

Who Benefits from the GED?

New Regression Discontinuity Evidence From Massachusetts*

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Abstract

A mature body of research has examined the labor market returns to passing the GED, typically finding modest (or negligible) benefits for the individual. In this study, we use a regression discontinuity research design to estimate the impact of obtaining the GED on postsecondary outcomes for two self-selected groups of test-takers in Massachusetts: high school dropouts who do and do not enroll in publicly funded adult basic education (ABE) classes. In contrast with previous work, we find that earning a GED credential substantially increases enrollment and persistence in postsecondary education for ABE students who marginally pass the GED, but find no such effects for dropouts who do not participate in ABE. Specifically, our IV estimates indicate that earning a GED increases the likelihood that ABE participants ever enroll in college by 33.4-55.8 percentage points and increases enrollment for four or more quarters by 25.4-33.7 percentage points, depending on the specification. We hypothesize that although ABE students are negatively selected in terms of academic skills, they are positively selected on dimensions of non-cognitive skills and motivation relative to non-ABE test-takers. Our findings highlight a policy-relevant population of GED test-takers for whom earning a GED may be particularly beneficial and furthers our understanding of who does and does not benefit from this credential.

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1 Introduction

Returns to education grew substantially during the last quarter of the 20th century and into the 21st as demand for highly skilled workers outstripped supply (Autor, 2014, Goldin & Katz, 2009). During this period, U.S. workers who did not hold a high school diploma experienced wage stagnation and disproportionate rates of unemployment, both during periods of economic recession and periods of relative economic prosperity (Cameron & Heckman, 1993; Rouse, 2005; Heckman, Stixrud, & Urzua, 2006; Autor, 2014). One of the primary benefits of a high school diploma is access to postsecondary education, which has been shown to have high returns, even for academically marginal students (Carnevale, Rose, & Cheah, 2013; Zimmerman, 2014; Goodman, Hurwitz, and Smith, 2017). The GED provides an opportunity for students who did not earn a traditional high school diploma to earn a high school equivalency (HSE) credential that meets minimum educational attainment standards required by most postsecondary education institutions, as well as some jobs and vocational training programs.

Past regression discontinuity analyses of the returns to passing the GED have estimated Local Average Treatment Effects (LATEs) for all GED test takers near the passing threshold in a given state or group of states (Tyler, Murnane, & Willett, 2000; Tyler, 2004; Lofstrom & Tyler, 2008; Jepsen, Mueser, and Troske, 2016, 2017). We highlight the impact of earning a GED for a self-selected population of students in Massachusetts who are the primary recipients of public investment related to GED preparation: students in public Adult Basic Education (ABE) classes. We contrast the impact of earning a GED for ABE students to the impact of earning a GED for recent high school dropouts in Massachusetts who do not participate in ABE. From a policy perspective, a major question related to the GED is whether to continue investing public resources in preparing students to pass the GED and earn an HSE credential, given that recent evidence suggests minimal labor market benefits for the marginal passer (Jepsen, Mueser, & Troske, 2016). In this work we seek to answer the question of whether previous estimates of a statewide LATE at the margin of passing generalizes to the subset of individuals who participate in ABE classes that are funded or subsidized with public resources.

If ABE students select into these classes because they are relatively weak academically and need extra help to pass, then the marginal GED passer who participates in ABE may have less latent ability than the average marginal GED passer, which could diminish their expected academic or labor market outcomes. Conversely, if ABE students select into GED preparation classes because

they have particular educational or job-related goals or are better suited to a structured educational environment than the average test-taker, they may be expected to benefit disproportionately or be more likely to use their GED to access further education or training. Enrolling in an ABE course demonstrates a willingness to build academic skills in a traditional schooling environment, and executing a plan to prepare for and take the GED exam requires organizational skills, prior planning, and persistence.

In this paper, we will examine the impact of earning a GED on rates of postsecondary enrollment, persistence, and degree attainment for students who participate in ABE classes in Massachusetts and other recent dropouts who do not. While a mature body of research has examined the value of the GED in the labor market using regression discontinuity (RD) research designs, Jepsen, Mueser, and Troske's (2016) analysis of the returns to the GED in Missouri calls into question the methodology of over a decade of findings. Jepsen, Mueser, and Troske (hereafter "JMT") note the importance of accounting for retaking behavior, ignored in previous regression discontinuity analyses used to measure the impact of the GED, in constructing and interpreting quasi-experimental evidence. We build on JMT's methods, examining several regression discontinuities (one for each subtest, plus one for overall score) and aggregating all discontinuities into a single measure of distance from passing. Each discontinuity can be used to estimate a different LATE of the impact of passing the GED on college outcomes. Our analysis highlights the value of examining LATE estimates from multiple discontinuities when multiple rating scores influence first-stage outcomes, and policies may have heterogeneous impacts for individuals who are constrained at different margins.

