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COLLEGE ACCESS, INITIAL COLLEGE CHOICE AND DEGREE COMPLETION

Joshua Goodman
Michael Hurwitz
Jonathan Smith

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ABSTRACT

The relatively low degree completion rate of U.S. college students has prompted debate over the extent to which the problem is attributable to the students or to their choice of colleges. Estimating the impact of initial college choice is confounded by the non-random nature of college selection. We solve this selection problem by studying the universe of SAT-takers in the state of Georgia, where minimum SAT scores required for admission to the four-year public college sector generate exogenous variation in initial college choice. Regression discontinuity estimates comparing the relatively low-skilled students just above and below this minimum threshold show that access to this sector increases enrollment in four-year colleges, largely by diverting students from two-year community colleges. Most importantly, access to four-year public colleges substantially increases bachelor's degree completion rates, particularly for low-income students. Conditional on a student's own academic skill, the institutional completion rate of his initial college explains a large fraction of his own probability of completion. Consistent with prior research on college quality and the two-year college penalty, these results may explain part of the labor market return to college quality.

Joshua Goodman
Harvard Kennedy School
79 JFK Street
Cambridge, MA 02138
and NBER
joshua_goodman@hks.harvard.edu

Michael Hurwitz
College Board
1919 M Street NW
Suite 300
Washington, DC 20036
mhurwitz@collegeboard.org

Jonathan Smith
College Board
1919 M Street NW
Suite 300
Washington, DC 20036
jsmith@collegeboard.org

1. Introduction

A report summarizing the recent White House summit on college access declared that:

> "Too few low-income students apply to and attend colleges and universities that are the best fit for them, resulting in a high level of academic undermatch – that is, many low-income students choose a college that does not match their academic ability. Students who attend selective institutions, which tend to have more resources available for student support, have better education outcomes, even after controlling for student ability."[1]

The last line of that excerpt highlights the current state of knowledge regarding the impact of college choice on student's educational outcomes. We have clear evidence that students, particularly low-income ones, do not attend the highest quality colleges available to them (Roderick et al., 2008; Bowen et al., 2009; Dillon and Smith, 2013; Smith et al., 2013). We also have clear evidence that low-cost interventions can alter these enrollment patterns, at least for high-skilled students (Hoxby and Turner, 2013). We have, however, relatively little causal evidence that choosing a college of lower quality than might otherwise be available generates longer-run penalties, such as reduced graduation rates or earnings.

Such evidence matters because of the need to explain recent negative trends in U.S. college completion rates. Completion rates among college enrollers are lower now than in the 1970s, due in part to low completion rates of students from lower socioeconomic backgrounds (Belley and

[1] White House Summit on College Education (2014, p. 4). Available at: http://www.whitehouse.gov/sites/default/files/docs/increasing_college_opportunity_for_low-income_students_report.pdf

Lochner 2007; Bound et al. 2010; Bailey and Dynarski 2011). Explanations for the trend tend to focus either on student-level factors, such as academic skill and financial resources, or postsecondary institution-level factors, such as funding or management quality. The non-random selection of students into different colleges generally confounds attempts to distinguish the influence of these two types of factors. The major empirical challenge is thus to find an exogenous source of variation in college choice.

We do so by exploiting the complexity of the U.S. college application and enrollment system, in which the optimal strategy may be particularly unclear for low-skilled or low-income students who lack the information and support necessary to navigate the process (Avery and Kane, 2004; Dillon and Smith, 2013). Even high-achieving low-income students fail to apply to colleges sufficiently selective to match their academic talents (Hoxby and Avery, 2013). We explore a previously understudied factor that adds another complication to the college application process, namely the use of test score thresholds by colleges during the admissions process. Such thresholds are used by public college systems in a number of states, including California, Florida and Texas, though often in combination with other factors such as GPA. Across the U.S., roughly one in five colleges report using specific scores as a minimum threshold for admission (Briggs, 2009).

We focus on Georgia's state university system (GSUS), which publicly announces minimum SAT scores to be used for first-year admission. As a result, such thresholds play an important role in access to the state's public four-year college sector. We also provide corroborating evidence from a second set of individual four-year public colleges, which we describe further below, whose use of SAT thresholds in the admissions process is not known to the public. We develop an algorithm to identify this latter group by exploiting our unique dataset, which connects the universe of SAT-takers to college enrollment and completion outcomes.

A regression discontinuity design comparing the relatively low-skilled students just above and below the relevant thresholds yields two main findings. First, access to four-year public colleges diverts students largely from two-year colleges, though some would have attended other four-year colleges or no college at all. Second, enrollment in four-year public colleges instead of those alternatives substantially increases bachelor's degree completion rates, by about 30 percentage points, and even more so for low-income students.

We see this work as contributing to three recent strands of the literature. First, this is the first paper in the U.S. context to document the importance of test score thresholds across multiple universities, including an entire state public university system. In this sense, our work resembles recent research exploiting the Chilean and Colombian national systems of college admissions thresholds to estimate the impact of college quality on a variety of labor market and other outcomes (Saavedra, 2008; Kaufmann et al., 2012; Hastings et al., 2013; Palau-Navarro et al. 2014). We also believe that ours is the first use of college using admissions thresholds hidden from applicants.

Second, the sensitivity of college choice to small test score differences suggests that the marginal students here do not face a continuum of postsecondary options in terms of cost and quality. Such a continuum may not exist because access to four-year colleges necessarily means access to a large, implicit and indivisible subsidy provided by public funding of such institutions. Some of this sensitivity to small test score differences may, however, stem from the fact that students fail to take low cost steps that would widen their enrollment options. In Georgia, for example, retaking the SAT might, for some marginal students, raise their scores sufficiently to grant them access to the four-year public sector. That apparently small costs have disproportionate impacts on students' college decisions and can, in some cases, be remedied by relatively low-cost interventions has been well documented in previous work (Pallais, forthcoming; Bettinger et al., 2012; Hoxby and Turner, 2013; Carrell and Sacerdote, 2013; Castleman et al., 2014; Smith et al. 2015). We contribute to this literature by documenting a new aspect of the college admissions process, a systematic admissions threshold, that affects college choice for students whose retesting and application behavior may be suboptimal.

Third, and perhaps most important, our work adds to the literature on importance of college choice and quality to long-run outcomes. Our central estimates are generated by students choosing four-year public colleges largely instead of two-year colleges. The substantial graduation rate impacts we observe are consistent with the previously documented graduation rate penalty associated with choosing a two-year instead of a four-year college (Rouse, 1995; Rouse, 1998; Leigh and Gill, 2003; Long and Kurlaender, 2009; Reynolds, 2012). They are also consistent with the growing literature showing a consistently strong relationship between four-year college quality and graduation rates (Long, 2008; Smith, 2013). We add to this literature a new example of a clearly identified mechanism that generates quality differences and subsequent graduation rate impacts. This paper focuses on students near the 20th percentile of the skill distribution who are quite different from those studied in recent work focusing on the high end of the distribution (Hoxby and Turner, 2013). Our results that college quality affects graduation rates for students near the low end of the skill distribution can thus be thought of as supplementing the evidence in Cohodes and Goodman (2014) that college quality matters for high-skilled students' graduation rates.

Prior work has also demonstrated that undermatching, in which students choose colleges where the average student's academic skill is well below their own, is a widespread phenomenon. This is particularly true among low-income students and those who are poorly informed about the college application process (Dillon and Smith, 2013). The evidence we present is inconsistent with recent attempts to argue that college quality and undermatch do not affect graduation rates (Bastedo and Flaster, 2014; Heil et al., 2014). We believe this is some of the first clear evidence that graduation rates improve when students "overmatch" by choosing a college where the level of academic skill greatly exceeds his or her own. The marginal students generating our estimates are, by definition, among the lowest-skilled at their colleges and thus not obviously well-matched in a traditional sense to those institutions. They nonetheless appear to benefit greatly from having chosen the higher quality college option.

Finally, we also note that the improved graduation rates generated by access to higher quality colleges may explain part of the labor market return to college quality. Such estimated returns are present and large in both OLS and propensity score matching specifications (Black and Smith, 2004; 2006). Such estimates diminish somewhat when educational attainment is included as a control, suggesting that attainment explains part of that relationship. Other recent work exploiting admissions thresholds at individual four-year public colleges also find clear evidence of large labor market returns to admission into those colleges, both at the high and low end of the skill distribution (Hoekstra, 2009; Zimmerman, 2014). Though we do not observe labor market outcomes here, ours is the first such paper to observe college outcomes regardless of where a given student ultimately enrolled.

The structure of the paper is as follows. Section 2 describes the data, the context studied here, and our regression discontinuity methodology. Section 3 presents summary statistics, evidence on retesting behavior, and evidence on the validity of our empirical design. Section 4 describes our enrollment and completion results. Section 5 discusses the implications of those results and concludes.

2. The Data, Context, and Empirical Strategy

2.1 The Data

We use student-level data for the graduating high school classes of 2004-07, collected from two sources. The first data set, collected and maintained by the College Board (CB), contains information on the nearly 1.5 million students each year who take the SAT, a test many four-year colleges require for admission. The SAT contains a math and critical reading section, each of which is scored on a scale between 200 and 800 for a maximum composite score of 1600.[2] Students may retake the SAT as often as the testing schedule permits, with each test administration costing roughly $40 during the time period studied here. Fee waivers are available to low-income students taking the exam for the first or second time. Depending on the context, we use two versions of students' SAT scores, their first scores and their maximum scores. A student's maximum composite score is defined as the sum of the maximum math and critical reading scores earned regardless of whether they were earned on the same test date. Colleges frequently rely on this maximum SAT score for admission. The CB data set also identifies colleges to which students send official copies of their SAT scores, which serve as good proxies for actual college applications (Card & Krueger, 2005; Pallais forthcoming).[3] In addition, the

[2] The writing section was introduced in 2005, making the maximum composite score 2400. For consistency across class, and because colleges typically do not rely on the writing section, we focus here only on the math and critical reading sections.

[3] When registering for the SAT, the student has the option to send his scores to four colleges for free. Scores may also be sent at a later date for a fee of $11 per score send.

CB data set contains information on student race, gender, parental income and education, and high school attended. Self-reported year of high school graduation is used to assign students to graduating classes.

These data are then merged with data from the National Student Clearinghouse (NSC), which collects information on the vast majority of students enrolled in U.S. postsecondary institutions. In the years and states studied here, the NSC captured somewhere between 90 and 95 percent of all students enrolled in Title IV institutions, according to Dynarski et al. (forthcoming).[4] Data from the NSC allow us to track a student's postsecondary trajectory including enrollment, transfer behavior and degree completion. We focus on the 2004-07 classes for whom we can observe six-year graduation rates.

Measuring college quality across the two- and four-year sectors is difficult because traditional data sources such as the Integrated Postsecondary Education Data System (IPEDS) lack comparable measures between the two sectors. IPEDS contains average SAT scores of incoming students at four-year colleges but does not have any similar measure for two-year colleges, which generally do not require students to have taken the SAT. IPEDS is also limited by the fact that degree completion rates reported by colleges do not account for the outcomes of transfer students, a particularly acute problem for the two-year sector, which is designed in part to facilitate transfers to the four-year sector.

We therefore use the merged CB and NSC data to construct measures of college quality that are comparable across these sectors. To measure student quality, we follow Smith and Stange (2015) and assign each college the average score of that college's first-time students on the

[4] See Table 2, where the enrollment coverage rate for Georgia ranges from 89.9% in 2005 to 94.8 in 2011. Other mid-Atlantic and Southeast states look similar. Some of those not captured by NSC may be enrolling in for-profit institutions.

PSAT, a College Board test taken by high school sophomores and juniors, including many who do not later take the SAT. We can thus assign each student a measure of the quality of the peers to whom he is exposed at his initial college. Those who do not enroll initially are not assigned such a value. To measure institutional degree completion rates, we identify all SAT-takers who enroll in that college and then compute the fraction of such students who complete a B.A. anywhere within six years. This measure has the advantage of being computable for both the two- and four-year sectors, as well as including transfer students among those degree recipients. For students who do not initially enroll in college, we assign a value of zero to this institutional completion rate variable.

2.2 Context

The main analysis sample consists of all students residing in the state of Georgia at the time of taking the SAT. We focus on Georgia because its Board of Regents has required that SAT-takers score at least 430 in critical reading and at least 400 in math in order to be admitted to universities within the Georgia state university system (GSUS).[5] We describe the set of 18 universities governed by this requirement in panel A of Table A.1. These consist of three research universities, two regional universities, and 13 state universities. Columns 8 and 9 show that five of the 18 universities impose higher minimum thresholds than required by the Board of Regents, though only two impose substantially higher thresholds. Georgia's state and technical

[5] This requirement has been in effect since well before 2004.

colleges, all of which are primarily two-year institutions, impose much lower minimum thresholds of 330 in critical reading and 310 in math.[6]

The Georgia context is interesting for three reasons. First, the GSUS minimum admissions thresholds correspond to roughly the 20th-25th percentile of the distribution of scores among Georgia SAT-takers in the years in question. The marginal student here has relatively low academic skills and is often choosing between two- and four-year colleges. The prior literature on college choice and quality has tended to focus on a much higher point in the skill distribution (Cohodes and Goodman, 2014; Hoxby and Turner, 2013). Second, these thresholds apply to all students considering four-year public institutions in Georgia. As we show later, over 60% of Georgia students near these thresholds who enroll in four-year colleges do so in these GSUS institutions. These thresholds thus affect the majority of college options for students in this market. Most prior research exploiting admissions thresholds has focused on individual institutions, rather than entire postsecondary systems (Hoekstra, 2009; Zimmerman, 2014).

Third, the public nature of these requirements means that students can, in theory, take the thresholds into account when planning their college application process. We explore whether students do, in fact, plan around these thresholds. Because the public nature of the thresholds may render score-sending behavior endogenous, we define our sample as all students residing in the state of Georgia, rather than just students sending scores to GSUS institutions.

2.3 Empirical Strategy

[6] A few of the GSUS institutions also have small two-year degree programs. In 2012, for example, 1.1% of the undergraduate degrees awarded by GSUS institutions were associates degrees. As such, we assume that enrollment in GSUS institutions is equivalent to enrollment in a four-year degree program.

