maternal Education – After Policy*



Based on 2002-2009 Cohorts. Discontinuity sample with 20-point bandwidth. Each line represents predicted values from local linear regression on both sides of the cutoff for each of the four maternal education subgroups.

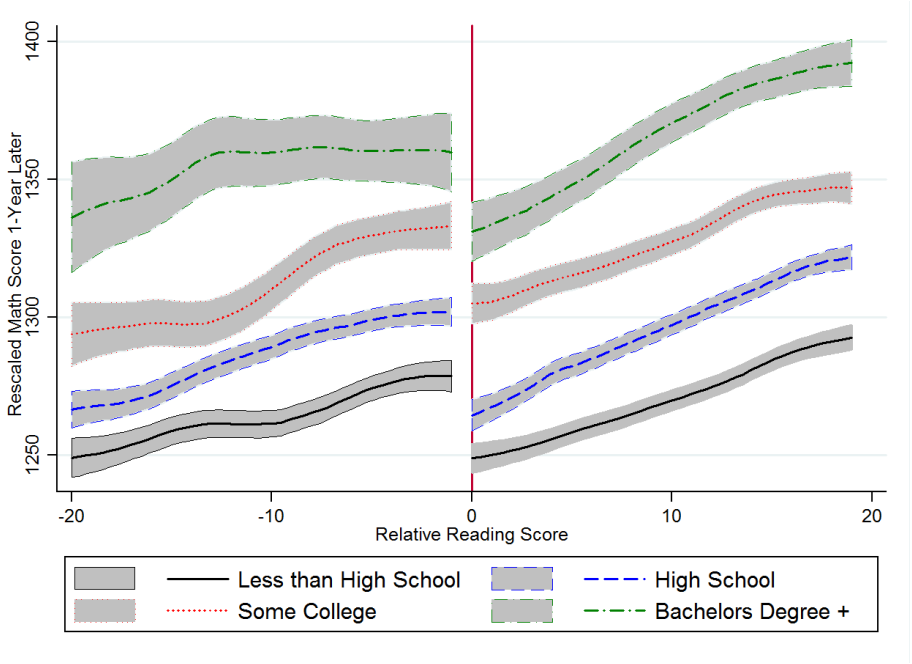
Figure 10. *Relationship Between Third-Grade Reading Scores and Grade Retention Around the Cutoff by Maternal Education – Before Policy*



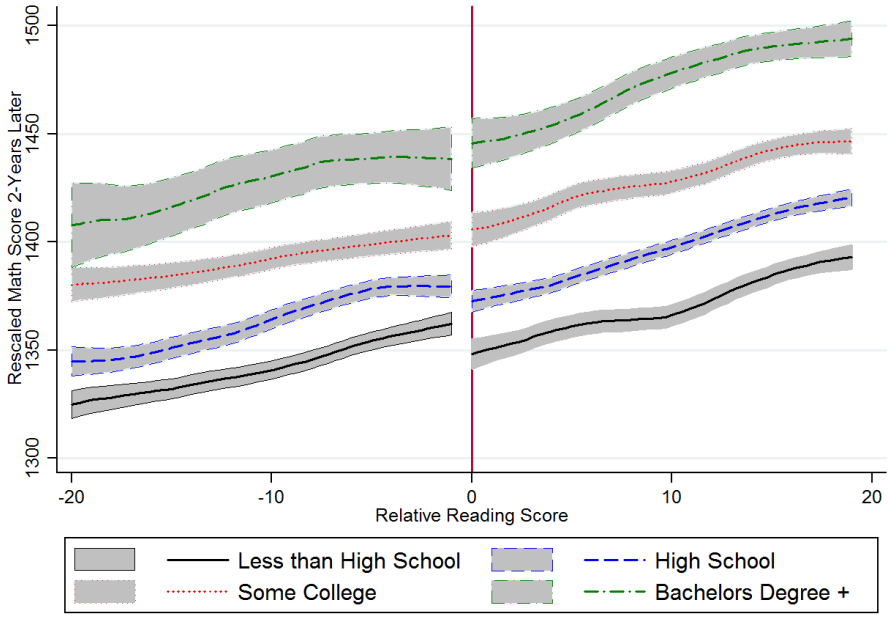
Based on 2000-2001 Cohorts. Discontinuity sample with 20-point bandwidth. Each line represents predicted values from local linear regression on both sides of the cutoff for each of the four maternal education subgroups.

Figure 11. *Relationship Between Third-Grade Reading Scores and Later Math Achievement by Maternal Education*