For non-ABE dropouts, we find fleeting increases in the probability that those who cross the passing threshold on their first GED attempt enroll in college in the first two quarters immediately following the exam, with no significant effects on ever-enrolling, number of quarters enrolled, or persistence in college. For the marginal ABE students who crosses the passing threshold, however, earning a GED substantially increases enrollment for the first 5-7 quarters after taking the GED. Earning a GED also has large positive effects of 26-40 percentage points on the probability that ABE students ever enroll in college and increases the length of college enrollment by 1.6-2.8 quarters, depending on the specification. We find no evidence that passing the GED threshold on one's first attempt impacts the probability an individual earns a degree or certificate for ABE or non-ABE test-takers.

The next section provides a description of Adult Basic Education services offered in Mas-

sachusetts, an overview of HSE credential options in Massachusetts, and a review of past-research on HSE credentials. The third section describes our data. The fourth section describes our empirical strategy. The fifth section presents results, and the sixth section concludes, discussing potential explanations of the patterns we observe and directions for future analyses.

2 Overview of ABE, HSE, and Past Research

2.1 Adult Basic Education in Massachusetts

In Massachusetts, ABE encompasses a suite of low-cost and no-cost public education services for adults provided by learning centers throughout the state. ABE classes are offered on a wide range of topics, but the most popular courses are HSE test preparation, adult diploma programs, basic literacy and numeracy, basic computer skills, and English language courses for speakers of other languages (ESOL). The majority of non-ESOL ABE courses are dedicated HSE test preparation. Column 2 of Table 1 provides an overview of the demographics of ABE students enrolled between 2008-2016 who completed the GED from 2002 to 2013.¹ Massachusetts ABE students are a diverse group; just over half are non-white and roughly 25% are non-native English speakers. Almost half reported receiving public assistance (e.g. TANF, AFDC, etc.) and only 31% were employed at the time they enrolled in ABE, consistent with survey data showing nearly 70% of ABE students indicate that getting a new or better job is of primary importance to them (Massachusetts Workforce Investment Board 2008).

Roughly 20,000 students attend at least 12 hours of ABE instruction in Massachusetts each year, but demand for services far outstrips supply. In August 2017, there were over 17,000 individuals on waitlists for ESOL courses, as well as over 2,400 students on waitlists for other ABE courses and services.

2.2 High School Equivalency Credentials in Massachusetts

Since its development in 1942, the GED exam has been the most prominent high school equivalency credential for U.S. students who do not earn a high school diploma. It is the only nationally recognized HSE test in the United States,² and until 2014, it was the only test that students

¹GED test-takers comprise 38.7% (17,813) of all students who enrolled in a non-ESOL ABE class during this period. In addition, 4,605 (10.0%) of all non-ESOL ABE participants took the HiSET exam for the first time between 2014-2015.

²See <https://www.gedtestingservice.com/testers/history> for more information about the history of the GED.

could take to earn a HSE credential in Massachusetts. From 2014-2016, Massachusetts switched from using the GED to award HSE credentials in favor of the HiSET exam. Since January 2017, Massachusetts residents may pass either the GED exam or the HiSET exam in order to earn a Massachusetts HSE Credential. In 2013, 14,717 individuals took the GED in Massachusetts (U.S. Department of Education, 2017).³

The GED consists of a battery of five timed tests covering reading, writing, mathematics, social studies, and science. Tests can be taken individually over the course of several days, months, or even years, and students are allotted just over seven hours to complete the full battery.⁴ To pass the GED during the period we consider (2002-2013), individuals were required to earn a minimum score of 410 (out of 800) in each of the five subtests and an overall average score of 450 across the five subtests (for a minimum total score of 2250 out of a possible 4000 points).⁵ In Massachusetts, individuals may retake GED subtests as many times as they like, but if an individual fails any subtest three times, they must wait 60 days between each subsequent attempt on that subtest. GED scores do not expire, except when the test series changes, which has happened four times since the first test series was released in 1942 (1978, 1988, 2001, and 2014).