To eliminate selection bias driven by different types of students making different college choices, we exploit the thresholds previously described. We use a regression discontinuity to compare a variety of outcomes between students just above and below these thresholds. We generate first stage estimates by running local linear regressions of the form:

$$GSUS_{ic} = \alpha_0 + \alpha_1 Access_{ic} + \alpha_2 Distance_{ic} + \alpha_3 Access_{ic} * Distance_{ic} + \gamma_c + \mu_{ic} \qquad (1)$$

Here, *GSUS* indicates the initial enrollment of student *i* in high school class *c* in a Georgia four-year public college, (within one year of high school graduation. *Access* is an indicator for meeting or exceeding the relevant test score threshold and *Distance* measures the number of SAT points each student's score is from the threshold. We control flexibly for time-varying shocks by including high school class fixed effects (γ_c). Because the two sets of students on either side of the threshold are nearly identical in terms of academic skill and other characteristics, the coefficient of interest, α_1, estimates the causal effect of being above the admissions threshold on enrollment in Georgia's four-year public sector.

We then generate instrumental variable estimates of the impact of enrollment in the four-year public sector by running regressions of the form:

$$Y_{ic} = \beta_0 + \beta_1 GSUS_{ic} + \beta_2 Distance_{ic} + \beta_3 Access_{ic} * Distance_{ic} + \delta_c + \varepsilon_{ic} \qquad (2)$$

where *GSUS* is instrumented by access according to equation 1. Using *GSUS* as the endogenous regressor allows us to capture the full set of marginal students whose enrollment decisions were altered by the thresholds.[7] This implies that we are estimating the impact of enrollment in the four-year public sector relative to the full set of forgone alternatives, largely but not solely two-year colleges. As a result, we will not be able to perfectly isolate the two-year/four-year tradeoff, for example.

We use three different sets of outcomes *Y*. The first are measures of enrollment in other college sectors, in order to estimate which types of colleges students are forgoing when induced into the four-year public sector. The second are the measures of college quality mentioned previously, namely student quality and institutional completion rates, in order to estimate how enrollment in the four-year public sector changes the quality of one's initial college. The third are various measures of students' degree completion, in order to estimate the impact of initial college choice on completion rates.

In Georgia, a student must score at least 430 in reading and at least 400 in math. We therefore define distance from the threshold as:

$$Distance_{GA} = \min\,(SAT_R - 430,\, SAT_M - 400)$$

This minimum function collapses the two-dimensional threshold into a single dimension, where negative values imply a student has missed at least one threshold and zero or positive values imply a student has met or exceeded both thresholds. This method of collapsing a multi-dimensional boundary into a single dimension is discussed in Reardon and Robinson (2012) and

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[7] Using four-year college enrollment as the endogenous variable, for example would yield estimates that failed to account for the empirically important fact that the thresholds shift some students between private and public four-year colleges.

has previously been used in papers such as Cohodes and Goodman (2014) and Papay, Murnane, and Willet (2014).

Because Georgia's admissions thresholds are publicly known, we define each student's distance from the threshold using that student's first SAT scores. First scores do not suffer from any endogeneity driven by potential retaking of SAT in reaction to failing to meet the thresholds. We will provide evidence that, though there is endogenous retaking of SAT in reaction to the thresholds, the magnitude of that endogeneity is quite small. As such, we also show estimates in which distance has been defined by maximum SAT scores, the measure that is actually employed by colleges in the admissions process.[8] Using maximum scores yields estimates generally similar in magnitude but much more precise than those generated by first scores because of a clearer first stage relationship between maximum scores and GSUS enrollment.

We run the local linear regressions above using a rectangular kernel. We present our primary estimates for each outcome using a bandwidth of 100 SAT points. This corresponds fairly closely to the optimal bandwidths suggested by Imbens and Kalyanaraman (2012), which balances the need for precision against the desire to minimize bias generated by fitting straight lines to data that may become non-linear far from the threshold. Such optimal bandwidths vary by outcome, so fixing the bandwidth across regressions has the advantage of defining a single sample clearly. We test the sensitivity our estimates to a number of bandwidths, including the Imbens-Kalyanaraman (IK) optimal bandwidth for each outcome. We cluster standard errors by discrete distance to the threshold, as suggested by Card and Lee (2008). Clustering instead by high school yields very similar standard errors.

[8] See http://www.usg.edu/academic_affairs_handbook/section3/C660 for the GSUS admissions requirements.

Finally, we disaggregate our estimates by income as measured by the average reported income of SAT-takers at each student's high school. We characterize students by the average income at their high schools for two reasons. First, approximately one-third of SAT-takers failed to report their income. Using high school average income allows us to assign everyone to an income level. Second, the high school-level income measure is likely a better measure of the permanent income of the student's family, because of both transitory shocks to income and mis-reporting by students. We label students as low income if they come from high schools in the bottom third of the income distribution within our sample, an income threshold that corresponds to roughly $60,000 a year.

3 Summary Statistics, Retaking Behavior, and Validity of the Research Design

3.1 Summary Statistics

Table 1 presents summary statistics for the RD sub-samples examined here, residents of Georgia whose first SAT scores fell within 100 points of the threshold, overall and divided by high school income. The College Board data provides information on students' gender, race, parental education and income. Those data also include SAT scores, retakes and score sends. We define indicators for students failing to report gender, race or parental education. The National Student Clearinghouse data allow us to construct indicators for both on-time college enrollment, defined as enrollment within one year of high school graduation, and degree completion within six years of high school graduation.

In the Georgia sample, 17 percent had parents whose highest education was no high school diploma, 29 percent had parents whose highest education was a high school diploma, and 43 percent had a parent with at least a four-year college degree. Slightly less than one-third of the sample attended high schools with an average family income of less than $59,799 a year. The average student in this sample had a first SAT score of 918, had a maximum SAT score of 960, took the SAT 1.9 times, and sent scores to 3.6 colleges. 38 percent first enrolled in a GSUS college within one year of graduating high school, while 58 percent enrolled in any four-year college. This means that two-thirds of the students who enrolled in a four-year college did so in the in-state public sector. 23 percent first enrolled in a two-year college. The average six-year B.A. completion rate of students' initial colleges, including non-enrollers as zeroes, was 41 percent. Only 37 percent completed a B.A. degree within six years of graduating high school. Another eight percent completed A.A. degrees. Compared to the overall sample, the low income sub-sample is less white, more black, has less educated parents, lower SAT scores, and lower college enrollment and completion rates.

3.2 Retaking Behavior

In order for the regression discontinuity design to estimate causal impacts, we need the thresholds to provide exogenous sources of variation in eligibility to attend the colleges in question. This, in turn, requires that the running variable itself is not subject to manipulation by the student, particularly near the threshold. First SAT scores satisfy this condition but maximum SAT scores may fail to do so if students retake the test in response to their distance from the threshold. This endogenous retaking behavior should be a potential problem only in settings where thresholds are publicly known, such as Georgia.

Figure 1 shows the graphical version of this relationship between retake probability and distance from the GSUS threshold. Retake rates rise with SAT score in this part of the score distribution and near the threshold roughly 60 percent of students retake the exam. The figure shows a small but clear discontinuity. Table 2 presents formal estimates of this discontinuity in SAT retaking behavior at the GSUS eligibility threshold, running the regression in equation 1 with SAT retaking measures as outcomes. Here and in many of the tables that follow, panel A examines the entire Georgia sample, using the first SAT score distance as the running variable, while panels B and C split the sample by income, as previously described. Panel A shows that students whose first SAT scores barely meet the eligibility threshold are about three percentage points less likely to retake the SAT than those who barely miss the threshold. Put differently, missing the threshold increases retaking rates. Though not shown here, this result is robust to a variety of bandwidths and does not appear in other SAT-taking states, suggesting that it is driven by the GSUS-specific nature of the thresholds.

In particular, missing the GSUS thresholds initially increases the probability of retaking the SAT two or more times. As a result, those on the threshold retake the SAT 0.06 fewer times than those just below the threshold. Those who meet the thresholds initially are no less likely to send scores to GSUS institutions, implying that students interested in the four-year public sector include such colleges in their initial list of score sends. Meeting the thresholds does decrease the total number of colleges students send scores to, likely because retakers are given additional free score sends. Interestingly, we observe similar threshold-induced SAT retaking for low-income and non-low-income students, even though overall levels of retaking are higher for higher income students.

This paper is, to our knowledge, the first to document exam retaking in response to publicly known admission thresholds. Prior research on SAT-taking behavior has shown that some students retake the SAT in order to achieve round-numbered scores like 1000 or 1100 (Pope and Simonsohn, 2011). Others retake the SAT to increase their maximum scores (Vigdor and

Clotfelter, 2003), which are an important factor in an increasingly competitive admissions process (Bound et al., 2009). Theoretical models of admissions systems based on maximum SAT scores suggest that such systems have the potential to elicit accurate information about student ability, particularly when the alternatives to retaking are test preparation services (Leeds, 2012). These prior empirical and theoretical works explore retaking behavior when admissions processes are private, in that students know only that higher scores increase their odds of admission. Given that that the GSUS thresholds have no significance outside of Georgia, we interpret our results as clear evidence of demand for access to public four-year colleges.

Though retaking behavior reacts endogenously to distance from the threshold, the magnitude of this endogeneity is not particularly large, as only three percent of students' scores are affected by this endogenous retaking. Given that 60 percent of students just below the eligibility threshold retake the SAT, this implies that only one twentieth of those retakes are endogenous reactions to the threshold. The vast majority of SAT retaking has nothing to do with the threshold itself and instead is driven by more general admission incentives to achieve higher scores. Though we will focus on estimates that use first SAT scores in order to avoid such endogeneity, we supplement these with estimates using maximum SAT scores as the running variable, given that the latter differ from the former largely for reasons having nothing to do with the thresholds. We provide two further pieces of evidence in favor of taking seriously the results from using the maximum SAT score as the running variable in the Georgia context. First, we will show that students on either side of the threshold, as defined by maximum SAT scores, look relatively similar in terms of observable characteristics. Second, we show in robustness checks that controlling for such observables, including the number of retakes, has little impact on our estimated coefficients.

3.3 Validity of the Research Design

Before turning to our main results concerning college enrollment and completion, we first perform two checks of the validity of our regression discontinuity design. The key assumption underlying the identification strategy is that students on either side of the threshold are similar in terms of observable and unobservable characteristics, so that eligibility for admission is the only factor that differs between them. We present two tests that suggest this is the case. First, we follow the suggestion in McCrary (2008) to check for discontinuities in the density of observations, which would suggest that students can substantially manipulate which side of the threshold they fall on. Figure 2 graphs the number of observations in each SAT score cell. No discontinuity is apparent, a fact confirmed by more formal statistical tests. The overall shape of that distribution looks quite similar in other states and is due in part to the way in which the College Board translates raw scores into the scaled scores used here.

Second, we test for balance in observable covariates across the threshold in Table 3, which uses first SAT scores to generate the running variable. Each column tests for a discontinuity at the threshold in observable covariates such as gender, race, parental education and high school-level income. Panel A shows no statistically significant discontinuities in gender, parental education or race, with the only statistically significant but small discontinuity in the fraction of students classified as low income. Panels B and C similarly show few statistically significant discontinuities in covariates. This is unsurprising given students' inability to precisely manipulate which side of the threshold they initially fall on. Table 3A, which uses maximum SAT scores to generate the running variable, does show more statistically significant discontinuities, particularly with respect to race, perhaps a function of small differences in retaking behavior by student characteristics. We show in later robustness checks that controlling for these observable covariates in both the first and maximum score specifications does not substantially change our point estimates, further evidence that magnitude of any such discontinuities is practically insignificant.

4 College Enrollment and Completion Effects

4.1 College Enrollment Effects

We now turn to the question of how the GSUS admissions threshold affects students' college enrollment decisions. Figure 3 shows graphically the relationship between distance to the threshold and the probability of enrolling in one of Georgia's four-year public colleges. Panel A, which uses the maximum SAT score-based distance measure, shows a clear, large discontinuity, with students with SAT scores just at the threshold substantially more likely to enroll in the four-year public sector than those just below it. We note here that GSUS enrollment below the threshold is non-zero for two reasons. First, students can also gain admission through the ACT exam, the SAT's primary alternative, taken by roughly 30% of Georgia's high school classes of 2004-07.[9] Second, each institution may exempt individual students from these minimum thresholds if such students otherwise demonstrate potential for success through interviews, portfolios or life experiences.[10] Panel B, using the first SAT score-based distance measure, shows a clear discontinuity, but one smaller than in panel A because the maximum SAT score is the measure actually used by colleges in the admissions process.

[9] This overall ACT-taking rate comes from the ACT's website at http://www.act.org/newsroom/data/. The College Board data do not allow us, however, to compute what fraction of SAT-takers also took the ACT.

[10] Such students are considered under a policy known as "Limited Admission" because of legal caps on the number of students each institution may grant such exemptions to. Some of these students are granted "Presidential Exceptions" in which college presidents determine they are admissible. Students may also gain admission by appealing initial admissions decisions and submitting letters of support from teachers, counselors or others who can attest to their potential for college success.

Focusing on first SAT scores, we show the regression-based estimates of this first stage discontinuity in column 1 of Table 4. Access to the four-year public sector increases the likelihood of on-time enrollment in that sector by four percentage points, an impact that is highly statistically significant and does not differ by student income. The minimum SAT thresholds thus provide a strong source of exogenous variation in initial college choice. The instrumental variable estimates in columns 2-4 show which alternative college options the marginal student forgoes in order to enroll in the four-year public sector. 68 percent of such students would otherwise have enrolled in a two-year community college, 23 percent would have enrolled in another four-year college (private in-state or out-of-state), and 9 percent would not have enrolled in any college.

As a result, for the marginal student, access to the four-year public sector increases the probability of enrollment in any four-year college by 77 percentage points, the reduced form versions of which are shown graphically in Figure 4. Though the magnitude of this increase in four-year college enrollment does not differ by income, the origin of that shift does. No marginal non-low income students would have failed to enroll in college in the absence of access to GSUS, whereas roughly one-fourth of low income students would have enrolled nowhere. The result is that the GSUS "treatment" here for low income students is being compared to an alternative mixture that is half two-year colleges, one-fourth other four-year colleges, and one-fourth no college. For non-low income students, those alternatives are three-fourths two-year colleges and one-fourth other four-year colleges.

That fact that so many of the marginal students forgo two-year colleges for four-year public colleges implies a substantial change in the quality of the institution attended. As column 7 shows, conditional on enrolling on time in a two- or four-year college, the marginal student induced to enroll in GSUS improves the academic quality of his peers by nearly 19 PSAT points, which represents roughly a standard deviation in skill. The magnitude of this change in peer quality is more than twice as large for low income students as for non-low income students.

Bolstering our argument that endogenous retaking is too small to substantially bias our results, IV estimates based on maximum SAT scores in Table 4A are generally quite similar to those based on first SAT scores. Though the first stage impact of exceeding the threshold based on maximum scores is a much larger thirteen percentage points, the marginal student still largely foregoes two-year colleges, increases four-year college enrollment by 70 percentage points, and dramatically improves the academic quality of his peers. Differences by income are apparent but muted relative to those generated using first SAT score-based distance as the running variable.