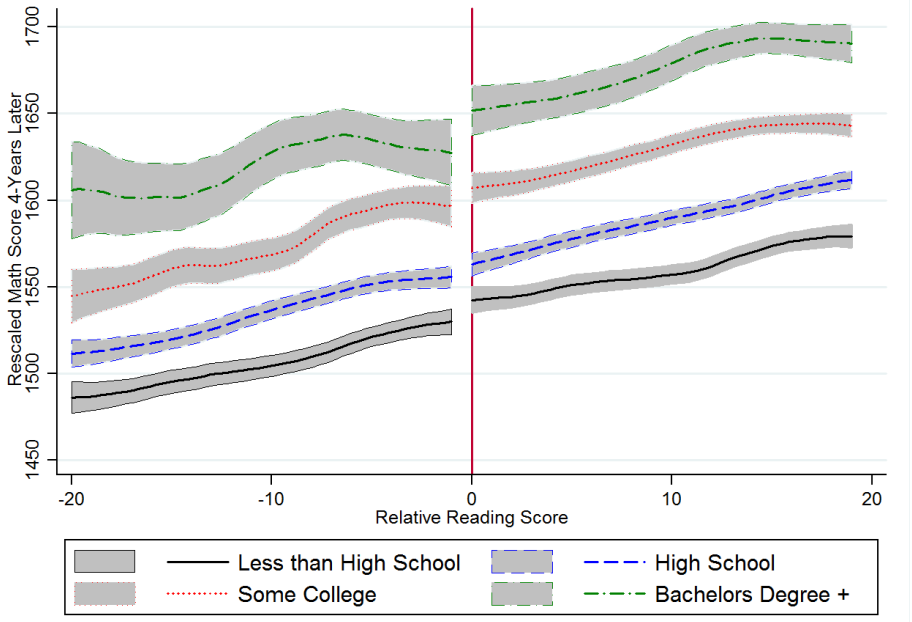
1-Year Later



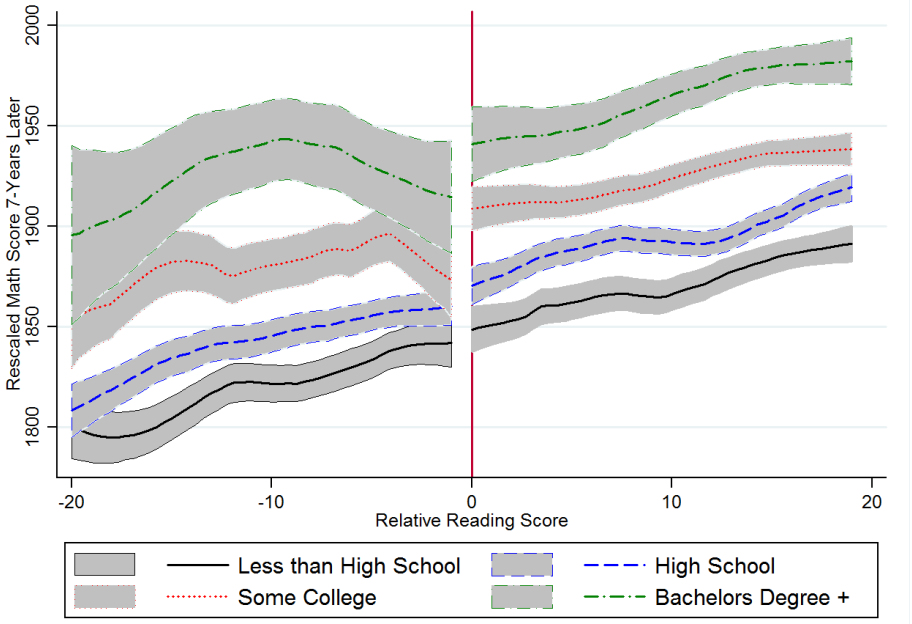
2-Years Later


Rescaled Math Score 2-Years Later
1300
1350
1400
1450
1500
-20
-10
0
10
20
Relative Reading Score
Less than High School
High School
Some College
Bachelors Degree +

4-Years Later



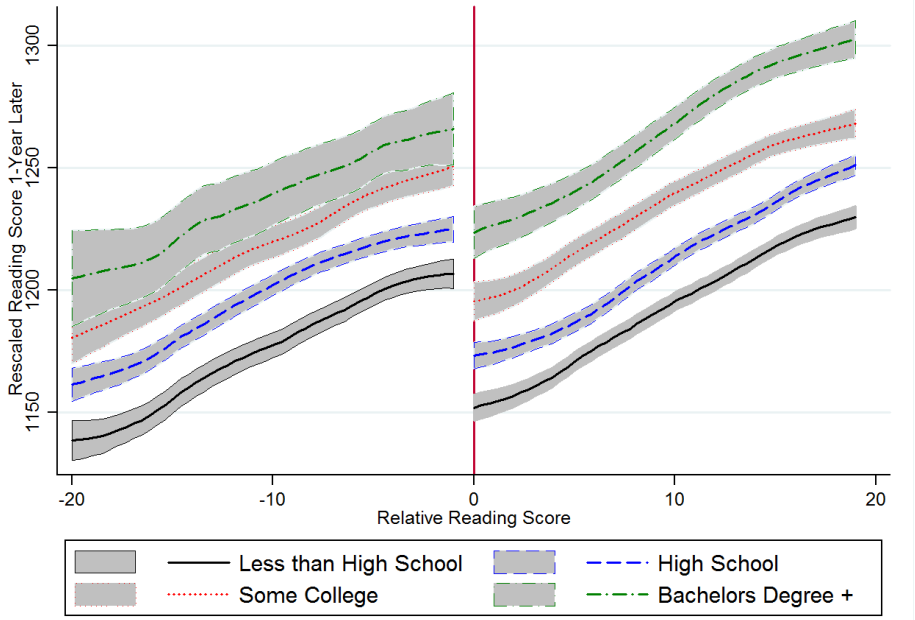
7-Years Later



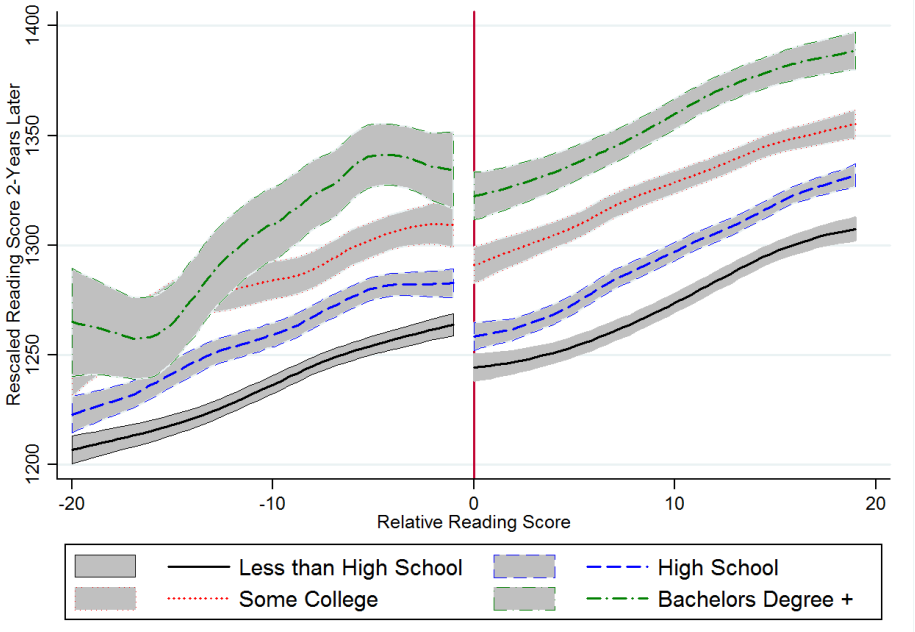
Based on 2002-2009 Cohorts. Discontinuity sample with 20-point bandwidth. Dashed line represents predicted values from local linear regression and shaded area represents 95% confidence interval.