Most two- and four-year colleges in Massachusetts require a high school diploma or high school equivalency credential in order to enroll. Although students may enroll in GED programs with goals related to higher education, prior research suggests that few students who obtain a GED go on to complete a postsecondary degree (Tyler, 2003; Heckman, Humphries, & Kautz, 2014; JMT, 2016).

2.3 Past Research on the High School Equivalency Credentials

An extensive literature examines the impact of passing the GED for individuals who do not hold a traditional American high school diploma. Heckman, Humphries, and Kautz (2014) review past analyses of the labor market value of the GED and present a survey of estimates from different nationally representative datasets that rely on a selection-on-observables assumption to assess the

³A small number of students earn their HSE credential through Massachusetts' adult diploma programs, which do not require students to take the GED, HiSET, or any standardized high-stakes test. In email correspondence, MA DESE reports that 1,081 students completed an Adult Diploma program in Massachusetts between 2008-2013, an average of 180 students per year.

⁴While Massachusetts now offers students the option to take either exam to earn an HSE, this analysis will focus on cohorts of students for whom the GED was the only HSE credential option. As such, we will not discuss details of the HiSET in this analysis. See <https://hiset.ets.org/> for further information about the HiSET.

⁵In 2014, the GED introduced its fifth series of the test and substantially changed the scoring scale. Each subtest in the fifth series is scored on a 100-200 point scale, and Massachusetts GED testers must achieve a score of 145 on each subtest to pass (with no separate total score requirement).

labor market value of the GED. They find no evidence that the GED has significant value in the labor market after conditioning on observable characteristics. Tyler, Murnane, and Willett's (2000) analysis is the first to attempt to generate causal estimates of the signaling value of the GED in an RD-like framework. Tyler, Murnane, and Willett leverage differences in passing scores by state to compare the outcomes of individuals in different states who earn the same GED score but differ in their GED credential status, estimating the impact of passing the GED exam on earnings for students on the margin of passing the test (i.e. the lowest-performing passers). They find large positive wage impacts for the marginal white GED holder, but not for minorities.⁶ This analysis is part of a productive period of research measuring the value of the GED in the labor market. Subsequent analyses have explored the impact of passing the GED on various subgroups, including women (Boudett, Murnane, & Willett, 2000), foreign-born students (Clark & Jaeger, 2006), prisoners (Nuttall, Hollmen, & Staley, 2003), and students with disabilities (Wagner et al., 2005). In addition to studies estimating the impact of passing the GED on earnings (Tyler, Murnane, & Willett, 2000; Clark & Jaeger, 2006; Heckman & LaFontaine, 2006; JMT, 2016), a variety of alternative outcomes have been examined, including recidivism (Nuttall, Hollmen, & Staley, 2003), health outcomes (Kenkel, Lillard, & Mathios, 2006), postsecondary education (Cameron & Heckman, 1993; Maralani, 2011; JMT, 2016).

While there is no clear consensus about the GED credential's value in the labor market, JMT (2016) cast doubt upon the validity of past RD estimates of the credential's value. They note that past RD analyses have used "a composite score based on multiple test attempts as their forcing variable" without accounting for the endogenous nature of individuals retesting to push their final score over the passing threshold. Comparing the outcomes of individuals whose final score barely clears the passing threshold after multiple retests to individuals who choose not to retest after failing on their first attempt will likely bias results toward finding positive impacts for the GED, since individuals who retest multiple times may (1) see great value in passing the GED and (2) exhibit high levels of non-cognitive skills like grit and persistence by continuing to retake the test until they pass. JMT argue that while an individual's first GED attempt can be used to construct a valid regression discontinuity estimator, a composite score that incorporates scores after retesting cannot. We agree with JMT and extend their analysis to multiple regression discontinuities represented by the multiple scoring requirements for passing the GED.

⁶They hypothesize that a disproportionate number of minority GED holders taking the exam while incarcerated or through government programs could explain this heterogeneity in impact.

Theory suggests a complicated interplay between high school equivalency credentials, traditional high school diplomas, and labor market outcomes. Offering an alternative high school credential like the GED may encourage some students who otherwise would have obtained regular high school diplomas to drop out and pursue this less valuable credential (Tyler, 2003; Heckman, et al., 2012). Agodini and Dynarski (2000) present a framework for students deciding whether to continue working toward a traditional high school diploma, drop out of regular high school and pursue a high school equivalency credential, or drop out of high school and remain without any high school credential. They use this model to show how growth in GED participation relates to simultaneous efforts to make the GED easier and more accessible while raising standards for attaining a regular high school diploma. Araujo, Gottlieb, and Moreira (2004) develop a model suggesting that passing the GED and attaining a HSE in lieu of a traditional high school diploma conveys a mixed signal to employers about an individual's skills, suggesting relatively high cognitive skills but low non-cognitive skills. They postulate the impact of passing the GED on labor market outcomes will depend upon the relative weights employers place on different types of skills in making hiring and wage-setting decisions.