4.2 College Completion Effects

Having shown that the GSUS admissions threshold generates large and clear impacts on students' initial college choices, we turn now toward estimating the impacts of such choices on college completion. Figure 5 shows the reduced form graphical version of these estimates. Panel A, based on maximum SAT scores, shows a clear discontinuity with students just above the threshold more likely to have completed a B.A. within six years than students just below the threshold. The discontinuity in Panel B, based on first SAT scores, is less visually apparent. Figure 6 limits the sample to low income students and both panels show a clear discontinuity in the B.A. completion rate at the threshold.

We turn to regression estimates of such discontinuities in Table 5. The previous evidence suggests that access to and enrollment in the four-year public sector dramatically increases college quality as measured by peers' academic skill. The first column of Table 5 presents another piece of evidence on the impact on college quality using institutional completion rates as the outcome, constructed as described previously. The estimates suggest that enrolling in the four-year public sector increases the average B.A. completion rate of the institution a student attends by 41 percentage points. For low income students that increase is 46 percentage points, compared to 34 percentage points for non-low income students. Such large differences are driven in part by the substantially higher average B.A. completion rates of four-year institutions relative to two-year institutions. Control complier means, as suggested by Abadie et al. (2002) and Abadie (2003), imply that in the absence of access to the four-year public sector, the average complier would have attended a college with a six-year B.A. completion rate of 24 percent. Enrollment in the four-year public sector thus nearly triples the completion rate of the institution attended by compliers.

The remaining columns of Table 5 alternate between instrumental variables and OLS estimates of the impact of GSUS enrollment on individual student's degree completion outcomes. Both sets of columns use the specification from equation 2, with the IV estimates using GSUS enrollment as predicted by the first stage and the OLS estimates using actual GSUS enrollment. The first striking result, in column 2, is that access-induced enrollment in the four-year public sector increases the probability of B.A. completion within six years by 32 percentage points. This represents a near tripling of the B.A. completion rate, given that 17 percent of control compliers finish their B.A. within that timeframe. In short, access to the four-year public sector substantially increases B.A. completion rates.

Four other facts are worth noting. First, the increase in B.A. completion driven in part by a shift away from two-year colleges does not decrease A.A. completion rates in any statistically significant way, so that overall degree completion rates rise nearly as much as B.A. rates do. This implies that relatively few of the marginal students here would have completed their A.A. degrees if denied access to the four-year sector. Second, across nearly all of the coefficients shown here, we cannot reject the equality of instrumental variables and OLS estimates. It may be that our controls for academic skill, namely SAT scores, are sufficiently rich as to soak up much of the omitted variable bias one might otherwise worry about in the non-quasi-experimental estimates, though this appears to be somewhat less true for low income students. Third, as shown in panel A, conditional on a student's own academic skill, the institutional completion rate of his initial college explains a large fraction of his own probability of completion. The impact of access-induced enrollment on individual students' completion rates is roughly three-fourths the magnitude of the impact on institution-level completion rates.

Fourth, and finally, the estimated impacts on B.A. completions rates appear to be substantially larger for low income students than for their higher income peers. For low income students, enrollment in the four-year public sector increases B.A. completion by 50 percentage points, compared to a control complier mean completion rate of only 2 percent. The comparable figure for higher income students is a statistically insignificant 13 percentage point increase in B.A. completion, compared to a control complier mean completion rate of 31 percentage points. Access to the four-year public sector appears to be much more critical to the B.A. completion of low income students than that of higher income students. These magnitudes suggest that, conditional on a student's own academic skill, the institutional completion rate of his initial college explains basically all of a low income student's own probability of completion but less than half of a higher student's probability of completion.

Table 5A replicates Table 5, using maximum SAT scores as the basis of the running variable. Relative to the first SAT score-based specification, these estimates are substantially more precise, are generally somewhat smaller in magnitude, and vary less by income. Here, four-year public enrollment increases the B.A. completion rate by 23 percentage points, with low income students seeing a 27 percentage point increase. Though these point estimates are smaller than in Table 5, most of the points highlighted above still hold. Associate degree completion rates decrease very little, instrumental variables estimates are extremely close in magnitude to OLS estimates, and institutional completion rates of initial colleges still explain a large fraction of individual completion rates.

4.3 Robustness Checks and Heterogeneity

In tables 6 and 6A, we test the robustness of our central estimates to a variety of alternative bandwidths and kernels, and to the inclusion of demographic controls. The top row of each panel uses the optimal bandwidth for the reduced form suggested by Imbens and Kalyanaraman (2012), as well as a triangular kernel.[11] Our baseline specification in each panel is the row labelled "Bandwidth = 100." The overall impression is that, although the first stage magnitude is somewhat sensitive to bandwidth, all of the IV estimates of central interest are relatively robust to such choices.

Figure 7 confirms this further, graphing the IV estimate of GSUS enrollment on six-year B.A. completion rates against a variety of bandwidths. For the first SAT score-based specification in panel B, the estimate is statistically significant and remarkably stable between 30 and 40 percentage points, with the exception of the very smallest bandwidths shown. For the maximum SAT-scored based specification in panel A, the estimate is highly statistically

[11] Because the first stage's optimal bandwidth is usually slightly smaller than that of the reduced form, we use the "Bandwidth = 50" specification to approximate the estimates we would find if we instead used the first stage optimal bandwidth everywhere.

significant and always between 20 and 30 percentage points for all of the bandwidths shown. In neither set of specifications does the addition of demographic controls substantively change the estimated coefficients, suggesting that any imbalance in observable covariates across the threshold is too small to be driving our main conclusions.

Though not shown here, we also run placebo tests measuring the reduced form impact of the GSUS thresholds on these outcomes for students in state of North Carolina, where such thresholds are irrelevant. Those placebo tests yield point estimates quite close to zero and statistically insignificant, suggesting the impact of the GSUS thresholds is specific to Georgia and not generated by spurious features of the data.

In Table 7, we split our sample by gender, race and parental education in order to see whether any of the central estimates of interest appear to vary according to such student characteristics. We see relatively little evidence of such systematic heterogeneity. In particular, the impact of GSUS enrollment on institutional and individual B.A. completion rates is remarkably similar across gender, race and parental education groups. This lack of heterogeneity may be due to the fact that all of our analyses condition on SAT scores as a measure of academic skill. Such scores may be sufficient to capture much of other underlying differences between different demographic subgroups of students, thus explaining the lack of heterogeneity we observe.

4.4 Colleges With Hidden Thresholds

We present one final piece of evidence that we gather from outside of the Georgia context. To do so, we construct a second sample from the merged CB-NSC data that consists of all students who sent their SAT scores to one of seven colleges we identify as using minimum test score thresholds in the admissions process, even though the existence of such thresholds is not publicly known. We refer to these as “hidden threshold” colleges. We define hidden threshold colleges as those for which students’ matriculation probabilities as a function of the maximum composite SAT show a clear and substantial discontinuity. We now describe the algorithm by which we identified these colleges.

We started with the graduating high school class of 2004 and conducted the following procedure. First, we identified all students who sent SAT scores to that college. Second, using those students, we employed a regression discontinuity design to test for the presence of discontinuities in the probability of matriculation as a function of maximum composite SAT scores. To do so, we ran a series of local linear regressions in which we varied the potential location of the discontinuity from a composite score of 600 to a composite score of 1400, testing all possible values in between. Third, we kept only potential discontinuities where the t-statistic on the threshold indicator exceeded three. We also eliminated colleges where the density of score senders changed dramatically around potential discontinuities. Colleges that violated this density condition were those that made public their specific thresholds, making it much less likely that students just above and below the threshold were similar in terms of observable or unobservable characteristics. Fourth, to verify that these discontinuities were not anomalies, we then repeated this search process for the remaining colleges but for each the subsequent classes of 2005-07, keeping only colleges that showed clear discontinuities for all four classes.

The result of this process was the identification of seven colleges that clearly employ minimum SAT thresholds in the admissions process. A few points are worth noting. First, the seven colleges fall into two groups, those with low hidden thresholds (composite SAT scores ranging from 754-1028) and those with high hidden thresholds (composite SAT scores ranging from 1192-1216). Figures A.1 and A.2 show the probability that applicants enroll in these colleges as a function of applicants' distance from the threshold we identify as relevant for their high school class. The low threshold colleges have six-year graduation rates in the 40-60 percent range, slightly higher than the average GSUS institution. The high threshold colleges have six-year graduation rates in the 70-80 percent range, substantially higher than the GSUS and low threshold colleges. All seven colleges are located in either the Mid-Atlantic or the Southeast and all seven are public, so we further limit the sample to students who are in-state residents.[12].

Second, extensive internet research revealed no public indication of the use of such thresholds for any of these seven colleges, strongly implying that these colleges keep this aspect of their admission processes hidden from applicants. Because these thresholds are not publicly known, score-sending behavior should not be endogenous with respect to those thresholds. We confirm this empirically below and thus define our sample to include only those who send scores to these colleges, a definition which should not generate any selection bias. Third, the slight variation in the location of each college's threshold over time suggests that colleges may be setting these thresholds based either on the percentiles represented by these composite scores or based on their capacity to read a fixed number of applications each year.

We then run nearly identical regressions as in the Georgia context, with only three small differences. First, instead of just using high school class fixed effects, we include target college by high school class fixed effects. Second, we define each student's distance from the threshold as:

[12] In addition to being consistent with the Georgia analysis, which uses in-state students, students who send scores from out of state are likely unusual in other respects. Out-of-state students may, for example, meet special admissions criteria, such as those for recruited athletes. We include as multiple observations the relatively few students who send scores to multiple hidden threshold colleges. Excluding these students entirely or limiting each to only a single college has no impact on the results.

$$Distance_{TC} = SAT_R + SAT_M - MINSAT_{TC}$$

where *MINSAT* is the threshold composite score identified by our algorithm for the applicant's target college (*TC)* and class. We use only maximum composite SAT scores when defining distance here because the hidden nature of the thresholds precludes endogenous retaking of the test, a fact that we confirm empirically but do not show. We also confirm that there is no heaping of the distance measure as constructed, nor any covariate imbalance across the threshold. The third difference is that we use a bandwidth of 200 SAT points, which is closer to the optimal bandwidth suggested by the IK procedure for most of these outcomes.[13]

Table 8 shows the results of these regressions, with panel A including applicants to low hidden threshold colleges, panels B and C dividing those applicants by income, and panel D focusing on applicants to high hidden threshold colleges. The first column shows a very strong first stage across all of the panels, with those above the thresholds 10-14 percentage points more likely to enroll in their target colleges than those below the thresholds. The strength of the first stage is by design, given that we search for colleges in part on the basis of this first stage.

Access induced enrollment in low hidden threshold colleges diverts 35 percent of marginal students from two-year colleges and 57 percent from other four-year colleges, fractions that are relatively similar across the two income groups. Compared to students in Georgia who were largely diverted from two-year colleges, the marginal student here is largely diverted from another four-year college. The net effect of this is that enrollment in the target college increases the institutional completion rate of the college attended by 23 percentage points. For the average

[13] We also note that a bandwidth of 200 points for a student's composite SAT is equivalent to a bandwidth of 100 points for a single component, as used in the Georgia context.

student, individual B.A. completion rates rise by a statistically insignificant 7 percentage points. This is driven entirely by a marginally statistically significant 22 percentage point increase in the completion rate for low income students. Similar to the Georgia context, it appears that access to four-year public colleges has large effects on low income students' degree completion rates. For higher income applicants to low hidden threshold colleges, this change in initial college choice has no clear impact on completion rates. Similarly, there is little impact of initial college choice for applicants to high hidden threshold colleges, nearly all of whom would otherwise have attended another four-year institution.

5 Discussion and Conclusion

We document substantial college enrollment effects generated by the use of test score thresholds as part of the admissions process. Exogenous variation in access to four-year colleges shifts substantial numbers of students out of the two-year and into the four-year college sector, dramatically changing the quality of the institution attended, as measured by the institution's own graduation rate. The fact that small differences in test scores can generate such large differences in initial college choice is itself remarkable. This suggests that students are not applying to a continuum of colleges, either because they are applying too narrowly or because such a continuum may not exist in some postsecondary markets. In Georgia, for example, a student denied access to the four-year public sector may not have other four-year college options available near that point in the price and quality distribution. That enrollment effects are observed using first SAT scores in Georgia may also suggest that some students are not retaking the SAT sufficiently often in reaction to just missing the admissions threshold.[14]

[14] We cannot, however, exclude the possibility that students whose first SAT scores place them just below the threshold have private information suggesting retaking the test would be unlikely to improve their scores.

The observed B.A. completion effects suggest that initial college choice matters. Perhaps most importantly, our instrumental variables estimates allow us to reject the claim that the marginal students here have such low academic skills that they are incapable of completing a four-year college degree, a result consistent with naïve OLS estimates. That A.A. completion rates are not clearly diminished also implies that most of these marginal students would have failed to earn their two-year college degrees had they started college in the two-year sector.

We cannot rule out another margin of impact, namely the importance of unobserved college match quality. If missing these thresholds pushes students away from their desired college and to another college of similar observed quality, there may still be graduation impacts. If, for example, the desired college is closer to home or less expensive than the alternative, this may decrease completion rates. In analysis available on request, we show that these thresholds do not clearly change the distance between a student's home and initial college, suggesting that proximity is one form of match quality that cannot explain these completion effects. Though we ultimately cannot isolate which margin is driving the B.A. completion results, the overall implication is that enrolling in a lower quality institution appears to have meaningful long-run consequences.

In the Georgia context, we see graduation effects across the income distribution, though the estimated impacts are larger for low-income students. For applicants to low hidden threshold colleges, the graduation effects are entirely concentrated among low-income students. The contrast may be due to the fact that the system-wide nature of the Georgia thresholds substantially constrains the set of college alternatives available even to non-low-income students, whereas applicants to hidden threshold colleges are constrained only with respect to the single college using that threshold. That these effects are generally larger for low-income students may be due to the fact that higher income students diverted into lower quality institutions nonetheless have the academic and financial resources to succeed in those institutions. That low-income students' long-run outcomes are most sensitive to initial college choice seems unsurprising.

Finally, that applicants to high hidden threshold colleges see little change in their choice of college sector and their completion rates is likely due to the fact that such high-achieving students are sophisticated college applicants. They apply to a larger number of schools, so that failing to gain admission to any single school does not alter their probability of attending a four-year college. As such, their enrollment rates are unaffected. The thresholds do, however, affect the quality of their four-year college without affecting graduation rates, in contrast to the results in Cohodes and Goodman (2014). One crucial distinction is that marginal students here are, by definition, at the bottom of the skill distribution at their college, which was not true in the case of the merit scholarship program studied by Cohodes and Goodman (2014). If relatively high-skilled students benefit from being near the top of their peer group or suffer from being at the bottom, this could offset the potentially beneficial graduation impacts of attending a higher quality institution.