Figure 12. *Relationship Between Third-Grade Reading Scores and Later Reading Achievement by Maternal Education*

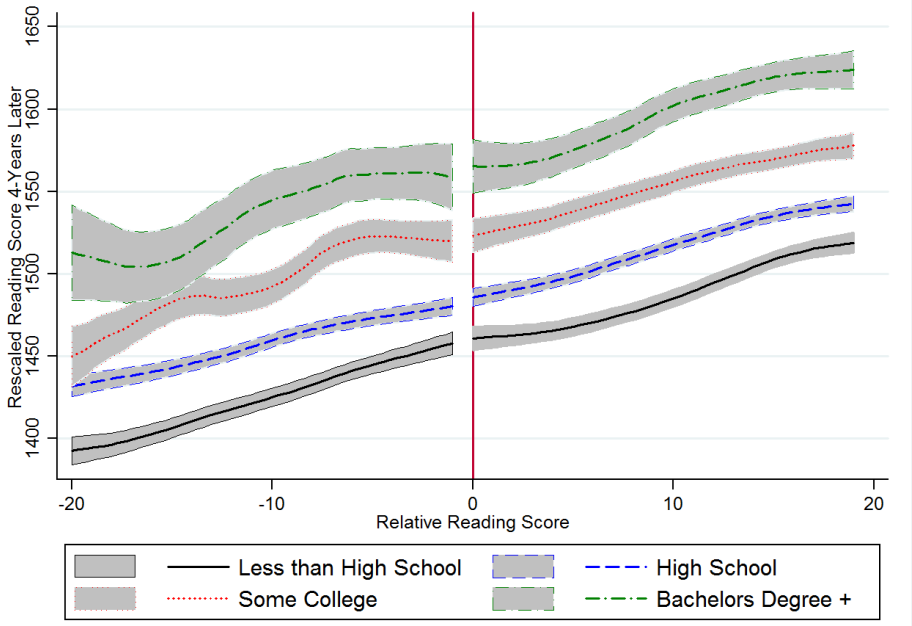
1-Year Later



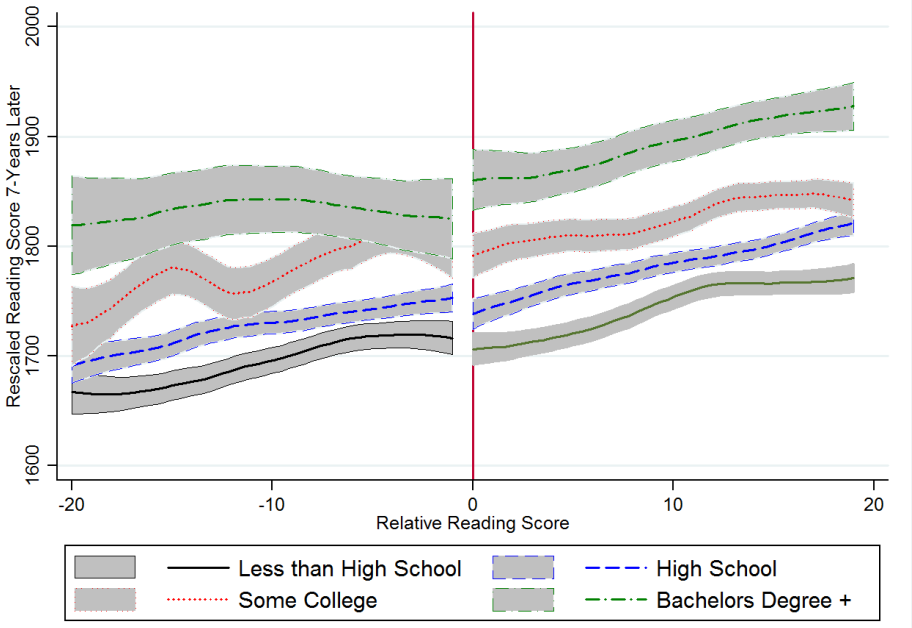
2-Years Later



4-Years Later



7-Years Later



Based on 2002-2009 Cohorts. Discontinuity sample with 20-point bandwidth. Dashed line represents predicted values from local linear regression and shaded area represents 95% confidence interval.

Tables

Table 1. *Percent of Students Below Promotion Cutoff and Retained by Cohort Year – Before and After Policy Implementation*

	Before Policy			After Policy								
	2000	2001	Total	2002	2003	2004	2005	2006	2007	2008	2009	Total
% Below	23.72	23.8	23.77	21.17	18.59	16.9	11.73	16.21	13.79	14.33	14.18	15.79
% Retained	3.38	3.36	3.37	15.04	11.56	9.87	6.75	7.89	7.33	7.98	7.01	9.10
% of Below Retained	10.39	11.16	10.89	67.13	58.27	54.77	51.83	45.24	48.64	51.63	44.56	53.44
% Above Retained	1.20	0.92	1.02	1.05	0.90	0.74	0.76	0.67	0.73	0.68	0.81	0.79
Total	59,849	107,248	167,097	112,380	108,498	110,093	113,345	117,445	120,989	121,751	126,105	930,606

Table 2. *Percent of Students Below Promotion Cutoff and Retained by Maternal Education - Before and After Policy Implementation*

	Before Policy				After Policy			
	Less than High School	High School	Some College	Bachelor's Degree +	Less than High School	High School	Some College	Bachelor's Degree +
% Below	38.65	24.56	16.05	7.72	27.56	16.92	9.91	4.31
% Retained	6.23	3.35	1.91	0.74	16.06	9.78	5.60	2.33
% of Below Retained	12.98	10.37	8.37	6.11	54.66	53.61	51.28	47.61
% Above Retained	1.98	1.07	0.68	0.29	1.38	0.85	0.58	0.29
Total	39,160	69,196	36,689	22,052	216,730	352,732	212,712	148,432