3 Data

Data for our analysis comes from the Massachusetts Department of Elementary and Secondary Education (MA DESE). Our final dataset combines ABE and K-12 student records, GED test scores, and National Student Clearinghouse (NSC) record matches. Our ABE dataset includes student name, date of birth, social security number, ABE ID, gender, race/ethnicity, ABE class enrollment, and key demographic variables for each student who enrolled in ABE classes between 2008 and 2016.⁷ We use these records to identify students in our ABE sample, which consists of individuals who ever enrolled in an ABE class (or classes) during this time period, regardless of whether or not we can determine that they enrolled before taking the GED.⁸

Our K-12 administrative data includes student names, dates of birth, enrollment status, and demographic information including race/ethnicity and eligibility for free or reduced price lunch. We

⁷All ABE programs that are overseen by the Adult Community Learning Services (ACLS) division of MA DESE receive public funding and nearly all are subject to federal reporting and compliance standards. ACLS collects the same information for all ABE participants regardless of the source of funding for their program or class.

⁸We are able to confirm that students enrolled in ABE before taking the GED for the first time for approximately 75% of our sample, but are unsure about the remaining 25% of students because we lack enrollment records prior to 2008. We limit our sample to the 75% of students we observe enrolling in ABE before taking the GED as a sensitivity test for our results. See Appendix Tables 1B, 2B, 3B, and 4B

focus our analysis on a pool of dropouts who were last enrolled in a public school in Massachusetts between 2007 and 2016. We limit our sample to students who were last observed in K-12 administrative records in 2007 or earlier since we are unable to determine if dropouts who exited earlier enrolled in ABE programs. We assign students to our non-ABE dropout sample if they are found in these K-12 records but not also found in the ABE enrollment records for test-takers.⁹

Our GED data includes student name, date of birth, social security number (or other ID number), gender, race/ethnicity, and test results by date for each subtest a student attempted between 2/1/2002 and 12/31/2013. GED records were linked to the ABE and K-12 student files using first name, last name, social security number (ABE only), date of birth, and (in some cases) gender. Any records that matched on three or four identifiers (first name, last name, date of birth, and/or social security) were accepted as a match. For the remaining observations, we ran the “relink2” program in Stata to identify close matches that we may have missed through exact matching (e.g. misspellings, misreported birth dates, inconsistent use of nicknames or maiden/married names, reversed first and last name, observations with missing social security numbers, etc.).¹⁰ When we were unsure of whether a potential match accurately represented the same person in both datasets, we erred on the side of discarding potentially incorrect matches. While we can calculate our own measure of GED passing by checking whether an individual achieved the minimum score to pass each subset and the minimum total score summing over the five subtests, we use the GED’s internal measure of passing to identify individuals who have earned a GED in light of the possibility of test abnormalities, cheating, and other avenues by which an apparently passing score might be disqualified.¹¹

We link these data to National Student Clearinghouse (NSC) records using internal MA DESE student identifiers. NSC records pool retrospective information on postsecondary program enrollments and degree completion for individual students from participating institutions that cover 96.8

⁹Approximately 22% of recent dropouts who take the GED also match to ABE records.

¹⁰The relink2 program searches for close matches along a set of user-specified variables and returns a match score between 0 and 1 for each successful match that is increasing in the closeness of the match. For our ABE and non-ABE samples, we manually reviewed and accepted almost all matches above a minimum matching score value (0.85 for ABE, 0.86 for non-ABE) and then manually reviewed matches above a minimum match score beneath which match quality deteriorated (0.6 for ABE, 0.66 for non-ABE). We used our best judgment to identify true matches. Common examples of successful matches included observations with close misspellings of first and/or last names; observations with first and last name reversed but matching date of birth and/or social security number; observations with non-matching last-names but matching first name and social security number (sometimes with previous last names moved to middle name or middle initial). We can provide further details of our matching process upon request.