Our results have three implications for education policy. First, our findings are consistent with the two-year penalty literature (Long and Kurlaender, 2009; Reynolds, 2012; Smith, 2013) in that starting at a two-year college may reduce their probability of earning a B.A. degree. This is driven both by the fact that two-year college completion and transfer rates are so low and that some of the marginal students here, though relatively low-skilled, are nonetheless capable of completing their four-year college degrees. Our results imply that concerns about pushing low-income students into higher quality colleges, as articulated in Bastedo and Flaster (2014), may be ill-founded. Our results suggest that "overmatching," or enrolling in a college where one is substantially less academically skilled than one's peers, is actually beneficial for students, at least in terms of degree completion.

Second, these findings reinforce previous research emphasizing the need for students to make test-taking and application choices that do not restrict their available postsecondary options. The thresholds studied here are simply one additional factor adding to the importance of such choices. In settings where thresholds are publicly known, this implies that students falling below those thresholds might be encouraged to retake the relevant exam, either through information campaigns or reductions in the costs of retaking. More generally, students should be encouraged to expand their college application portfolios in order to improve the quality of the college options available to them.

Third, our estimates suggest one potential unintended consequence of a recent proposal by the Obama administration to make community college free for a large portion of the student population. Lowering the price of community college may improve college enrollment and degree completion for students who would not otherwise have attended college. By changing the relative price of the two- and four-year sectors, such a proposal may, however, actually lower degree completion rates for students drawn out of the four-year and into the two-year sector. The net effect of this proposal thus depends on the number of students on each margin (i.e. between two-year and no college and between two-year and four-year college) and the fraction of such marginal students whose degree completion is affected by that choice. Our results suggest that price reform might need to be accompanied by quality reform, if possible, in order to avoid such unintended consequences.

Finally, further research is needed to determine why initial college choice matters and which aspects of college quality are responsible for these graduation effects. Our work provides some of the clearest evidence to date on the importance of initial college choice for low-skilled students and low-income students. The precise mechanism through which this operates warrants more work.

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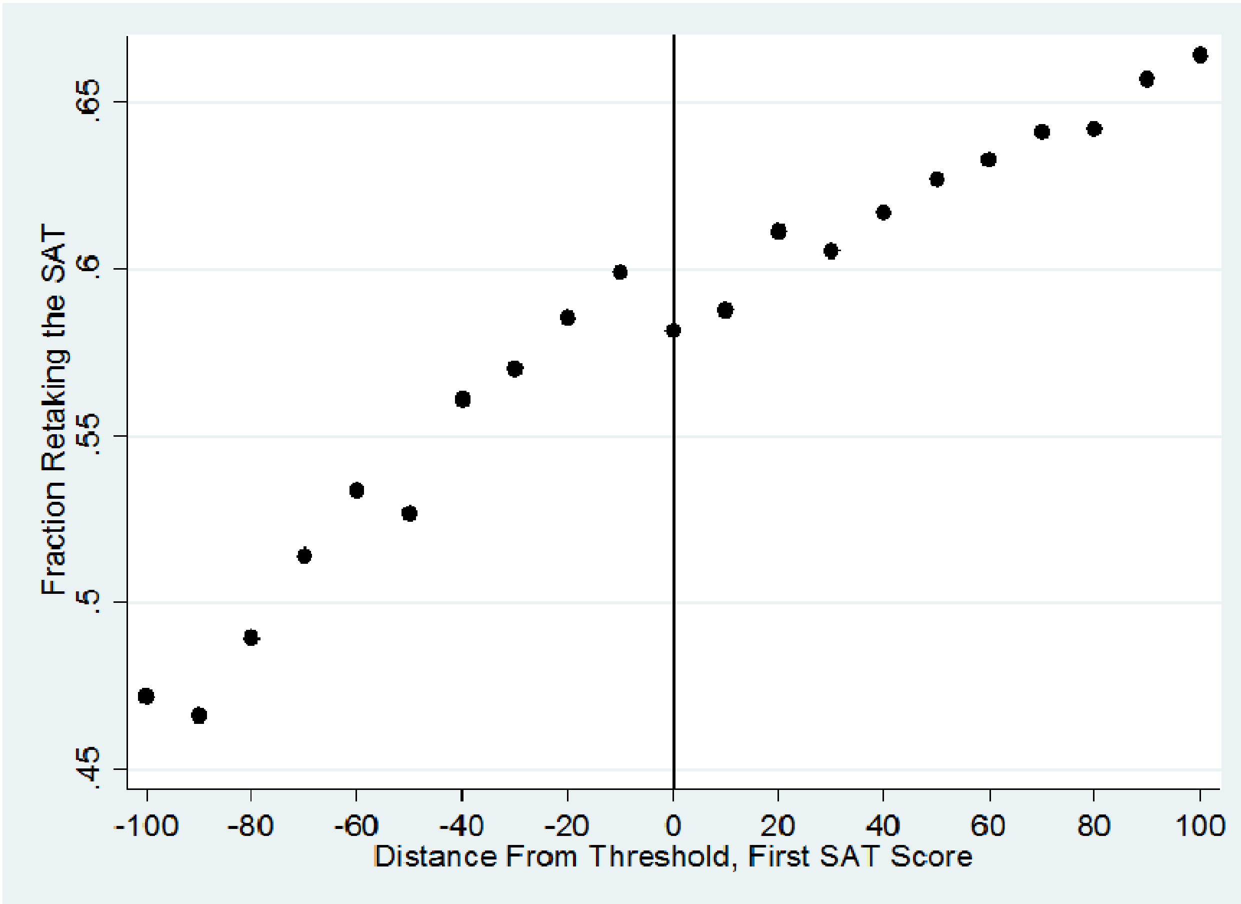
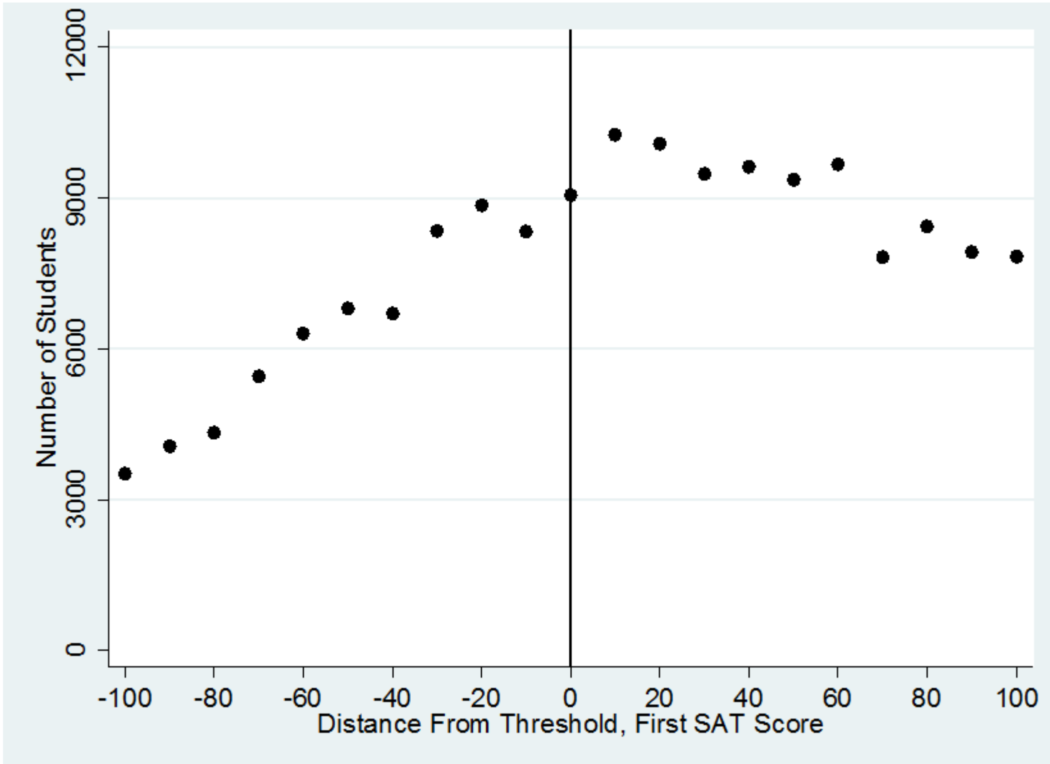
Figure 1: SAT Retaking in Georgia



Notes: Shown above is the fraction of students retaking the SAT at least once, as a function of the distance of their first SAT scores from the GSUS threshold. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

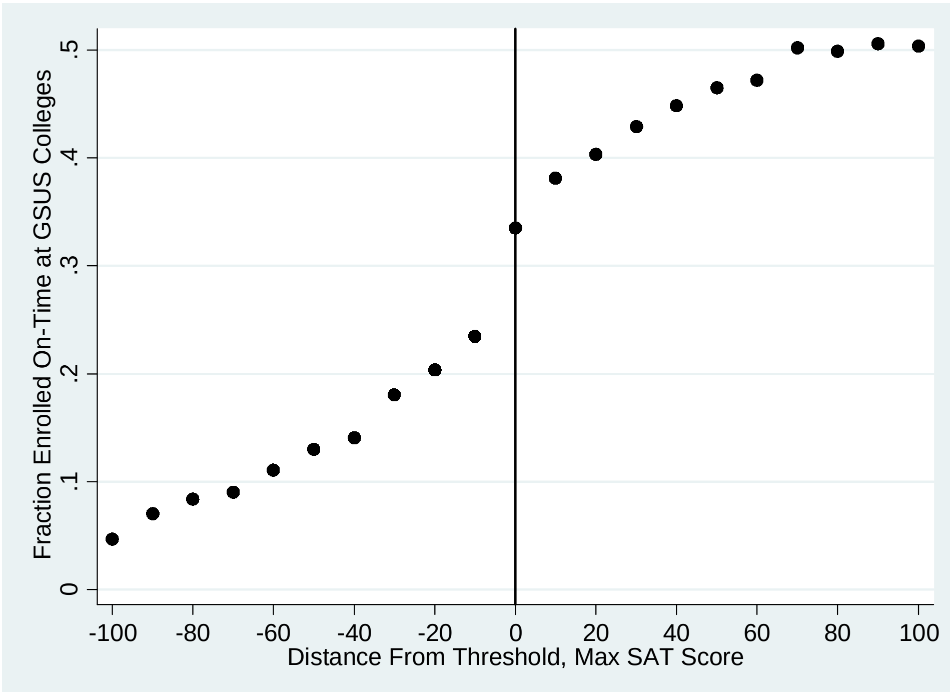
Figure 2: Density of Running Variable



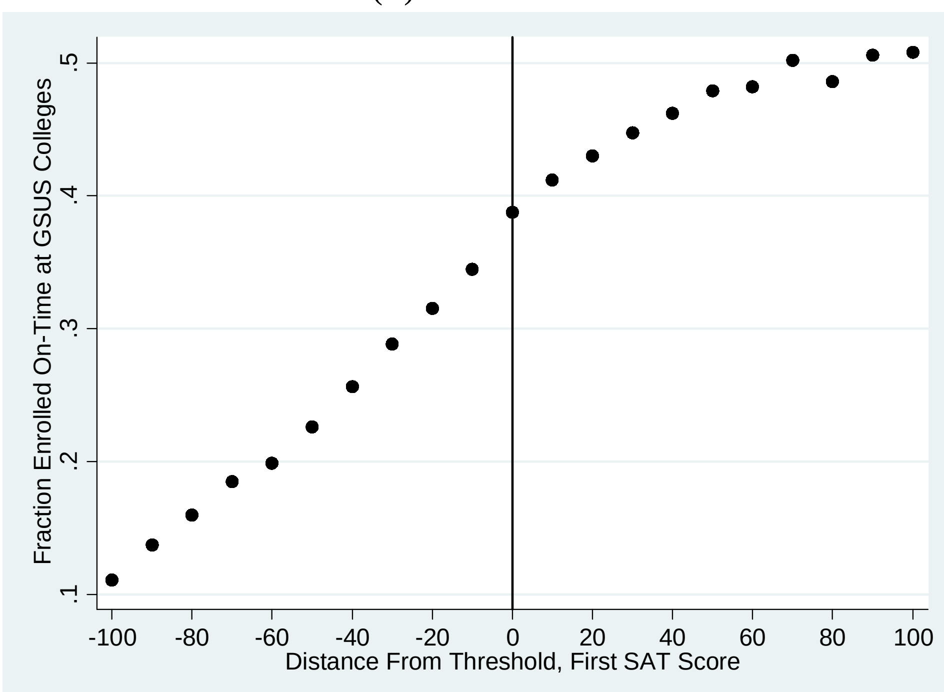
Notes: Shown above is the number of students whose first SAT scores place them at a given distance from the GSUS admissions thresholds. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