Table 3. *Descriptive Statistics: Variable Means*

	2000-2009	**2002-2009**			
			Below cutoff		
Variable	All	All	Retained	Promoted	Group Difference
Panel 1					
Maternal education less than high school	23.31	23.29	41.59	39.60	**
	(0.423)	(0.423)	(0.493)	(0.489)	
Maternal education high school	38.44	37.90	40.76	40.48	**
	(0.486)	(0.485)	(0.491)	(0.405)	
Maternal education some college	22.72	22.86	13.77	15.02	**
	(0.419)	(0.420)	(0.345)	(0.357)	
Maternal education bachelor's degree or more	15.53	15.95	3.88	4.90	**
	(0.362)	(0.366)	(0.193)	(0.216)	
Limited English proficient	8.04	8.25	15.04	13.38	**
	(0.272)	(0.275)	(0.357)	(0.341)	
Disabled	14.25	14.47	26.53	44.51	**
	(0.350)	(0.352)	(0.442)	(0.497)	
Free or reduced price lunch	52.58	53.27	79.68	76.19	**
	(0.499)	(0.499)	(0.402)	(0.426)	
Foreign born mother	24.56	25.07	28.21	24.00	**
	(0.430)	(0.433)	(0.450)	(0.427)	
Married mother	61.62	61.02	40.94	43.83	**
	(0.486)	(0.488)	(0.492)	(0.496)	
Age of mother at birth	26.67	26.70	24.91	25.03	**
	(6.21)	(6.24)	(6.14)	(6.12)	
Black	25.16	25.01	46.59	41.26	**
	(0.434)	(0.433)	(0.499)	(0.492)	
White	49.59	49.02	26.00	32.72	**
	(0.500)	(0.500)	(0.439)	(0.469)	
Hispanic	20.53	21.03	24.33	22.36	**
	(0.404)	(0.408)	(0.429)	(0.417)	
Other Race/Ethnicity	4.71	4.94	3.08	3.66	**
	(0.212)	(0.217)	(0.173)	(0.188)	
Male	50.14	50.36	58.02	59.36	**
	(0.501)	(0.500)	(0.493)	(0.491)	
Age in months	104.33	104.66	105.68	109.56	**
	(5.58)	(5.73)	(6.36)	(7.64)	
Birth weight	3316.14	3310.8	3231.52	3228.19	
	(617.28)	(620.59)	(677.91)	(681.43)	

Table 3. *Descriptive Statistics: Variable Means – Continued*

	2000-2009	**2002-2009**			
			Below cutoff		
Variable	All	All	Retained	Promoted	Group Difference
Panel 2					
Third grade FCAT reading score	1366.24	1381.29	782.54	818.48	**
	(371.46)	(366.53)	(236.38)	(235.40)	
Third grade FCAT math score	1,404.10	1,420.81	1,027.71	1,105.17	**
	(293.93)	(291.11)	(270.64)	(280.39)	
Third grade SAT10 percentile rank	59.02	59.29	18.22	22.75	**
	(27.48)	(27.38)	(11.14)	(15.64)	
Total	1,097,703	930,606	78,508	68,401	

Note: Standard deviations are in parentheses.

Table 4. *Association Between Student Background Characteristics and the Likelihood of Being Retained in the Face of Failing to Meet the Promotion Cutoff*

Variable	1	2
Maternal education - high school	-0.034**	-0.023**
	(0.003)	(0.003)
Maternal education - some college	-0.066**	-0.043**
	(0.004)	(0.004)
Maternal education - bachelor's degree or more	-0.105**	-0.066**
	(0.007)	(0.007)
Limited English Proficiency	0.012*	-0.004
	(0.005)	(0.004)
Disabled	-0.104**	-0.169**
	(0.003)	(0.003)
Free or reduced price lunch	0.035**	0.023**
	(0.003)	(0.003)
Foreign born mother	0.010**	0.016**
	(0.004)	(0.004)
Married mother	-0.008**	-0.004
	(0.003)	(0.003)
Age of mother at birth	0.000	0.000
	(0.000)	(0.000)
Black	0.038**	0.012**
	(0.003)	(0.003)
Hispanic	0.008*	0.003
	(0.004)	(0.004)
Male	0.027**	0.029**
	(0.003)	(0.002)
Age in months	-0.018**	-0.018**
	(0.000)	(0.000)
Birth weight	-0.000**	-0.000
	(0.000)	(0.000)
Observations	146,909	146,909
Controls for Achievement	No	Yes

Notes: Robust standard errors in parentheses. Estimates obtained from OLS regressions on all students who scored below the promotion cutoff between for 2002-2009 cohorts. All models include full demographic controls listed in Panel 1 of Table 3. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table 5. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade*

Variable	1	2	3	4	5	6
Below cutoff	0.349**	0.375**	0.439**	0.373**	0.356**	0.358**
	(0.004)	(0.007)	(0.009)	(0.010)	(0.016)	(0.017)
High school X Below		-0.026*	-0.025*	-0.016	-0.017+	-0.015
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Some college X Below		-0.055**	-0.049**	-0.034**	-0.037**	-0.032*
		(0.013)	(0.013)	(0.013)	(0.014)	(0.014)
Bachelor's or more X Below		-0.110**	-0.090**	-0.062**	-0.061**	-0.060**
		(0.019)	(0.019)	(0.019)	(0.020)	(0.021)
Lep X Below			0.012	0.013	-0.014	-0.023
			(0.012)	(0.012)	(0.014)	(0.015)
Disability X Below			-0.122**	-0.127**	-0.099**	-0.092**
			(0.010)	(0.010)	(0.010)	(0.011)
Sat10 reading > 51st ptile X Below			-0.151**	-0.130**	-0.132**	-0.145**
			(0.008)	(0.008)	(0.008)	(0.009)
Fcat math X Below				-0.000**	-0.000**	-0.000**
				(0.000)	(0.000)	(0.000)
Black X Below					0.032**	0.027*
					(0.011)	(0.011)
Hspanic X Below					0.002	0.005
					(0.013)	(0.013)
Male X Below					0.047**	0.046**
					(0.008)	(0.008)
Age (in months) X Below					-0.007**	-0.006**
					(0.001)	(0.001)
Birth weight X Below					-0.000	-0.000
					(0.000)	(0.000)
FRP lunch X Below					0.033**	0.033**
					(0.010)	(0.011)
Foreign born mother X Below					0.045**	0.042**
					(0.011)	(0.012)
Married mother X Below					-0.003	-0.002
					(0.009)	(0.009)
Mother's age X Below					-0.001	-0.001
					(0.001)	(0.001)
Observations	139,960	139,960	139,960	139,960	139,960	139,960
Number of School X Year						14,900
Maternal Education	No	Yes	Yes	Yes	Yes	Yes
LEP/Disability/SAT10>51st percent	No	No	Yes	Yes	Yes	Yes
Third Grade FCAT Math Score	No	No	No	Yes	Yes	Yes
Student/Family Characteristics	No	No	No	No	Yes	Yes
School by Year Fixed Effects	No	No	No	No	No	Yes

Notes: Columns 1-5 include robust standard errors in parentheses; Column 6 standard errors are clustered at the schoolXyear level. Discontinuity estimates are obtained parametrically using a degree of 1 and within 20 points of the promotion cutoff. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table 6. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade: Before Versus After Policy Implementation*