¹¹Our internal calculations match the GED administrative records for 99.69% of observations in the full GED sample of GED completers. Our results are robust to using our internal calculations to construct an indicator of whether an individual passed the GED.

percent of all college enrollments nationwide.¹² MA DESE submitted NSC queries for all ABE students with valid names and dates of birth between 2008 and 2016 and for all individuals who were enrolled in MA public schools in grade 8 or above but did not graduate from a public school in the state.¹³ We observe NSC queries for 100% of individuals in our non-ABE samples and 97.3% of ABE test-takers. NSC records include postsecondary enrollment histories only up to the point the query was submitted, so we exclude the 12.8% of ABE students whose most recent NSC record query was submitted before they took the GED for the first time. For test-takers included in our final ABE and non-ABE samples, our NSC records cover postsecondary enrollment for an average of 22.2 quarters after the date of their first complete GED.

Table 1 presents baseline demographic characteristics for our analysis samples. Column 1 presents sample means for the limited demographic information that is available for all GED completers, regardless of whether they appear in the ABE or K-12 database. Column 2 presents sample means of the more detailed set of demographic variables available for ABE students who completed the GED. Column 3 presents equivalent information for non-ABE dropouts who took the GED. ABE test-takers tend to be older (over 8 years on average) than non-ABE dropouts when they take the GED for the first time. ABE test-takers are also less likely to be white and less likely to be male than non-ABE recent dropouts. In terms of GED performance, ABE test-takers are less likely to pass the GED on their first or any subsequent attempts than non-ABE test-takers, suggesting they are negatively selected in terms of academic skill. Because they are more likely to fail the GED, ABE test-takers are also more likely to have taken the test more than once.¹⁴ Columns 4-7 present sample means for the complete set of demographics for the various subsamples that we use to construct our RD estimates, which we discuss in greater detail in the following sections. Our subsamples for ABE and non-ABE students closely resemble the full samples of ABE and non-ABE test-takers.

¹²See <https://studentclearinghouse.org/> for more information.

¹³We use data on non-graduates identified by MA DESE at three points in time, corresponding to three separate NSC inquiries submitted by the state. One file identifies nongraduates who were observed in MA public schools from SY 2003-2011 but were not enrolled as of October 2011; the second identifies nongraduates who were observed in MA public schools from SY 2007-2014 but were not enrolled as of October 2014; the third identifies nongraduates who were observed in MA public schools from SY 2009-2016 but were not enrolled as of October 2016. We collapse information from these files to the student-level when we encounter duplicate observation.

¹⁴When we compare individuals who failed the GED the first time, we find the retake rates for ABE and non-ABE test-takers are similar (81.6% and 83.4%, respectively).

4 Empirical Strategy

To estimate the causal impact of GED attainment, we construct several “fuzzy” regression discontinuity estimators that identify LATE parameters for the impacts of earning the GED for individuals at particular passing thresholds. We cannot assess the impact of the GED on college outcomes by simply comparing the outcomes of GED completers who earn a GED to those of GED completers who do not because these estimates would be confounded by the fact that passing the GED is associated with higher levels of underlying academic skill and, particularly for individuals who retake the test multiple times, non-cognitive skills like grit and persistence.

The RD design allows us to identify the impact of plausibly exogenous variation in GED receipt by comparing the difference in the predicted outcomes for individuals just above and below GED passing thresholds for each criteria. The identifying assumption for the unbiasedness of our RD estimates is that any underlying difference in the probability of earning a GED in the neighborhood of the passing threshold is captured by the smooth polynomial trends on GED scores on either side of the threshold and that the remaining variation is uncorrelated with unmeasured ability, reflecting plausibly exogenous variation in an individual's scale score. While students are certainly motivated to earn a passing score on each subtest of the GED, the mapping from raw scores to scaled scores is unknown to students, and students are unable to systematically manipulate their scores to pass any given threshold on their first attempt. Our RD estimates also assume that any differences in college outcomes for those immediately above and below the GED passing threshold are explained only by the difference in probability of earning a GED that is caused by the individual's value of the running variable being just above or below the threshold, net of error and the explicitly modeled trends associated with the running variable.

Following JMT (2016), we use an individual's first attempt on each subtest for our regression discontinuity estimates. Using the test-taker's first score (as opposed to final score) addresses concerns about endogenous re-taking behavior that could bias regression discontinuity estimates (see JMT). Figures 1a-1d demonstrate that the distribution of test scores for all test-takers in our estimation samples is smooth at the discontinuity for each of the tested thresholds. There is no evidence that students were able to manipulate their scores at any passing threshold. We note also that the minimum passing score creates discontinuities at different places in the skill distribution in for each subject; for example, while the minimum passing score for both the math and science subtests is 410, this represents the 26th percentile of math scores for first-time test-takers and 9th

percentile of science scores.