Figure 3: Enrollment in GSUS Colleges

(A) Maximum SAT Score



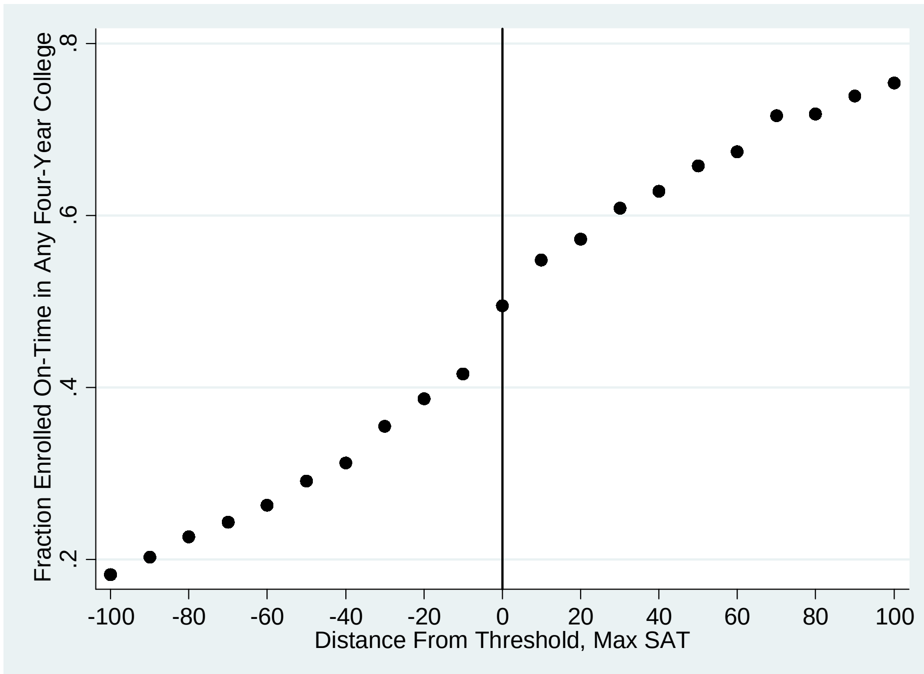
(B) First SAT Score



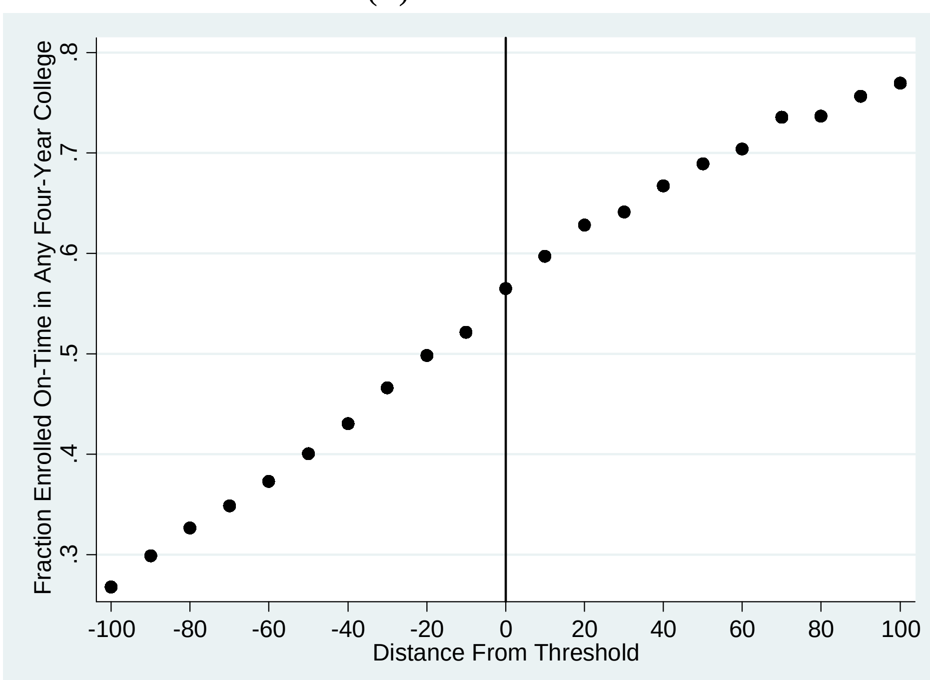
Notes: Shown above is the fraction of students enrolling in a GSUS college within a year of graduating high school, as a function of the distance from the GSUS threshold of their maximum (panel A) or first (panel B) SAT scores. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

Figure 4: Four-Year College Enrollment

(A) Maximum SAT Score



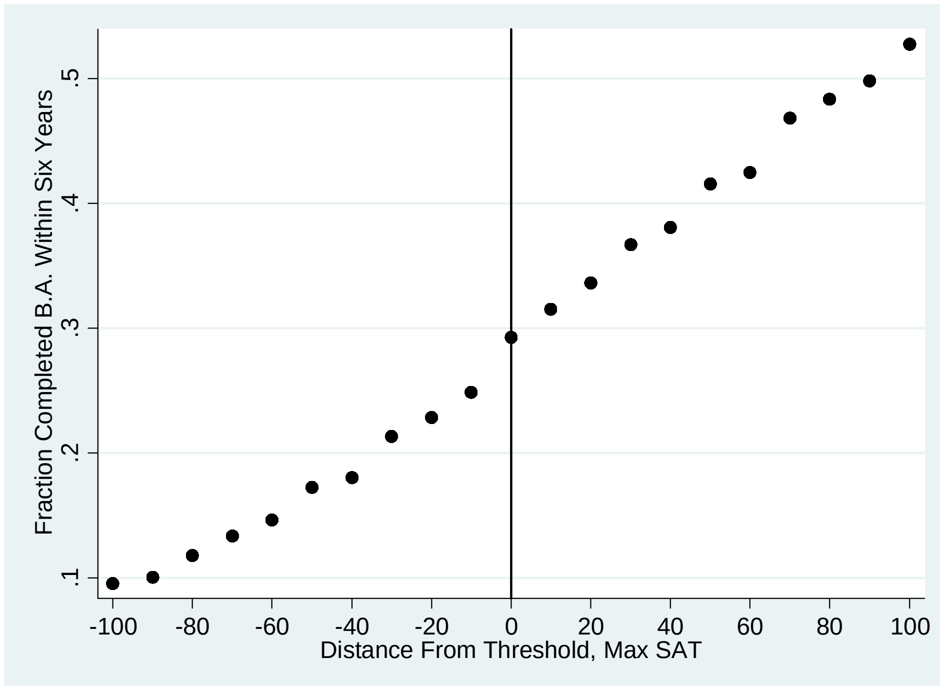
(B) First SAT Score



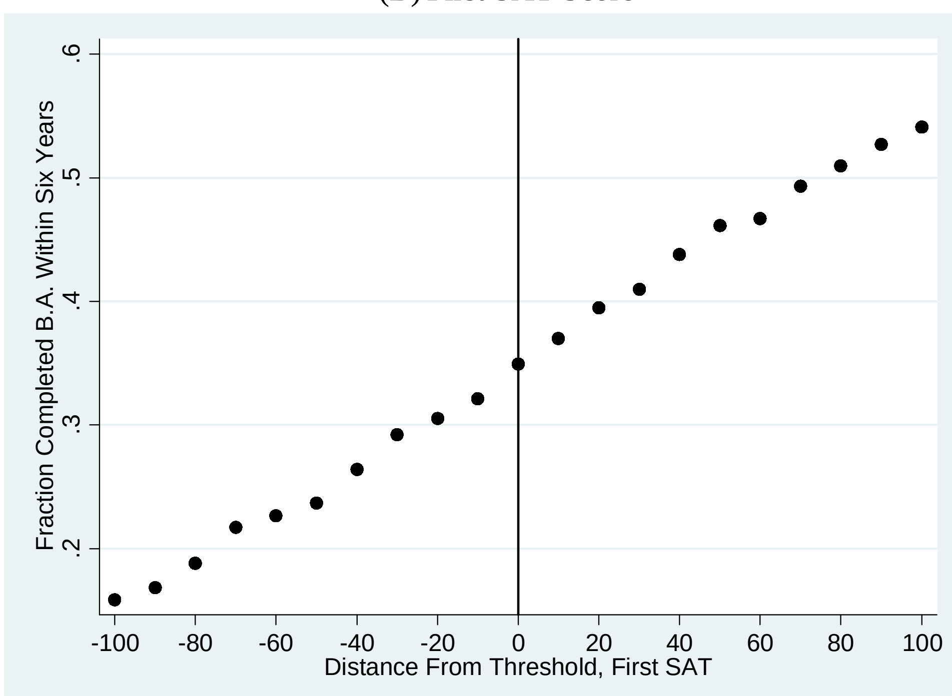
Notes: Shown above is the fraction of students enrolling in any four-year college within a year of graduating high school, as a function of the distance from the GSUS threshold of their maximum (panel A) or first (panel B) SAT scores. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

Figure 5: B.A. Completion

(A) Maximum SAT Score



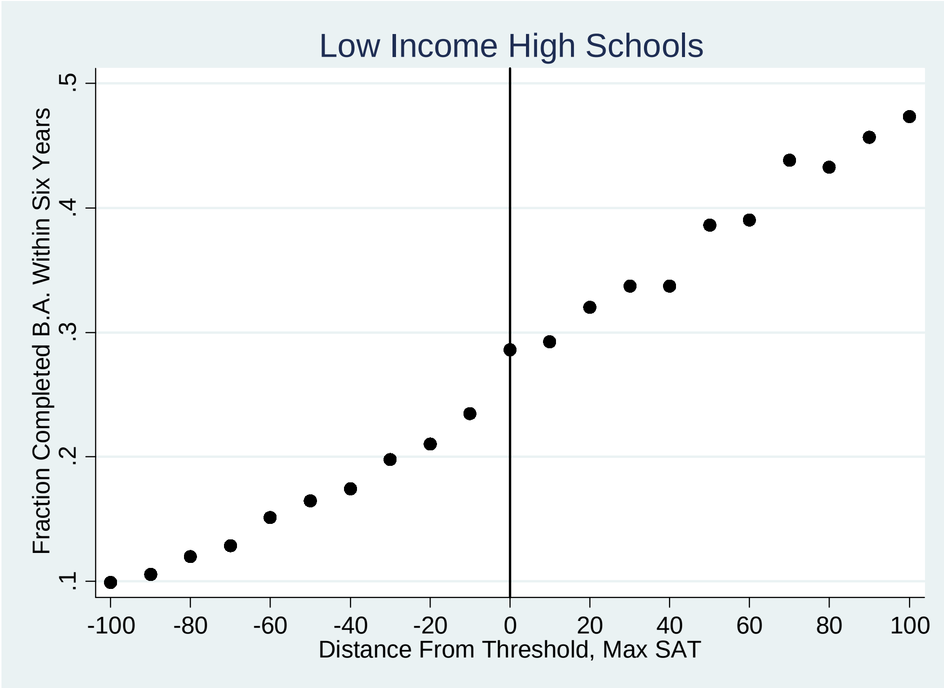
(B) First SAT Score



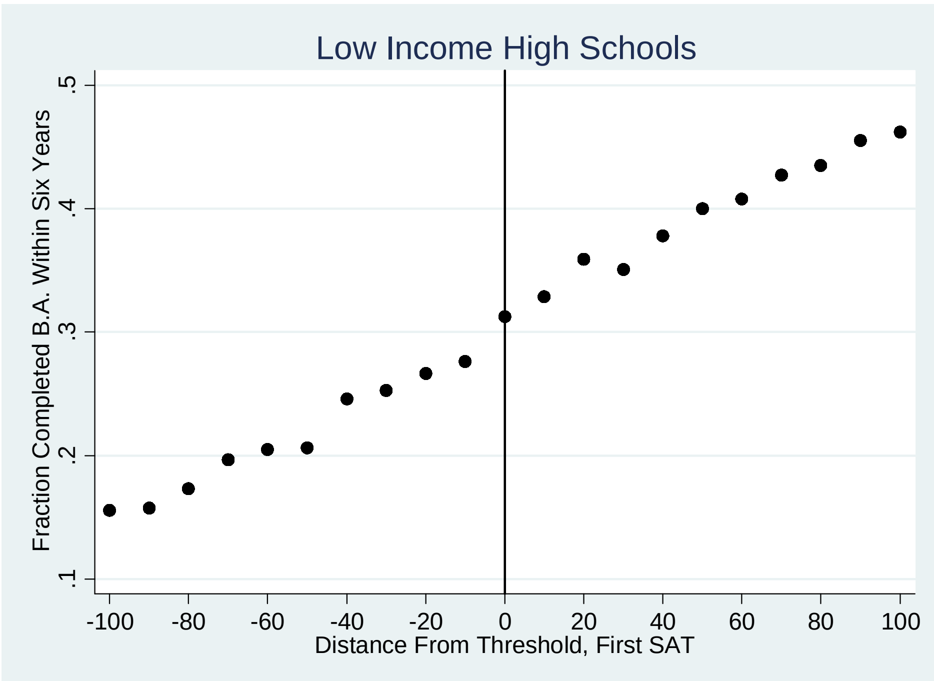
Notes: Shown above is the fraction of students completing a B.A. within six years of graduating high school, as a function of the distance from the GSUS threshold of their maximum (panel A) or first (panel B) SAT scores. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

Figure 6: B.A. Completion, Low Income Students

(A) Maximum SAT Score



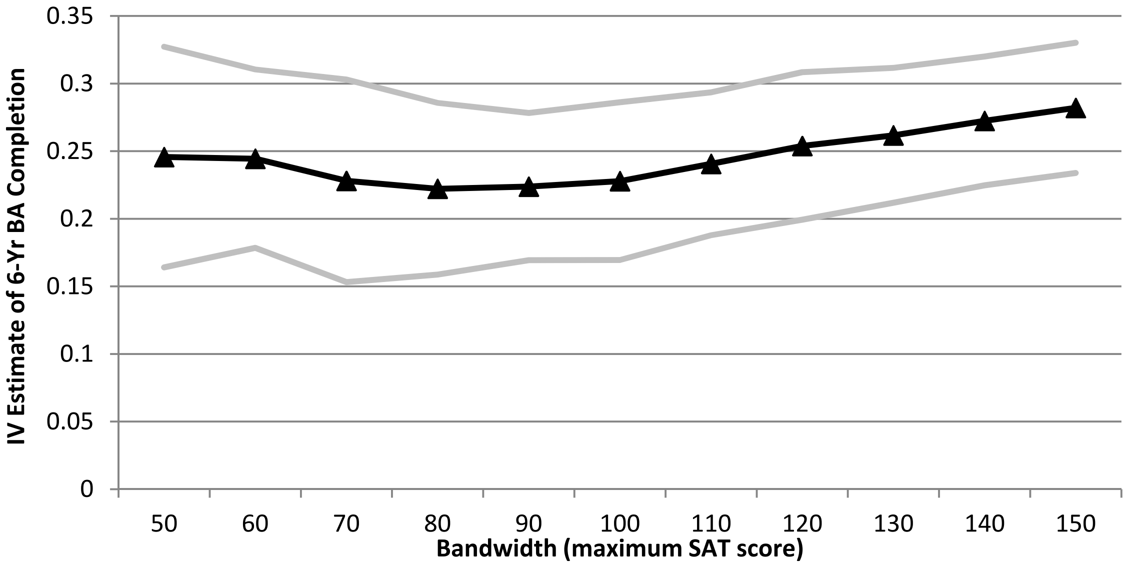
(B) First SAT Score



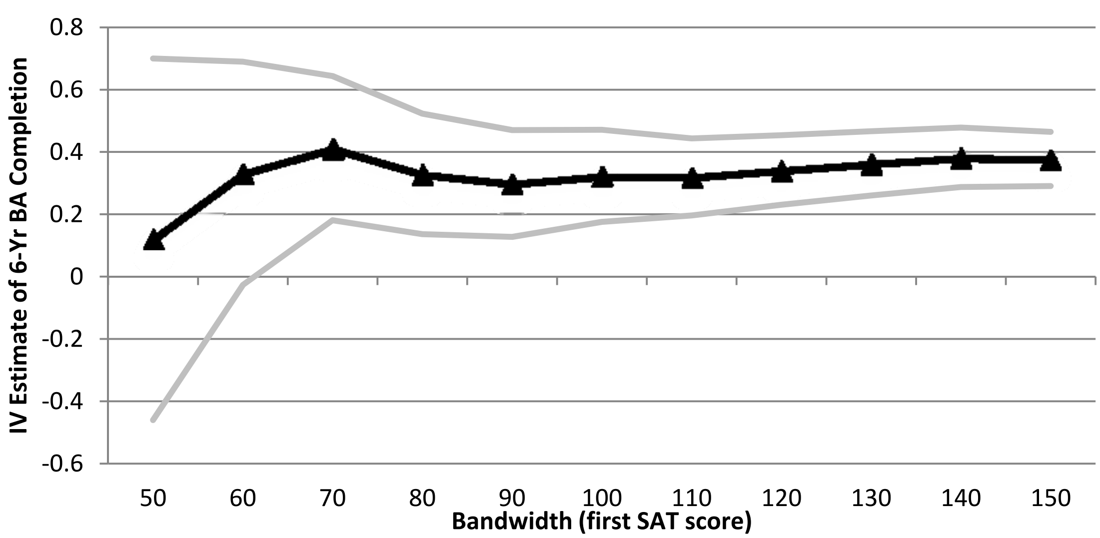
Notes: Shown above is the fraction of low income students completing a B.A. within six years of graduating high school, as a function of the distance from the GSUS threshold of their maximum (panel A) or first (panel B) SAT scores. The sample consists of the 2004-07 graduating high school classes residing in Georgia the time of taking the SAT.