	Before	After
Below cutoff	-0.001	0.358**
	(0.022)	(0.017)
Maternal education - high school	-0.017*	-0.010**
	(0.008)	(0.004)
Maternal education - some college	-0.019*	-0.006
	(0.009)	(0.005)
Maternal education - bachelor's degree or more	-0.021+	-0.010
	(0.012)	(0.008)
High school X Below	0.008	-0.015
	(0.013)	(0.010)
Some college X Below	-0.013	-0.032*
	(0.016)	(0.014)
Bachelor's or more X Below	-0.013	-0.060**
	(0.021)	(0.021)
Observations	31,647	139,960
Number of School X Year	3,346	14,900

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all interacted controls and school by year fixed effects as found in Table 5 Column 6. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table 7. *Individual Subgroup Effects of Scoring Below the Promotion Cutoff on Retention in Third Grade*

Variable	All	Race			FRP lunch status	
		White/Other	Black	Hispanic	No FRPL	FRPL
Below cutoff	0.358**	0.375**	0.362**	0.365**	0.382**	0.398**
	(0.017)	(0.028)	(0.030)	(0.037)	(0.034)	(0.016)
High school X Below	-0.015	-0.030	-0.008	-0.004	-0.006	-0.014
	(0.010)	(0.020)	(0.016)	(0.022)	(0.029)	(0.011)
Some college X Below	-0.032*	-0.043+	-0.022	-0.057+	-0.030	-0.039*
	(0.014)	(0.025)	(0.023)	(0.029)	(0.032)	(0.017)
Bachelor's or more X Below	-0.060**	-0.065+	-0.069	-0.045	-0.051	-0.063+
	(0.021)	(0.035)	(0.044)	(0.043)	(0.037)	(0.034)
Observations	139,960	51,507	55,248	33,205	39,538	100,422
SchoolXYear	14,900	11,919	10,930	8,589	11,925	13,868

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff and including all interacted controls and school by year fixed effects as found in Table 5 Column 6. Race subgroup estimates do not include controls or interactions for race. FRP lunch estimates do not include controls or interactions for FRP lunch. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table 8. *School Level Subgroup Effects of Scoring Below the Promotion Cutoff on Retention in Third Grade*

Variable	All	School level average maternal education quintile					School level average FRP lunch quintile				
		Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Below cutoff	0.358**	0.366**	0.345**	0.345**	0.371**	0.421**	0.415**	0.429**	0.312**	0.361**	0.340**
	(0.017)	(0.034)	(0.034)	(0.038)	(0.043)	(0.058)	(0.056)	(0.044)	(0.038)	(0.033)	(0.039)
High school X Below	-0.015	-0.002	-0.010	-0.035	-0.005	-0.066	-0.085*	-0.050	0.002	-0.016	0.002
	(0.010)	(0.017)	(0.019)	(0.024)	(0.030)	(0.047)	(0.044)	(0.031)	(0.024)	(0.019)	(0.016)
Some college X Below	-0.032*	-0.057*	-0.017	-0.028	-0.019	-0.077	-0.110*	-0.032	0.043	-0.073**	-0.037
	(0.014)	(0.028)	(0.029)	(0.031)	(0.036)	(0.050)	(0.049)	(0.037)	(0.031)	(0.028)	(0.026)
Bachelor's or more X Below	-0.060**	-0.115*	-0.055	-0.066	-0.056	-0.083	-0.105+	-0.071	-0.024	-0.072	-0.092+
	(0.021)	(0.057)	(0.051)	(0.048)	(0.047)	(0.058)	(0.058)	(0.049)	(0.047)	(0.049)	(0.051)
Observations	139,960	41,940	34,726	27,135	21,881	14,278	14,739	21,258	26,783	33,721	43,459
SchoolXYear	14,900	3,524	3,201	2,937	2,749	2,489	2,529	2,687	2,888	3,180	3,616

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff and including all interacted controls and school by year fixed effects as found in Table 5 Column 6. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 9. *2SLS Effects of Retention on Later Reading Test Scores*

Variable	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	206.650**	114.798**	65.210**	38.395**	8.088	27.874+	75.037**
	(10.076)	(10.996)	(12.178)	(12.292)	(11.782)	(14.404)	(25.501)
High school X Retained	4.222	4.587	16.311	10.682	-1.318	-0.068	-15.781
	(13.966)	(15.399)	(17.083)	(17.364)	(16.598)	(19.909)	(35.537)
Some college X Retained	23.687	-12.292	-12.887	12.998	-2.910	31.734	-15.668
	(19.806)	(21.383)	(23.607)	(24.394)	(23.001)	(27.633)	(50.351)
Bachelor's or more X Retained	14.236	52.782	-19.845	-6.772	1.186	-74.794	-126.717
	(36.850)	(39.603)	(45.492)	(46.220)	(43.816)	(49.494)	(82.540)
Observations	136,068	114,926	94,661	77,262	59,892	35,759	25,840
Schools X Year	14,848	12,850	10,892	8,971	7,097	4,913	3,441

Notes: Standard errors clustered by schoolXyear given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3 Panel 1, and school by year fixed effects. Estimates are based on rescaled later developmental test scores. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 10. *2SLS Effets of Reteniton on Later Math Test Scores*

Variable	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	116.872**	64.916**	45.003**	-9.137	-15.085	-10.542	8.755
	(8.169)	(8.179)	(10.366)	(10.380)	(9.328)	(10.438)	(15.400)
High school X Retained	11.581	-8.976	17.117	9.988	-3.708	-11.852	-44.393*
	(11.315)	(11.445)	(14.507)	(14.693)	(13.128)	(14.465)	(21.501)
Some college X Retained	15.759	-33.878*	0.197	22.770	18.624	-0.342	-48.985
	(16.023)	(15.908)	(20.067)	(20.640)	(18.161)	(19.996)	(30.346)
Bachelor's or more X Retained	6.794	-61.595*	-67.728+	-38.364	-36.363	-54.685	-49.493
	(29.912)	(29.359)	(38.639)	(39.253)	(34.545)	(36.012)	(49.443)
Observations	136,146	114,989	94,720	77,330	59,959	35,812	26,034
Schools X Year	14,847	12,849	10,896	8,971	7,099	4,917	3,443

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3, and school by year fixed effects. Estimates are based on rescaled later developmental test scores. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 11 *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade by Functional Form and Bandwidth: Model with No Controls*