There are three important differences between our fuzzy RD estimates and JMT's. First, while JMT only examine the impact of crossing the total score threshold, we consider estimates using each of the subject subtests and present results using the math score, writing score, and total score thresholds.¹⁵ We note that 22.7% of test-takers who fail the GED on their first attempt would have earned a GED had they passed the math subtest, while 6.9% of test-takers would have earned the GED had they passed the writing subtest, and 6.8% passed all five subtests but failed to pass the total score threshold of the GED.¹⁶ In addition, we present Multi RD estimates that use a single "distance-to-passing" measure that captures an individual's proximity to the nearest passing threshold across the multiple subtests as well as the total score threshold, as discussed below. In principle, examining LATEs at different subtest thresholds allows us to test whether the GED has heterogeneous impacts for individuals constrained by different thresholds; however, we lack precision to distinguish between the LATE parameters estimated from different thresholds.

Second, we restrict our analysis to individuals who face a binding constraint to passing the GED along a single dimension (i.e. *ceteris paribus*, changing the score of that single subtest or total score from below to above the threshold would be sufficient to push them from failing to passing the GED or from passing to failing). For our Multi RD estimates that combine distance from the passing threshold for all subtests and the total score, this is parallel to the binding-score RD approach outlined in Reardon and Robinson (2012) in their discussion of multiple rating score regression discontinuity (MRSRD) settings. For the individual subtest RD estimates, using the binding-score criterion to construct our sample creates a sharper discontinuity where all individuals above the threshold have, by definition, reached the minimum scores required for passing along all dimensions. MRSRD estimates that examine differences in outcomes among individuals constrained along a single dimension are more straightforward to interpret, as crossing the threshold along a single dimension) is necessary and sufficient to move from failing to passing or vice-versa. Using the binding-score sample also somewhat increases the precision of our two-stage least squares estimates (2SLS) by increasing the magnitude and precision of our first-stage estimates of the impact of crossing the threshold on ever earning a GED.¹⁷

¹⁵We omit results from the science, social science, and reading subtests because these subtests are not constraining (i.e. do not determine whether an individual does or does not receive a GED) for enough test-takers to generate a strong first-stage

¹⁶Comparable statistics are 1.49% for the social science section, 0.91% for the science section, and 1.3% for the reading section. The remaining 60 percent of test-takers who failed their first attempt failed to meet multiple score thresholds

¹⁷Using the full sample of test takers instead of the subset of individuals who are constrained by a single dimension

Finally, our analysis examines the impact of earning a GED for individuals who complete all five subtests, not all GED test-takers. JMT (2016) explicitly cite the fact the relationship between test score and GED receipt is irregular below 1500 and that “many of these individuals do not take all of the subtests” as a reason to constrain the bandwidth of their IV estimates to individuals who score above 1500. Since individuals who do not complete all five sections of the GED cannot earn a GED and are unlikely face a binding constraint in a single subtest, we exclude these individuals from our analysis. This accounts for about 8% of all first time test-takers. Following JMT, we further limit our RD samples to individuals whose first subtests scores sum to between 1500-3000 for the Total Score RD sample, and to individuals whose first subtest score is between 30-60 on the relevant subtest for each subtest RD sample.

With these caveats, we follow JMT’s (2016) specification to estimate the first-stage impact of reaching the minimum passing threshold on one’s first GED attempt for each subtest and total score on an individual’s probability of ever earning a GED ($PassEver_{ij}$):

$$\begin{aligned}
 PassEver_{ij} = & \alpha_{0j} + \alpha_{1j}Above_{ij} + \sum_{d=1}^D \alpha_{bjd}[Below_{ij}(Subscore_{ij} - Cutscore_j)]^d \\
 & + \sum_{d=1}^D \alpha_{ajd}[Above_{ij}(Subscore_{ij} - Cutscore_j)]^d + \alpha_{2j}X + \mu_{ij}
 \end{aligned} \tag{1}$$

Where $Above_{ij}$ and $Below_{ij}$ respectively indicate whether individual i was above or below the passing threshold along dimension $j \in \{\text{math, reading, writing, science, social science, total score}\}$. Interacting each with an individual’s distance from the passing threshold ($Subscore_{ij} - Cutscore_{ij}$) along the j dimension allows the slopes of the relationship between passing the GED and their score on dimension j to vary on either side of the threshold (i.e. α_{bd} versus α_{ad}). We set $D = 2$ for all subsamples to control for a second order polynomial in distance above and below the threshold in our preferred specification.¹⁸ Figures 2a-2d present a graphical representation of the first-stage relationships between the running variable and probability of ever earning a GED in the Multi RD, Math RD, Writing RD, and Total Score RD samples. X is a vector of covariates including age at first GED attempt, an indicator for nonwhite racial/ethnic status, an indicator for gender, and

does not meaningfully change our results.