Figure 7: Sensitivity of B.A. Completion Estimate to Bandwidth

(A) Maximum SAT Score



(B) First SAT Score



Notes: Shown above are the point estimates and confidence intervals for estimates of the effect of GSUS enrollment on B.A. completion within six years.

Table 1: Summary Statistics

	(1) All GA SAT Takers	(2) Low Income GA SAT Takers	(3) Non-Low Income GA SAT Takers
(A) Demographics			
Male	0.44	0.40	0.45
Female	0.56	0.59	0.55
White	0.54	0.35	0.63
Black	0.27	0.49	0.17
Hispanic	0.03	0.03	0.04
Asian	0.04	0.03	0.04
Missing race/ethnicity	0.08	0.07	0.09
Highest parental education - HS dropout	0.17	0.25	0.13
Highest parental education - HS graduate	0.29	0.35	0.27
Highest parental education - BA or higher	0.43	0.30	0.49
Missing parental education	0.11	0.10	0.12
Low income high school (< $59,799)	0.32	1.00	0.00
(B) Test scores			
First SAT score (M+CR)	918	883	934
Maximum SAT score (M+CR)	960	918	980
Number of SAT takes	1.89	1.78	1.94
Number of score sends	3.83	4.09	3.70
Access to GSUS (based on first SAT)	0.61	0.50	0.67
(C) College outcomes			
Enrolled on time at GSUS college	0.38	0.36	0.38
Enrolled on time at any four-year college	0.58	0.53	0.60
Enrolled on time at any two-year college	0.23	0.25	0.23
Mean PSAT score of first college	90.12	86.69	91.67
Six-year B.A. completion rate of first college	0.41	0.36	0.43
Completed BA within six years	0.37	0.30	0.40
Completed BA or AA within six years	0.45	0.39	0.48
N	162,266	52,007	110,249

Note: The sample consists of all Georgia SAT takers from the 2004-07 graduating high school classes whose first SAT scores place them within 100 math or reading points of the GSUS thresholds. Column 1 includes all students, while columns 2 and 3 divide the sample into those whose high school classmates had average annual incomes of less than (bottom one-third) and greater than (top two-thirds) $59,799. Ten students attended high schools for which averages could not be calculated, explaining why the sum of column 2 and 3 sample sizes fall short of the column 1 sample size. In panel C, on-time college enrollment is defined as enrollment within one year of high school graduation. The institutional mean SAT scores and six-year graduation rates come from IPEDS and are calculated only for on-time four-year college enrollees. Completion of a BA or AA in four and six years includes students who earned these degrees by June four and six years after high school graduation.

Table 2: SAT Retaking and Score Sending Behavior in Georgia

	(1) Retook SAT	(2) Retook once	(3) Retook 2+ times	(4) Number of takes	(5) Sent score to GSUS	(6) Score sends
(A) All students						
Access	-0.031***	-0.011	-0.021***	-0.061***	-0.023	-0.076***
	(0.004)	(0.007)	(0.005)	(0.008)	(0.020)	(0.024)
Mean below threshold	0.599	0.372	0.227	1.906	1.819	3.700
N	162,266	162,266	162,266	162,266	162,266	162,266
(B) Low income						
Access	-0.033***	-0.014	-0.019***	-0.057***	-0.007	-0.031
	(0.008)	(0.011)	(0.006)	(0.016)	(0.028)	(0.034)
Mean below threshold	0.550	0.363	0.187	1.797	1.977	4.015
N	52,007	52,007	52,007	52,007	52,007	52,007
(C) Non-low income						
Access	-0.034***	-0.009	-0.025***	-0.070***	-0.037	-0.098***
	(0.005)	(0.007)	(0.006)	(0.010)	(0.024)	(0.027)
Mean below threshold	0.627	0.377	0.249	1.967	1.729	3.522
N	110,249	110,249	110,249	110,249	110,249	110,249

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). All estimates come from a local linear regression of the listed outcome on an indicator for scoring at or above the GSUS threshold, using a bandwidth of 100. Distance to the threshold is defined by each student's first SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Also listed is the mean value of the outcome for students with SAT scores 10 points below the threshold. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 3: Covariate Balance Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Male	White	Black	Hispanic	Asian	Missing race	Parent high school dropout	Parent high school graduate	Parent B.A. or higher	Missing parental education	Low income
(A) All students											
Access	-0.005	0.012*	-0.012*	-0.000	0.002	-0.002	0.005	0.001	-0.006	0.001	-0.013**
	(0.003)	(0.006)	(0.006)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)	(0.003)	(0.005)
Mean below threshold	0.422	0.512	0.303	0.034	0.037	0.083	0.178	0.313	0.398	0.111	0.361
N	162,266	162,266	162,266	162,266	162,266	162,266	162,266	162,266	162,266	162,266	162,266
(B) Low income											
Access	-0.001	0.011*	-0.008	-0.001	0.006**	-0.004	0.007	0.006	-0.010*	-0.004	
	(0.007)	(0.006)	(0.008)	(0.003)	(0.002)	(0.005)	(0.005)	(0.008)	(0.005)	(0.007)	
Mean below threshold	0.391	0.325	0.505	0.033	0.029	0.075	0.243	0.355	0.294	0.107	
N	52,007	52,007	52,007	52,007	52,007	52,007	52,007	52,007	52,007	52,007	
(C) Non-low income											
Access	-0.009***	0.002	-0.006	0.001	0.001	-0.001	0.005	0.000	-0.009	0.004	
	(0.003)	(0.007)	(0.006)	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)	(0.007)	(0.003)	
Mean below threshold	0.439	0.618	0.189	0.035	0.042	0.087	0.141	0.289	0.457	0.113	
N	110,249	110,249	110,249	110,249	110,249	110,249	110,249	110,249	110,249	110,249	

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). All estimates come from a local linear regression of the listed covariate on an indicator for scoring at or above the GSUS threshold, using a bandwidth of 100. Distance to the threshold is defined by each student's first SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Also listed is the mean value of the outcome for students with SAT scores 10 points below the threshold. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 3A: Covariate Balance Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Male	Black	Hispanic	Asian	Missing race	Parent high school dropout	Parent high school graduate	Parent B.A. or higher	Missing parental education	Low income
(A) All students										
Access	-0.006	-0.034***	0.000	0.001	-0.007**	-0.003	0.002	0.004	-0.004	-0.024***
	(0.005)	(0.008)	(0.002)	(0.002)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)
Mean below threshold	0.427	0.373	0.034	0.038	0.084	0.209	0.334	0.346	0.111	0.413
N	149,566	149,566	149,566	149,566	149,566	149,566	149,566	149,566	149,566	149,566
(B) Low income										
Access	-0.006	-0.033***	0.000	0.006*	-0.003	0.001	0.005	-0.008	0.002	
	(0.008)	(0.006)	(0.003)	(0.004)	(0.004)	(0.006)	(0.010)	(0.007)	(0.007)	
Mean below threshold	0.397	0.568	0.029	0.028	0.073	0.266	0.356	0.274	0.104	
N	51,489	51,489	51,489	51,489	51,489	51,489	51,489	51,489	51,489	
(C) Non-low income										
Access	-0.009*	-0.019**	-0.000	-0.002	-0.009***	-0.001	0.003	0.004	-0.006**	
	(0.005)	(0.008)	(0.003)	(0.002)	(0.003)	(0.006)	(0.005)	(0.005)	(0.003)	
Mean below threshold	0.448	0.235	0.038	0.046	0.092	0.169	0.319	0.397	0.116	
N	98,066	98,066	98,066	98,066	98,066	98,066	98,066	98,066	98,066	

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). All estimates come from a local linear regression of the listed covariate on an indicator for scoring at or above the GSUS threshold, using a bandwidth of 100. Distance to the threshold is defined by each student's maximum SAT scores. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Also listed is the mean value of the outcome for students with SAT scores 10 points below the threshold. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 4: Initial College Enrollment

	(1) Enrolled on time, GSUS 4-year college (FS)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-GSUS 4-year college (IV)	(4) Did not enroll on time at any college (IV)	(5) Enrolled on time, any 4-year college (IV)	(6) Ever enrolled, any 4-year college (IV)	(7) Median PSAT score, on time college (IV)
(A) All students							
Access / Enrolled GSUS	0.040***	-0.684***	-0.227***	-0.089	0.773***	0.293***	18.7***
	(0.007)	(0.063)	(0.072)	(0.099)	(0.072)	(0.055)	(4.5)
Control (complier) mean	0.345						81.1
N	162,266	162,266	162,266	162,266	162,266	162,266	131,137
(B) Low income							
Access / Enrolled GSUS	0.045***	-0.493***	-0.241*	-0.266***	0.759***	0.407***	28.0***
	(0.007)	(0.115)	(0.143)	(0.093)	(0.143)	(0.115)	(6.7)
Control (complier) mean	0.370						77.6
N	52,007	52,007	52,007	52,007	52,007	52,007	40,662
(C) Non-low income							
Access / Enrolled GSUS	0.040***	-0.779***	-0.234***	0.013	0.766***	0.190**	12.0***
	(0.009)	(0.117)	(0.062)	(0.132)	(0.062)	(0.083)	(3.6)
Control (complier) mean	0.330						83.1
N	110,249	110,249	110,249	110,249	110,249	110,249	90,467

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). In column 1, first stage estimates come from a local linear regression of an indicator for on-time enrollment in a GSUS college on an indicator for scoring at or above the GSUS threshold, using a bandwidth of 100. The remaining columns present instrumental variables estimates of the impact of on-time enrollment in a GSUS college on the listed outcomes. Distance to the threshold is defined by each student's first SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. In columns 1-5, the outcomes are defined as first-time enrollment within one year of high school graduation. Column 6 considers enrollment through the summer of 2013. Column 7 uses an outcome the median PSAT score of peers at a given student's enrolled college, with non-enrollers treated as missing. Column 1 lists the mean GSUS enrollment rate for students 10 SAT points below the threshold, while column 7 lists the control complier mean. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 4A: Initial College Enrollment, Using Maximum SAT Score

	(1) Enrolled on time, GSUS 4-year college (First	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-GSUS 4-year college (IV)	(4) Did not enroll on time at any college (IV)	(5) Enrolled on time, any 4-year college (IV)	(6) Ever enrolled, any 4-year college (IV)	(7) Median PSAT score, on time college (IV)
(A) All students							
Access / Enrolled GSUS	0.127***	-0.538***	-0.301***	-0.161***	0.699***	0.334***	13.4***
	(0.013)	(0.031)	(0.019)	(0.024)	(0.019)	(0.017)	(0.844)
Control (complier) mean	0.235						81.5
N	149,566	149,566	149,566	149,566	149,566	149,566	118,546
(B) Low income							
Access / Enrolled GSUS	0.128***	-0.428***	-0.352***	-0.220***	0.648***	0.304***	15.4***
	(0.016)	(0.052)	(0.053)	(0.021)	(0.053)	(0.033)	(1.549)
Control (complier) mean	0.290						80.2
N	51,489	51,489	51,489	51,489	51,489	51,489	39,769
(C) Non-low income							
Access / Enrolled GSUS	0.134***	-0.611***	-0.260***	-0.129***	0.740***	0.348***	11.1***
	(0.014)	(0.047)	(0.022)	(0.033)	(0.022)	(0.025)	(0.994)
Control (complier) mean	0.195						82.3
N	98,066	98,066	98,066	98,066	98,066	98,066	78,770

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). In column 1, first stage estimates come from a local linear regression of an indicator for on-time enrollment in a GSUS college on an indicator for scoring at or above the GSUS threshold, using a bandwidth of 100. The remaining columns present instrumental variables estimates of the impact of on-time enrollment in a GSUS college on the listed outcomes. Distance to the threshold is defined by each student's maximum SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. In columns 1-5, the outcomes are defined as first-time enrollment within one year of high school graduation. Column 6 considers enrollment through the summer of 2013. Column 7 uses an outcome the median PSAT score of peers at a given student's enrolled college, with non-enrollers treated as missing. Column 1 lists the mean GSUS enrollment rate for students 10 SAT points below the threshold, while column 7 lists the control complier mean. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 5: College Degree Completion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	College's six-year B.A. completion rate	Completed B.A. within six years		Completed A.A. within six years		Completed B.A. or A.A. within six years	
	IV	IV	OLS	IV	OLS	IV	OLS
(A) All students							
Enrolled GSUS	0.413***	0.323***	0.224***	-0.079	-0.056***	0.250***	0.169***
	(0.048)	(0.075)	(0.011)	(0.090)	(0.002)	(0.052)	(0.009)
CCM	0.241	0.173		0.128		0.296	
N	161,800	162,266		162,266		162,266	
(B) Low income							
Enrolled GSUS	0.460***	0.502***	0.237***	-0.135	-0.071***	0.368***	0.168***
	(0.078)	(0.145)	(0.008)	(0.132)	(0.002)	(0.106)	(0.008)
CCM	0.197	0.024		0.157		0.182	
N	51,869	52,007		52,007		52,007	
(C) Non-low income							
Enrolled GSUS	0.339***	0.132	0.220***	-0.033	-0.049***	0.108	0.172***
	(0.066)	(0.094)	(0.013)	(0.090)	(0.003)	(0.089)	(0.011)
CCM	0.284	0.313		0.097		0.401	
N	109,921	110,249		110,249		110,249	