Variable	Linear				Quadradic				Cubic			
	50pt bw	20pt bw	10pt bw	5pt bw	50pt bw	20pt bw	10pt bw	5pt bw	50pt bw	20pt bw	10pt bw	5pt bw
Below	0.409**	0.375**	0.363**	0.353**	0.376**	0.357**	0.356**	0.367**	0.357**	0.351**	0.341**	0.375**
	(0.005)	(0.007)	(0.011)	(0.016)	(0.006)	(0.009)	(0.013)	(0.022)	(0.008)	(0.013)	(0.021)	(0.047)
High school X Below	-0.026**	-0.026*	-0.026+	-0.036+	-0.025**	-0.026*	-0.026+	-0.036+	-0.024**	-0.016	-0.028	-0.017
	(0.007)	(0.010)	(0.014)	(0.021)	(0.007)	(0.010)	(0.014)	(0.021)	(0.009)	(0.014)	(0.020)	(0.034)
Some college X Below	-0.060**	-0.055**	-0.063**	-0.058*	-0.057**	-0.054**	-0.063**	-0.058*	-0.051**	-0.052**	-0.049+	-0.074+
	(0.009)	(0.013)	(0.018)	(0.028)	(0.009)	(0.013)	(0.018)	(0.028)	(0.011)	(0.018)	(0.026)	(0.045)
Bachelor's or more X Below	-0.125**	-0.110**	-0.091**	-0.099*	-0.121**	-0.109**	-0.091**	-0.098*	-0.107**	-0.094**	-0.095*	-0.162*
	(0.013)	(0.019)	(0.027)	(0.040)	(0.013)	(0.019)	(0.027)	(0.040)	(0.017)	(0.026)	(0.038)	(0.064)
Observations	368,125	139,960	69,224	34,596	368,125	139,960	69,224	34,596	368,125	139,960	69,224	34,596

Notes: Robust standard errors given in parentheses. Discontinuity estimates are obtained parametrically using the specified polynomial order and score range. No additional controls or fixed effects are included. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 12. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade by Functional Form and Bandwidth: Model with Full Controls*

Variable	Linear		Cubic
	20 pts	5 pts	20 pts
Below	0.358**	0.369**	0.335**
	(0.017)	(0.041)	(0.023)
High school X Below	-0.015	-0.020	-0.006
	(0.010)	(0.025)	(0.014)
Some college X Below	-0.032*	-0.034	-0.028
	(0.014)	(0.034)	(0.019)
Bachelor's or more X Below	-0.060**	-0.045	-0.050+
	(0.021)	(0.052)	(0.029)
Observations	139,960	34,596	139,960
Number of School X Year	14,900	12,105	14,900

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using the specified polynomial order and score range, and including all interacted controls and school by year fixed effects as found in Table 5 Column 6. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 13. *2SLS Effect of Retention on Reading Scores 1-Year Later by Functional Form and Bandwidth*

Variable	Linear				Quadradic				Cubic			
	50 pts	20 pts	10 pts	5 pts	50 pts	20 pts	10 pts	5 pts	50 pts	20 pts	10 pts	5 pts
Retained	202.16**	199.22**	217.49**	205.29**	194.84**	211.29**	203.72**	276.59**	200.06**	207.15**	226.58**	177.44
	(6.32)	(10.40)	(15.31)	(22.67)	(10.11)	(16.64)	(24.10)	(39.25)	(13.70)	(22.03)	(40.29)	(252.73)
High school X Retained	12.29	15.47	-18.45	-24.12	20.30	-17.91	-18.86	-103.53+	2.18	-17.41	-16.65	15.08
	(8.85)	(14.67)	(21.57)	(32.31)	(14.20)	(22.95)	(33.54)	(56.17)	(18.91)	(30.94)	(95.09)	(271.48)
Some college X Retained	21.50+	24.12	31.39	71.82	30.09	37.09	56.81	-154.63+	24.88	78.91	-9.80	-118.01
	(12.34)	(20.60)	(31.36)	(47.70)	(19.71)	(33.04)	(48.51)	(80.63)	(26.04)	(64.69)	(108.13)	(313.66)
Bachelor's or more X Retained	49.17*	53.61	40.99	27.38	33.43	47.68	34.82	172.66	15.12	23.90	-40.44	129.51
	(22.62)	(38.19)	(54.56)	(79.40)	(36.80)	(55.89)	(85.18)	(221.33)	(70.73)	(92.63)	(171.89)	(561.47)
Observations	358,462	136,068	67,264	33,632	358,462	136,068	67,264	33,632	358,462	136,068	67,264	33,632

Notes: Robust standard errors given in parentheses. Two-stage-least-squares estimates are obtained parametrically using the specified polynomial order and score range. No additional controls or fixed effects are included. Estimates are based on rescaled later developmental test scores. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table 14. *2SLS Effect of Retention on Reading Scores 1-Year Later by Functional Form and Bandwidth*

Variable	Linear				Quadradic				Cubic			
	50 pts	20 pts	10 pts	5 pts	50 pts	20 pts	10 pts	5 pts	50 pts	20 pts	10 pts	5 pts
Retained	128.15**	105.28**	121.12**	94.48**	109.62**	107.01**	101.25**	134.10**	98.88**	119.30**	91.51**	9.82
	(6.15)	(10.16)	(14.84)	(21.61)	(9.83)	(16.01)	(23.20)	(36.41)	(13.29)	(20.86)	(33.53)	(177.74)
High school X Retained	3.33	28.63*	15.84	42.47	25.83+	27.30	36.98	35.52	33.89+	12.83	127.15	141.66
	(8.54)	(14.27)	(20.91)	(31.10)	(13.73)	(22.20)	(32.74)	(52.61)	(18.35)	(30.22)	(131.09)	(217.94)
Some college X Retained	-2.14	14.49	-9.85	14.39	10.79	33.94	6.77	-70.52	21.79	-50.72	-7.31	-90.70
	(11.96)	(20.00)	(30.22)	(45.17)	(19.09)	(31.87)	(47.08)	(79.61)	(25.12)	(65.43)	(165.80)	(228.08)
Bachelor's or more X Retained	54.46*	55.89	30.40	-11.03	51.11	46.42	15.66	-94.75	-3.21	-36.16	82.80	21.68
	(22.19)	(37.99)	(54.28)	(78.66)	(36.00)	(57.07)	(83.84)	(175.61)	(77.04)	(110.28)	(168.29)	(312.46)
Observations	358,669	136,146	67,299	33,652	358,669	136,146	67,299	33,652	358,669	136,146	67,299	33,652

Notes: Robust standard errors given in parentheses. Two-stage-least-squares estimates are obtained parametrically using the specified polynomial order and score range. No additional controls or fixed effects are included. Estimates are based on rescaled later developmental test scores. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table 15. *2SLS Effect of Retention on Test Scores 1-Year Later*