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). Distance to the threshold is defined by each student's first SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Column 1 uses an outcome the NSC-based average six-year B.A. completion rate of the first college a student enrolls in within one year of high school graduation, where non-enrollers are assigned zeroes. Columns 2, 4 and 6 show instrumental variable estimates in which on-time enrollment in a GSUS college has been instrumented with an indicator for scoring above the threshold. Columns 3, 5 and 7 show the OLS versions of those instrumental variables regressions. A bandwidth of 100 SAT points is used in all specifications. Also listed are the control complier means. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 5A: College Degree Completion, Using Maximum SAT Score

	(1) College's six-year B.A. completion rate	(2) Completed B.A. within six years	(3)	(4) Completed A.A. within six years	(5)	(6) Completed B.A. or A.A. within six years	(7)
	IV	IV	OLS	IV	OLS	IV	OLS
(A) All students							
Enrolled GSUS	0.298***	0.228***	0.206***	-0.041**	-0.055***	0.187***	0.151***
	(0.012)	(0.030)	(0.009)	(0.019)	(0.002)	(0.025)	(0.007)
CCM	0.279	0.237		0.103		0.340	
N	149,114	149,566		149,566		149,566	
(B) Low income							
Enrolled GSUS	0.297***	0.268***	0.211***	-0.044	-0.069***	0.221***	0.143***
	(0.019)	(0.053)	(0.008)	(0.031)	(0.002)	(0.046)	(0.007)
CCM	0.273	0.160		0.102		0.265	
N	51,352	51,489		51,489		51,489	
(C) Non-low income							
Enrolled GSUS	0.291***	0.179***	0.206***	-0.041**	-0.048***	0.141***	0.158***
	(0.016)	(0.027)	(0.011)	(0.021)	(0.003)	(0.032)	(0.009)
CCM	0.279	0.296		0.102		0.396	
N	97,751	98,066		98,066		98,066	

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). Distance to the threshold is defined by each student's maximum SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Column 1 uses an outcome the NSC-based average six-year B.A. completion rate of the first college a student enrolls in within one year of high school graduation, where non-enrollers are assigned zeroes. Columns 2, 4 and 6 show instrumental variable estimates in which on-time enrollment in a GSUS college has been instrumented with an indicator for scoring above the threshold. Columns 3, 5 and 7 show the OLS versions of those instrumental variables regressions. A bandwidth of 100 SAT points is used in all specifications. Also listed are the control complier means. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799.

Table 6: Robustness Checks

	(1) Enrolled on time, GSUS 4-year college (FS)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-GSUS 4-year college (IV)	(4) Enrolled on time, any 4-year college (IV)	(5) Median PSAT score, on time college (IV)	(6) College's six-year B.A. completion rate (IV)	(7) Completed B.A. within six years (IV)
(A) All students							
Bandwidth = IK	0.017***	-0.685***	-0.202**	1.056***	24.771***	0.479***	0.405**
	(0.002)	(0.102)	(0.094)	(0.177)	(7.812)	(0.080)	(0.202)
IK optimal bandwidth	45.7	48.3	118.2	49.6	50.8	49.3	62.9
Bandwidth = 50	0.017***	-0.828***	-0.093	0.907***	20.706***	0.442***	0.120
	(0.003)	(0.157)	(0.234)	(0.234)	(7.154)	(0.083)	(0.296)
Bandwidth = 100	0.040***	-0.684***	-0.227***	0.773***	18.685***	0.413***	0.323***
	(0.007)	(0.063)	(0.072)	(0.072)	(4.476)	(0.048)	(0.075)
Bandwidth = 100, controls	0.039***	-0.724***	-0.213***	0.787***	17.005***	0.401***	0.250***
	(0.007)	(0.065)	(0.076)	(0.076)	(4.320)	(0.044)	(0.096)
Bandwidth = 150	0.065***	-0.773***	-0.199***	0.801***	16.779***	0.406***	0.378***
	(0.011)	(0.044)	(0.043)	(0.043)	(3.033)	(0.025)	(0.044)
(B) Low income							
Bandwidth = IK	0.026***	-0.614***	-0.166	0.912***	34.937***	0.596***	0.559***
	(0.006)	(0.132)	(0.193)	(0.254)	(12.240)	(0.139)	(0.184)
IK optimal bandwidth	61.0	64.0	98.5	76.9	74.0	81.3	92.5
Bandwidth = 50	0.030***	-0.586***	-0.031	0.969***	32.704**	0.618***	0.529
	(0.007)	(0.161)	(0.348)	(0.348)	(13.642)	(0.196)	(0.337)
Bandwidth = 100	0.045***	-0.493***	-0.241*	0.759***	28.011***	0.460***	0.502***
	(0.007)	(0.115)	(0.143)	(0.143)	(6.679)	(0.078)	(0.145)
Bandwidth = 150	0.071***	-0.607***	-0.301***	0.699***	23.249***	0.376***	0.391***
	(0.012)	(0.076)	(0.079)	(0.079)	(3.604)	(0.046)	(0.087)
(C) Non-low income							
Bandwidth = IK	0.016***	-0.525***	-0.210***	0.750***	3.603	0.030	-0.126
	(0.003)	(0.169)	(0.061)	(0.156)	(3.382)	(0.096)	(0.251)
IK optimal bandwidth	48.4	48.2	136.5	50.1	58.9	52.7	64.0
Bandwidth = 50	0.011*	-1.118	-0.205	0.795***	6.912	0.145	-0.546
	(0.006)	(0.683)	(0.220)	(0.220)	(6.289)	(0.191)	(0.585)
Bandwidth = 100	0.040***	-0.779***	-0.234***	0.766***	11.984***	0.339***	0.132
	(0.009)	(0.117)	(0.062)	(0.062)	(3.556)	(0.066)	(0.094)
Bandwidth = 150	0.066***	-0.843***	-0.153***	0.847***	11.442***	0.387***	0.298***
	(0.012)	(0.063)	(0.040)	(0.040)	(2.788)	(0.038)	(0.057)

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). Distance to the threshold is defined by each student's first SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799. In panel A, the fourth row includes controls for gender, race (Black, Hispanic, Asian, White, missing ethnicity), high school income (less than $59,799, greater than $59,799), parental education (less than high school, high school, bachelors or higher) and self-reported GPA. Rectangular kernels are used in all regressions except for those where the bandwidth is set to the Imbens Kalyanaraman (IK) optimal bandwidth.

Table 6A: Robustness Checks, Using Maximum SAT Score

	(1) Enrolled on time, GSUS 4-year college (FS)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-GSUS 4-year college (IV)	(4) Enrolled on time, any 4-year college (IV)	(5) Median PSAT score, on time college (IV)	(6) College's six-year B.A. completion rate (IV)	(7) Completed B.A. within six years (IV)
(A) All students							
Bandwidth = IK	0.079***	-0.467***	-0.312***	0.693***	15.190***	0.310***	0.272***
	(0.006)	(0.052)	(0.021)	(0.034)	(0.761)	(0.016)	(0.039)
IK optimal bandwidth	38.4	48.3	118.2	49.6	50.8	46.8	62.9
Bandwidth = 50	0.089***	-0.470***	-0.344***	0.656***	14.004***	0.314***	0.246***
	(0.008)	(0.048)	(0.042)	(0.042)	(0.891)	(0.016)	(0.042)
Bandwidth = 100	0.127***	-0.538***	-0.301***	0.699***	13.385***	0.298***	0.228***
	(0.013)	(0.031)	(0.019)	(0.019)	(0.844)	(0.012)	(0.030)
Bandwidth = 100, controls	0.128***	-0.569***	-0.281***	0.719***	12.364***	0.293***	0.197***
	(0.013)	(0.030)	(0.017)	(0.017)	(0.734)	(0.010)	(0.029)
Bandwidth = 150	0.159***	-0.581***	-0.274***	0.726***	12.210***	0.310***	0.282***
	(0.017)	(0.031)	(0.019)	(0.019)	(0.906)	(0.009)	(0.025)
(B) Low income							
Bandwidth = IK	0.073***	-0.325***	-0.403***	0.573***	17.055***	0.339***	0.310***
	(0.010)	(0.102)	(0.072)	(0.092)	(2.545)	(0.027)	(0.074)
IK optimal bandwidth	52.1	64.0	98.5	76.9	74.0	69.0	92.5
Bandwidth = 50	0.090***	-0.302***	-0.448***	0.552***	16.179***	0.330***	0.335***
	(0.015)	(0.103)	(0.113)	(0.113)	(3.056)	(0.032)	(0.090)
Bandwidth = 100	0.128***	-0.428***	-0.352***	0.648***	15.409***	0.297***	0.268***
	(0.016)	(0.052)	(0.053)	(0.053)	(1.549)	(0.019)	(0.053)
Bandwidth = 150	0.161***	-0.482***	-0.352***	0.648***	13.879***	0.282***	0.283***
	(0.020)	(0.046)	(0.037)	(0.037)	(1.054)	(0.015)	(0.036)
(C) Non-low income							
Bandwidth = IK	0.094***	-0.516***	-0.255***	0.732***	11.119***	0.263***	0.184***
	(0.006)	(0.077)	(0.022)	(0.040)	(1.123)	(0.022)	(0.030)
IK optimal bandwidth	42.4	48.2	136.5	50.1	58.9	49.8	64.0
Bandwidth = 50	0.093***	-0.581***	-0.270***	0.730***	11.774***	0.293***	0.173***
	(0.009)	(0.080)	(0.041)	(0.041)	(1.272)	(0.031)	(0.033)
Bandwidth = 100	0.134***	-0.611***	-0.260***	0.740***	11.100***	0.291***	0.179***
	(0.014)	(0.047)	(0.022)	(0.022)	(0.994)	(0.016)	(0.027)
Bandwidth = 150	0.168***	-0.648***	-0.212***	0.788***	10.225***	0.322***	0.264***
	(0.017)	(0.037)	(0.022)	(0.022)	(1.055)	(0.014)	(0.030)

Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). Distance to the threshold is defined by each student's maximum SAT score. The sample consists of the 2004-07 graduating high school classes residing in Georgia when taking the SAT. Each regression includes class fixed effects. Panel A includes all students, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $59,799. In panel A, the fourth row includes controls for gender, race (Black, Hispanic, Asian, White, missing ethnicity), high school income (less than $59,799, greater than $59,799), parental education (less than high school, high school, bachelors or higher) and self-reported GPA. Rectangular kernels are used in all regressions except for those where the bandwidth is set to the Imbens Kalyanaraman (IK) optimal bandwidth.

Table 7: Heterogeneity by Gender, Race and Parental Education

	(1) Enrolled on time, GSUS 4-year college (FS)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, any 4-year college (IV)	(4) Median PSAT score, on time college (IV)	(5) College's six-year B.A. completion rate (IV)	(6) Completed B.A. within six years (IV)
(A) Male students						
Access / Enrolled GSUS	0.024***	-1.038***	0.918***	26.588**	0.477***	0.323*
	(0.008)	(0.295)	(0.188)	(10.370)	(0.136)	(0.193)
Control (complier) mean	0.314			77.676	0.214	0.047
N	70,640	70,640	70,640	55,687	70,424	70,640
(B) Female students						
Access / Enrolled GSUS	0.052***	-0.553***	0.711***	15.508***	0.384***	0.294***
	(0.007)	(0.061)	(0.074)	(3.738)	(0.041)	(0.081)
Control (complier) mean	0.367			82.518	0.257	0.228
N	91,471	91,471	91,471	75,338	91,221	91,471
(C) White students						
Access / Enrolled GSUS	0.041***	-0.732***	0.816***	5.823*	0.295***	0.196**
	(0.009)	(0.102)	(0.087)	(3.161)	(0.050)	(0.094)
Control (complier) mean	0.308			84.124	0.296	0.320
N	87,323	87,323	87,323	72,837	87,128	87,323
(D) Black students						
Access / Enrolled GSUS	0.062***	-0.550***	0.498***	19.896***	0.337***	0.108
	(0.010)	(0.072)	(0.090)	(4.486)	(0.066)	(0.147)
Control (complier) mean	0.416			81.608	0.300	0.287
N	44,189	44,189	44,189	34,933	44,026	44,189
(E) Parent earned BA						
Access / Enrolled GSUS	0.024***	-1.048***	0.802***	16.465**	0.473***	0.390*
	(0.008)	(0.212)	(0.225)	(6.581)	(0.141)	(0.202)
Control (complier) mean	0.380			87.289	0.262	0.387
N	69,356	69,356	69,356	59,481	69,186	69,356
(F) Neither parent with BA						
Access / Enrolled GSUS	0.051***	-0.579***	0.803***	21.183***	0.413***	0.257**
	(0.006)	(0.069)	(0.075)	(2.675)	(0.031)	(0.104)
Control (complier) mean	0.318			77.303	0.211	0.100
N	74,831	74,831	74,831	57,535	74,579	74,831

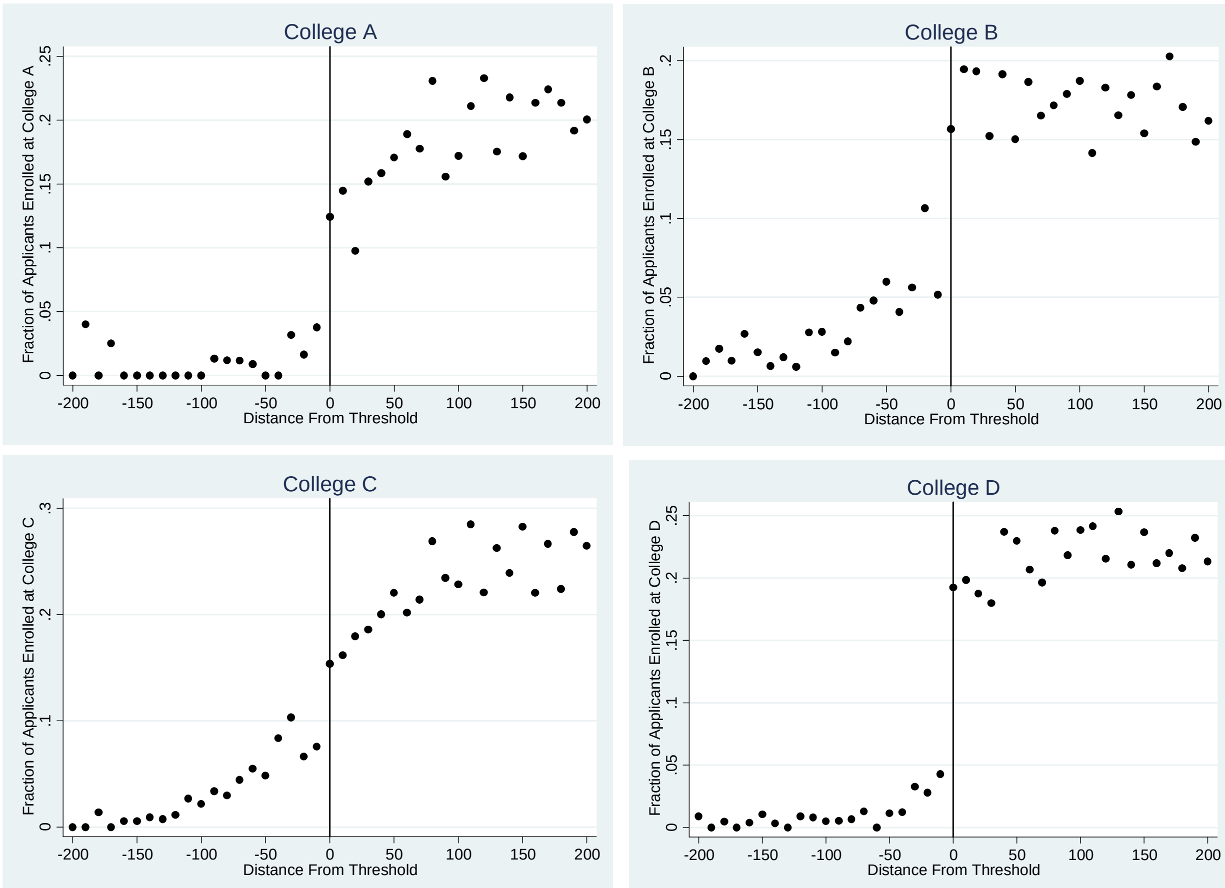
Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). Estimates are generated by replicating regressions from Tables 4 and 5 for the listed sub-sample of students. Also listed are control mean in column 1 and control complier means in columns 4-6.

Table 8: Initial College Enrollment and Completion, Hidden Threshold Colleges

	(1) Enrolled on time, target 4-year college (First stage)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-target 4-year college (IV)	(4) Enrolled on time, any 4-year college (IV)	(5) College's six-year B.A. completion rate (IV)	(6) Completed B.A. within six years (IV)
(A) Low hidden applicants						
Access / Enrolled target	0.128***	-0.352***	-0.569***	0.431***	0.225***	0.074
	(0.007)	(0.057)	(0.074)	(0.074)	(0.042)	(0.083)
Control (complier) mean	0.057				0.463	0.539
N	52,010	52,010	52,010	52,010	52,010	52,010
(B) Low income						
Access / Enrolled target	0.104***	-0.250**	-0.631***	0.369***	0.227***	0.218*
	(0.007)	(0.117)	(0.115)	(0.115)	(0.068)	(0.123)
Control (complier) mean	0.062				0.447	0.301
N	17,202	17,202	17,202	17,202	17,202	17,202
(C) Non-low income						
Access / Enrolled target	0.141***	-0.378***	-0.565***	0.435***	0.212***	-0.028
	(0.008)	(0.061)	(0.082)	(0.082)	(0.040)	(0.087)
Control (complier) mean	0.054				0.484	0.675
N	34,808	34,808	34,808	34,808	34,808	34,808
(D) High hidden applicants						
Access / Enrolled target	0.115***	-0.044	-0.942***	0.058	0.145***	-0.032
	(0.011)	(0.030)	(0.047)	(0.047)	(0.029)	(0.063)
Control (complier) mean	0.130				0.722	0.902
N	87,647	87,647	87,647	87,647	87,647	87,647

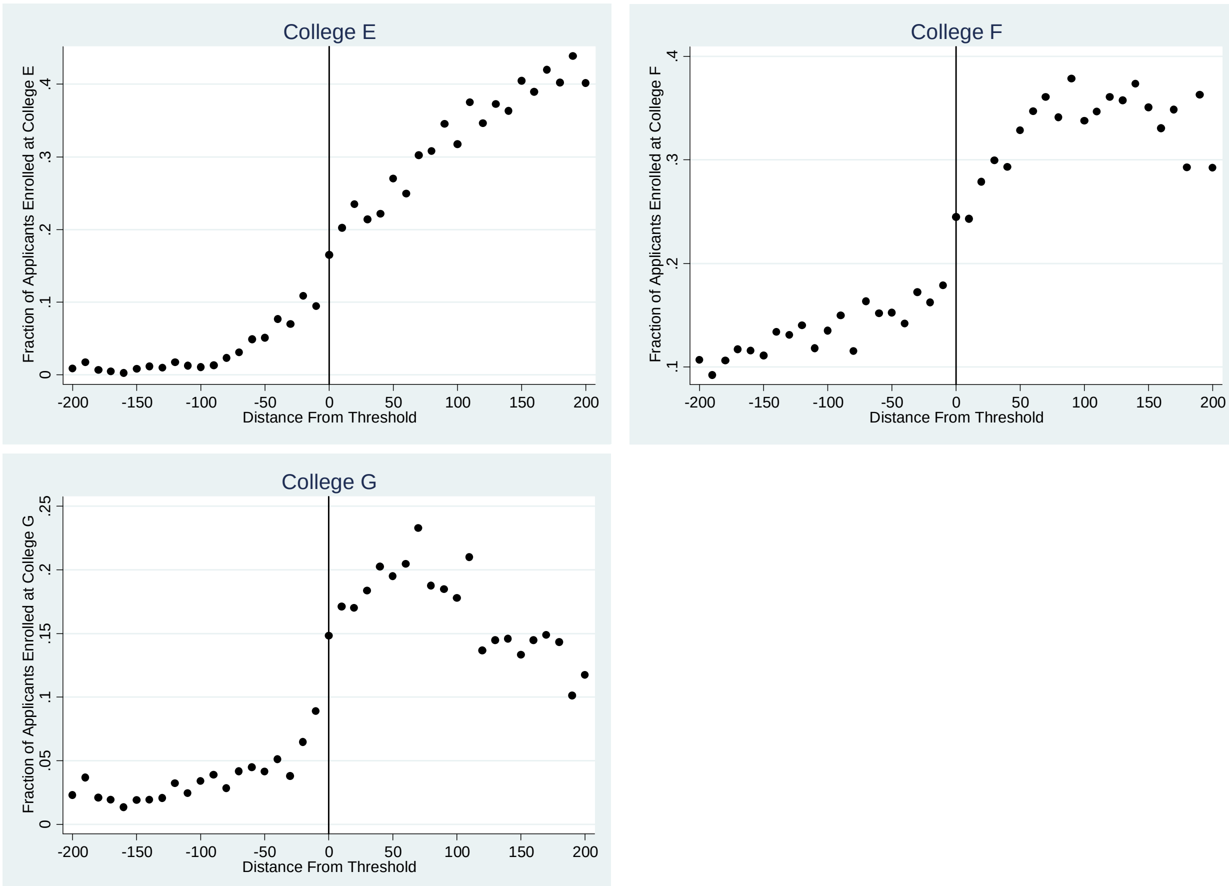
Note: Heteroskedasticity robust standard errors clustered by distance to the admissions threshold are in parentheses (* p<.10 ** p<.05 *** p<.01). In column 1, first stage estimates come from a local linear regression of an indicator for on-time enrollment in a hidden threshold college on an indicator for scoring at or above the relevant threshold, using a bandwidth of 200. The remaining columns present instrumental variables estimates of the impact of on-time enrollment in a hidden threshold college on the listed outcomes. Distance to the threshold is defined by each student's maximum SAT score. The sample consists of applicants hidden threshold colleges from the 2004-07 graduating high school classes. Each regression includes class-by-target college fixed effects. Also listed are control mean in column 1 and control complier means in columns 5 and 6. Panel A includes all in-state applicants to low hidden threshold colleges, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $50,000. Panel D includes all in-state applicants to high hidden threshold colleges.

Figure A.1: Enrollment at Low Hidden Threshold Colleges



Notes: Shown above is the fraction of students enrolling in one of the low hidden threshold colleges within a year of graduating high school, as a function of the distance of their maximum SAT scores from their target college's threshold. The sample consists of in-state students from the 2004-07 graduating high school classes who sent SAT scores to the given low hidden threshold colleges.

Figure A.2: Enrollment at High Hidden Threshold Colleges



Notes: Shown above is the fraction of students enrolling in one of the high hidden threshold colleges within a year of graduating high school, as a function of the distance of their maximum SAT scores from their target college's threshold. The sample consists of in-state students from the 2004-07 graduating high school classes who sent SAT scores to the given high hidden threshold colleges.

Table A.1: Characteristics of GSUS Colleges

	(1) FTE students	(2) Tuition and fees	(3) Median SAT score	(4) Percent admitted	(5) Instr. spending per FTE	(6) Six-year grad. rate	(7) SAT verbal threshold	(8) SAT math threshold	(9) SAT total threshold
I. Research universities									
Georgia Institute of Technology	15,789	4,076	1325	70	8,988	72	430	400	
Georgia State U.	21,437	3,920	1090	56	5,161	41	430	400	900
U. of Georgia	30,388	4,078	1205	75	6,057	72	430	400	
II. Regional universities									
Georgia Southern U.	14,374	2,912	1050	54	4,130	38	430	400	960
Valdosta State U.	8,854	2,860	1005	68	4,361	38	440	410	
III. State universities									
Albany State U.	3,129	2,774	920	84	5,211	40	430	400	
Armstrong Atlantic State U.	5,138	2,602	1020	84	4,370	18	460	430	
Augusta State U.	4,884	2,592	970	66	3,761	19	430	400	
Clayton State U.	4,208	2,670	995	71	3,525	14	430	400	
Columbus State U.	5,541	2,676	980	62	4,048	27	440	410	
Fort Valley State U.	2,283	2,782	930	44	6,106	30	430	400	
Georgia Coll. & State U.	4,762	3,596	1120	44	5,205	37	430	400	
Georgia Southwestern State U.	1,902	2,798	965	75	4,901	32	430	400	
Kennesaw State U.	13,854	2,724	1065	61	3,789	31	490	460	
North Georgia Coll. & State U.	3,836	2,808	1075	36	4,488	50	430	400	
Savannah State U.	2,415	2,830	880	49	4,737	31	430	400	
Southern Polytechnic State U.	2,857	2,754	1135	62	5,340	23	500	500	
U. of West Georgia	8,399	2,774	1000	61	3,911	30	430	400	
IV. Other Georgia public colleges									
State colleges (primarily two-year)	2,503	1,575	887	73	3,324		330	310	
Technical colleges (two-year)	1,776	1,127			3,097		330	310	

Notes: Figures in columns 1-6 are taken from the 2004 Integrated Postsecondary Education Data System. Median SAT scores are computed as the sum of the mean of the 25th and 75th percentile math and verbal SAT scores. The SAT thresholds listed in columns 7-9 are taken from academic handbooks from 2004.

Table A.2: Robustness Checks, Low Hidden Threshold Colleges

	(1) Enrolled on time, target 4-year college (First stage)	(2) Enrolled on time, any 2-year college (IV)	(3) Enrolled on time, non-target 4-year college (IV)	(4) Enrolled on time, any 4-year college (IV)	(5) College's six-year B.A. completion rate (IV)	(7) Completed B.A. within six years (IV)
(A) Low hidden applicants						
Bandwidth = IK	0.102***	-0.358***	-0.584***	0.452***	0.269***	0.066
	(0.006)	(0.095)	-0.068	(0.110)	(0.062)	(0.136)
IK optimal bandwidth	103.20	134.51	301.66	155.43	144.78	164.62
Bandwidth = 100	0.104***	-0.400***	-0.524***	0.476***	0.279***	0.029
	(0.007)	(0.102)	-0.123	(0.123)	(0.064)	(0.167)
Bandwidth = 200	0.128***	-0.352***	-0.569***	0.431***	0.225***	0.074
	(0.007)	(0.057)	-0.074	(0.074)	(0.042)	(0.083)
Bandwidth = 200, controls	0.127***	-0.352***	-0.582***	0.418***	0.212***	0.044
	(0.007)	(0.054)	-0.065	(0.065)	(0.038)	(0.077)
Bandwidth = 300	0.151***	-0.397***	-0.590***	0.410***	0.217***	0.096
	(0.009)	(0.043)	-0.053	(0.053)	(0.029)	(0.062)
(B) Low income students						
Bandwidth = IK	0.085***	-0.240	-0.676***	0.326***	0.221***	0.192*
	(0.005)	(0.171)	-0.112	(0.113)	(0.082)	(0.110)
IK optimal bandwidth	160.37	180.12	283.77	278.85	204.14	321.19
Bandwidth = 100	0.082***	-0.270	-0.706***	0.294	0.228**	0.271
	(0.006)	(0.219)	-0.186	(0.186)	(0.107)	(0.220)
Bandwidth = 200	0.104***	-0.250**	-0.631***	0.369***	0.227***	0.218*
	(0.007)	(0.117)	-0.115	(0.115)	(0.068)	(0.123)
Bandwidth = 300	0.116***	-0.302***	-0.697***	0.303***	0.221***	0.167*
	(0.007)	(0.090)	-0.092	(0.092)	(0.053)	(0.092)
(C) Non-low income students						
Bandwidth = IK	0.116***	-0.427***	-0.528***	0.524***	0.270***	-0.047
	(0.009)	(0.077)	-0.098	(0.116)	(0.052)	(0.131)
IK optimal bandwidth	125.52	149.84	205.56	150.44	151.73	176.04
Bandwidth = 100	0.116***	-0.470***	-0.454***	0.546***	0.287***	-0.108
	(0.009)	(0.089)	-0.13	(0.130)	(0.056)	(0.179)
Bandwidth = 200	0.141***	-0.378***	-0.565***	0.435***	0.212***	-0.028
	(0.008)	(0.061)	-0.082	(0.082)	(0.040)	(0.087)
Bandwidth = 300	0.167***	-0.412***	-0.575***	0.425***	0.198***	0.016
	(0.010)	(0.046)	-0.059	(0.059)	(0.028)	(0.064)

Note: Heteroskedasticity robust standard errors clustered by distance from relevant SAT thresholds are in parentheses (* p<.10 ** p<.05 *** p<.01). All estimates come from a local linear regression of the listed outcome on an indicator for being above the relevant admissions threshold, using the listed bandwidth. Distance to the threshold is defined by each student's maximum SAT score. The sample consists of applicants hidden threshold colleges from the 2004-07 graduating high school classes. Each regression includes class-by-target college fixed effects. Also listed is the mean value of the outcome for students with SAT scores 10 points below the threshold. Panel A includes all in-state applicants to low hidden threshold colleges, while panels B and C divide the sample into those whose high school classmates had average annual incomes of less than and greater than $50,000. In panel A, the fourth row includes controls for gender, race, parental income, parental education and self-reported GPA.