	Reading			Math		
Variable	1	2	3	1	2	3
Retained	199.221**	204.969**	206.650**	105.276**	115.113**	116.872**
	(10.397)	(9.958)	(10.076)	(10.164)	(8.173)	(8.169)
High school X Retained	15.469	6.879	4.222	28.627*	11.465	11.581
	(14.671)	(13.850)	(13.966)	(14.265)	(11.238)	(11.315)
Some college X Retained	24.121	27.537	23.687	14.492	13.576	15.759
	(20.600)	(19.456)	(19.806)	(19.995)	(15.536)	(16.023)
Bachelor's or more X Retained	53.606	42.225	14.236	55.893	22.395	6.794
	(38.188)	(35.875)	(36.850)	(37.990)	(28.273)	(29.912)
Observations	136,068	136,068	136,068	136,146	136,146	136,146
Number of School X Year			14,848			14,847
Full Controls	No	Yes	Yes	No	Yes	Yes
School by Year Fixed Effects	No	No	Yes	No	No	Yes

Notes: Robust standard errors given in parentheses in columns 1 and 2. Standard errors clustered at the schoolXyear level given in parentheses in column 3. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff. Full controls indicate the inclusion of all demographic and achievement controls listed in Table 3. School by Year Fixed Effects indicates the inclusion of these fixed effects in the model. Estimates are based on rescaled later developmental test scores. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$)

Appendix 1:

Table A1. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade – by Cohort Year*

	02	03	04	05	06	07	08	09
Below	0.385**	0.328**	0.406**	0.465**	0.306**	0.365**	0.370**	0.141
	(0.042)	(0.048)	(0.046)	(0.055)	(0.043)	(0.050)	(0.119)	(0.116)
High school X Below	0.014	-0.045	-0.033	-0.002	-0.014	-0.030	-0.014	-0.006
	(0.024)	(0.029)	(0.029)	(0.032)	(0.027)	(0.029)	(0.029)	(0.028)
Some college X Below	-0.005	0.001	-0.095*	-0.017	-0.042	-0.020	-0.027	-0.053
	(0.033)	(0.042)	(0.041)	(0.047)	(0.037)	(0.041)	(0.038)	(0.037)
Bachelor's or more X Below	0.022	-0.053	-0.081	-0.071	-0.071	-0.082	-0.060	-0.109*
	(0.054)	(0.064)	(0.061)	(0.072)	(0.053)	(0.062)	(0.058)	(0.055)
Observations	21,191	16,276	17,223	13,939	18,125	16,909	18,004	18,293
Schools	1,764	1,773	1,826	1,820	1,892	1,913	1,941	1,971

Notes: Standard errors clustered by school given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff and including all interacted controls and school by year fixed effects as found in Table 5 Column 6. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A2. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade by Proportion of Mothers in Student's School with a High School Degree or More – By Distribution Quintiles*

	All	Q1	Q2	Q3	Q4	Q5
Below	0.358**	0.341**	0.355**	0.351**	0.385**	0.415**
	(0.017)	(0.034)	(0.034)	(0.038)	(0.042)	(0.059)
High school X Below	-0.015	0.005	-0.014	-0.063**	0.007	-0.070
	(0.010)	(0.017)	(0.019)	(0.024)	(0.031)	(0.047)
Some college X Below	-0.032*	-0.062*	-0.022	-0.060+	0.004	-0.084+
	(0.014)	(0.028)	(0.028)	(0.032)	(0.035)	(0.051)
Bachelor's or more X Below	-0.060**	-0.067	-0.092+	-0.055	-0.065	-0.101+
	(0.021)	(0.058)	(0.049)	(0.049)	(0.048)	(0.058)
Observations	139,960	42,395	34,148	27,025	21,880	14,512
Number School X Year	14,900	3,608	3,200	2,854	2,739	2,499

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff and including all interacted controls and school by year fixed effects found in Table 5 Column 6. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A3. *Effect of Scoring Below the Promotion Cutoff on Retention in Third Grade by Proportion of Mothers in Student's School with a Bachelor's Degree or More – By Distribution Quintiles*

	All	Q1	Q2	Q3	Q4	Q5
Below	0.358**	0.406**	0.266**	0.404**	0.386**	0.410**
	(0.017)	(0.034)	(0.034)	(0.038)	(0.043)	(0.058)
Maternal ed high schoolXbelow	-0.015	-0.010	0.007	-0.037	-0.025	-0.049
	(0.010)	(0.016)	(0.019)	(0.024)	(0.029)	(0.045)
Maternal ed some collegeXbelow	-0.032*	-0.048+	0.007	-0.043	-0.036	-0.067
	(0.014)	(0.027)	(0.029)	(0.030)	(0.036)	(0.049)
Maternal ed bachelors or moreXbelow	-0.060**	-0.131*	-0.068	-0.051	-0.075	-0.051
	(0.021)	(0.058)	(0.051)	(0.047)	(0.046)	(0.058)
Observations	139,960	42,601	33,704	27,148	22,049	14,458
Number School X Year	14,900	3,741	3,050	2,891	2,750	2,468

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Discontinuity estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff and including all interacted controls and school by year fixed effects found in Table 5 Column 6. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A4. *2SLS Effect of Retention on Later Reading Test Scores – Not Rescaled*

	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	66.758**	142.286**	78.556**	33.541**	16.112	44.467**	103.682**
	(10.077)	(11.036)	(12.168)	(12.305)	(11.729)	(14.255)	(25.341)
High school X Retained	4.065	2.849	15.937	10.411	-0.932	0.073	-11.664
	(13.967)	(15.455)	(17.068)	(17.382)	(16.524)	(19.703)	(35.314)
Some college X Retained	23.375	-14.770	-14.463	12.375	-2.225	33.439	-13.932
	(19.807)	(21.461)	(23.587)	(24.419)	(22.899)	(27.347)	(50.035)
Bachelor's or more X Retained	14.256	50.980	-20.372	-7.092	1.579	-73.079	-123.096
	(36.852)	(39.748)	(45.453)	(46.267)	(43.622)	(48.982)	(82.021)
Observations	136,068	114,926	94,661	77,262	59,892	35,759	25,840
Schools X Year	14,848	12,850	10,892	8,971	7,097	4,913	3,441

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3, and school by year fixed effects. Later reading scores are not rescaled. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A5. *2SLS Effect of Retention on Later Math Test Scores – Not Rescaled*

	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	68.787**	41.282**	88.972**	-30.941**	-15.491+	7.636	30.072*
	(8.169)	(8.191)	(10.411)	(10.502)	(9.363)	(10.153)	(14.847)
High school X Retained	11.715	-8.017	15.957	9.073	-2.705	-11.665	-42.142*
	(11.314)	(11.462)	(14.570)	(14.866)	(13.177)	(14.070)	(20.730)
Some college X Retained	16.014	-31.464*	-4.109	20.762	20.636	2.447	-48.023
	(16.022)	(15.930)	(20.155)	(20.884)	(18.229)	(19.450)	(29.257)
Bachelor's or more X Retained	6.772	-60.574*	-68.253+	-38.913	-35.085	-52.756	-48.873
	(29.910)	(29.402)	(38.808)	(39.716)	(34.675)	(35.027)	(47.668)
Observations	136,146	114,989	94,720	77,330	59,959	35,812	26,034
Schools X Year	14,847	12,849	10,896	8,971	7,099	4,917	3,443

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3, and school by year fixed effects. Later math scores are not rescaled. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A6. *2SLS Effect of Retention on Later Reading Test Scores – Same Grade Comparison*

	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade
Retained	246.74**	167.54**	126.20**	108.24**	80.88**	73.53**	84.95**
	(12.59)	(12.21)	(13.57)	(13.80)	(12.68)	(22.05)	(31.49)
High school X Retained	10.53	-1.85	22.38	22.89	0.33	-6.77	-20.82
	(17.84)	(17.04)	(18.88)	(19.35)	(17.52)	(30.94)	(43.10)
Some college X Retained	24.52	-15.96	-0.74	29.52	-6.74	74.33+	-35.89
	(26.10)	(23.65)	(26.12)	(26.85)	(24.58)	(43.00)	(60.45)
Bachelor's or more X Retained	63.76	39.21	30.37	-51.46	45.91	-112.42	-103.60
	(54.77)	(44.40)	(49.63)	(51.47)	(43.34)	(69.62)	(98.03)
Observations	127,762	110,796	90,459	72,444	54,481	26,363	23,634
Schools X Year	14,791	12,849	10,899	9,012	7,125	3,641	3,539

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3 and school by year fixed effects. Later reading scores are not rescaled. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A7. *2SLS Effect of Retention on Later Math Test Scores – Same Grade Comparison*

	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade
Retained	183.03**	121.64**	86.93**	58.73**	45.54**	61.27**	61.54**
	(10.16)	(8.93)	(11.98)	(11.09)	(9.61)	(14.44)	(16.66)
High school X Retained	7.03	-7.58	20.52	9.58	-3.00	-44.38*	-43.32+
	(14.39)	(12.43)	(16.68)	(15.55)	(13.26)	(20.26)	(22.95)
Some college X Retained	4.23	-26.54	7.84	14.20	43.16*	-25.87	-73.05*
	(21.00)	(17.32)	(23.07)	(21.59)	(18.60)	(28.07)	(32.15)
Bachelor's or more X Retained	15.09	-86.82**	-17.79	-69.57+	-15.37	-122.31**	-46.40
	(44.00)	(32.41)	(43.82)	(41.39)	(32.84)	(45.29)	(51.96)
Observations	127,839	110,856	90,496	72,547	54,550	26,402	23,839
Schools X Year	14,791	12,852	10,900	9,012	7,126	3,642	3,547

Notes: Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3 and school by year fixed effects. Later reading scores are not rescaled. The following indicate significance: (** p<0.01, * p<0.05, + p<0.1).

Table A8. *2SLS Effect of Retention on Later Reading Test Scores – Students with 7-year Scores*

	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	204.31**	189.52**	80.17**	39.03+	8.23	34.46+	75.04**
	(21.53)	(24.23)	(23.57)	(22.83)	(19.70)	(20.05)	(25.50)
High school X Retained	-8.03	-2.20	7.57	2.00	-6.37	-16.24	-15.78
	(30.09)	(33.81)	(32.92)	(31.92)	(27.52)	(27.95)	(35.54)
Some college X Retained	-23.29	-72.11	13.85	11.29	-5.61	46.96	-15.67
	(43.85)	(49.47)	(47.53)	(46.33)	(38.40)	(39.58)	(50.35)
Bachelor's or more X Retained	42.15	-33.33	-6.57	9.68	-97.50	-106.64+	-126.72
	(74.40)	(85.31)	(82.45)	(72.61)	(63.11)	(64.63)	(82.54)
Observations	25,221	25,126	24,847	24,741	24,828	24,983	25,840
Schools X Year	3,427	3,423	3,418	3,419	3,424	3,433	3,441

Notes: One through seven years later estimates are for the subgroup of students who are observed with reading scores seven years later. Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3 and school by year fixed effects. Later reading scores are rescaled. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).

Table A9. *2SLS Effect of Retention on Later Math Test Scores – Students with 7-year Scores*

	1-Year	2-Years	3-Years	4-Years	5-Years	6-Years	7-Years
Retained	133.41**	74.71**	79.79**	-0.20	3.55	-3.23	7.16
	(18.05)	(16.89)	(21.02)	(19.11)	(14.87)	(13.95)	(15.31)
High school X Retained	0.08	-29.21	-6.11	0.40	-13.60	-27.06	-42.21*
	(25.20)	(23.53)	(29.28)	(26.70)	(20.75)	(19.47)	(21.34)
Some college X Retained	7.37	-68.76*	-64.74	-48.09	-23.27	-23.24	-47.81
	(36.75)	(34.29)	(42.23)	(38.64)	(29.07)	(27.53)	(30.24)
Bachelor's or more X Retained	-8.56	-35.14	-122.46+	-57.11	-41.04	-105.33*	-52.81
	(63.05)	(58.77)	(72.91)	(61.21)	(47.56)	(45.21)	(49.56)
Observations	25,208	25,121	24,839	24,736	24,824	25,016	25,840
Schools X Year	3,426	3,424	3,417	3,419	3,424	3,434	3,441

Notes: One through seven years later estimates are for the subgroup of students who are observed with math scores seven years later. Standard errors clustered at the schoolXyear level given in parentheses. Two-stage-least-squares estimates are obtained parametrically using a degree of 1, within 20 points of the promotion cutoff, and including all demographic and achievement controls listed in Table 3 and school by year fixed effects. Later math scores are rescaled. The following indicate significance: (** $p<0.01$, * $p<0.05$, + $p<0.1$).