¹⁸In results not presented here, we run our estimations using polynomials to the third order and find that the results remain substantively unchanged.

fixed effects for the year and quarter in which the GED was first attempted.¹⁹ The coefficient α_{1j} identifies the discontinuity in $PassEver_{ij}$ at the threshold.

Similarly, we can model the relationship between our college outcomes of interest and GED score at the threshold using the same model, but replacing the dependent variable with college outcomes, Y_{ij} :

$$Y_{ij} = \beta_{0j} + \beta_{1j}Above_{ij} + \sum_{d=1}^D \beta_{bjd}[Below_{ij}(Subscore_{ij} - Cutscore_j)]^d + \sum_{d=1}^D \beta_{ajd}[Above_{ij}(Subscore_{ij} - Cutscore_j)]^d + \beta_{2j}X + v_{ij} \quad (2)$$

The coefficient β_{1j} can be thought of as an “intent to treat” estimate of crossing the passing threshold on one’s first GED attempt on college outcomes. Figures 3a-3d presents a graphical representation of this relationship in each RD sample. The Wald estimator, τ_j , that estimates the impact of actually receiving a GED on college outcomes is the ratio of β_{1j} to α_{1j} :

$$\tau_j = \beta_{1j}/\alpha_{1j} \quad (3)$$

We can reformulate the fuzzy RD specification in an instrumental variables (IV) framework (Hahn, Todd, & Van der Klaauw, 2001; Imbens & Lemieux, 2008; JMT, 2016). To generate 2SLS estimates of the impact of earning a GED on college outcomes, we estimate the predicted value of $PassEver_{ij}$ from equation 1 and use this predicted value to estimate equation 4 below for each dimension j . Once $\widehat{PassEver}_{ij}$ is estimated from the predicted values in equation 1, we estimate the causal impact of earning a GED on college outcomes from:

¹⁹As a sensitivity test, we ran our results without control variables and found that our results were not sensitive to their inclusion.

$$\begin{aligned}
Y_{ij} = & \gamma_{0j} + \tau_j \widehat{PassEver}_{ij} + \sum_{d=1}^D \gamma_{bjd} [Below_{ij}(Subscore_{ij} - Cutscore_j)]^d \\
& + \sum_{d=1}^D \gamma_{ajd} [Above_{ij}(Subscore_{ij} - Cutscore_j)]^d + \gamma_{2j} X + \epsilon_{ij}
\end{aligned} \tag{4}$$

Importantly, all independent variables other than the predicted value $\widehat{PassEver}_{ij}$ enter the first and second stage of the 2SLS regression exactly as in equations 1 and 2, so the coefficients τ_j in equations 3 and 4 are numerically identical and identify the local impact of earning a GED by crossing the passing threshold along dimension j .

For the multi-subject RD, we calculate an individual's distance from the passing threshold along any dimension j that represents a single binding constraint determining whether or not they pass the GED and calculate a distance-from-passing measure $Dist_{ij}$ that is non-negative for individuals who meet or exceed the minimum passing score along that dimension and negative for individuals who do not. Individuals who do not face a binding constraint along dimension j are assigned a missing value for $Dist_{ij}$, and individuals who do not face any single binding constraint (e.g. they fail multiple subtests) are assigned a missing value for all $Dist_{ij}$. For individuals who fail the GED on their first attempt, it is only possible to have at most one binding constraint along any dimension j , but for individuals who pass the GED on their first attempt, their scores on all dimensions j represent binding constraints. Therefore, we take the minimum of each individual's non-missing values of $Dist_{ij}$, $j \in \{\text{math, reading, writing, science, social science, total score}\}$ to calculate a subject-neutral distance to passing measure $MinDist_i$ that is non-missing for all individuals who either passed the GED on their first attempt or failed the GED on their first attempt and faced a binding constraint along some single dimension j and fit within our sample parameters. We will call this sample of individuals the "Multi RD" sample. To calculate the impact of earning a GED on college outcomes for the Multi RD sample, we estimate each equation 1-4 using $MinDist_i$, the subject-neutral distance from passing, instead of $(Subscore_{ij} - Cutscore_{ij})$:

$$\begin{aligned}
PassEver_{iM} = & \alpha_{0M} + \alpha_{1M}Above_{iM} + \sum_{d=1}^D \alpha_{bMd}[Below_{iM}(MinDist_i)]^d \\
& + \sum_{d=1}^D \alpha_{aMd}[Above_{iM}(MinDist_i)]^d + \alpha_{2M}X + \mu_{iM}
\end{aligned} \tag{1M}$$

$$\begin{aligned}
Y_{iM} = & \beta_{0M} + \beta_{1M}Above_{iM} + \sum_{d=1}^D \beta_{bMd}[Below_{iM}(MinDist_i)]^d \\
& + \sum_{d=1}^D \beta_{aMd}[Above_{iM}(MinDist_i)]^d + \beta_{2M}X + v_{iM}
\end{aligned} \tag{2M}$$

$$\tau_M = \beta_{1M}/\alpha_{1M} \tag{3M}$$

$$\begin{aligned}
Y_{iM} = & \gamma_{0M} + \tau_j \widehat{PassEver} + \sum_{d=1}^D \gamma_{bMd}[Below_{iM}(MinDist_i)]^d \\
& + \sum_{d=1}^D \gamma_{aMd}[Above_{iM}(MinDist_i)]^d + \gamma_{2M}X + \epsilon_{iM}
\end{aligned} \tag{4M}$$

To provide evidence of the validity of our RD design, we run a placebo test to determine whether there are any unexpected discontinuities in observable characteristics at the passing threshold for each demographic characteristic in each RD sample:

$$\begin{aligned}
X_{ij} = & \alpha_{x0} + \alpha_{x1}Above_{ij} + \sum_{d=1}^D \alpha_{xbd}[Below_{ij}(Subscore_{ij} - Cutscore_j)]^d \\
& + \sum_{d=1}^D \alpha_{xad}[Above_{ij}(Subscore_{ij} - Cutscore_j)]^d + \omega_{ij}
\end{aligned} \tag{5}$$

We set $D=4$ for this equation.²⁰ Results of these balance tests are presented in Table 2 for the Multi RD and Math RD samples and in appendix Tables 2A for the Total and Writing samples. We

²⁰We find similar results using lower order polynomials, though we generate a few significant/marginally significant point estimates with lower order polynomials.

find no significant differences in baseline characteristics for individuals just to the to the right and left of the threshold in any of the Multi or Math RD samples, lending support to a key assumption of our RD specification. We do, however, find large, significant differences in the probability that test-takers to the right of the threshold retake the GED, with those to the right of the discontinuity (i.e. GED passers) at least 80 percentage points less likely to retake the test. Of particular importance for our analysis, we also find significant increases in the the probability that an individual ever passes the GED for individuals to the right of the threshold. Although many individuals who fail the GED the first time retake the exam until they pass, taking the GED imposes real financial, intellectual, and time costs that discourage some test-takers.²¹

5 Results

As mentioned, we focus on estimates from our Multi RD and Math RD samples, as estimates from these samples are more precise.²² The Math RD samples include all GED completers in either the ABE or non-ABE samples who face a binding constraint on their math subtest scores; this includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests and achieved a high enough score that earning the minimum passing score in math (410) would be sufficient to reach the minimum total passing score (2250). The Multi RD samples include all GED completers in either the ABE or non-ABE samples who either passed the GED on their first attempt or failed their first attempt while passing 4 of the 5 subtests or passing all 5 subtests, but failing to attain the minimum passing total score (2250). Estimates of the first stage impacts of crossing the threshold on eventual GED credential attainment are presented in the last row of Table 2. Crossing the passing threshold on the math subtest on one's first attempt increases the probability an individual will ever receive a GED by 19.8 percentage points in our non-ABE sample and 28.3 percentage points in our ABE sample. In our Multi-RD sample, crossing any passing threshold increases the probability an individual will receive a GED by 13.0 percentage points for non-ABE GED testers and 15.0 percentage points for ABE enrollees.

Table 3 presents IV estimates of the impact of earning a GED credential on probability of enrolling in college during each of the first 16 quarters immediately following their first GED

²¹In Massachusetts in 2019, it cost test-takers \$125 to take the full battery of GED tests for the first time. In the first year after ones initial test, each retest cost \$10/subject; thereafter, each retake cost \$31.25/subject. See <http://www.doe.mass.edu/hse/comparison.html> for details.

²²Appendix Tables 1A, 2A, 3A, and 4A replicate results for the Writing and Total Score RD samples. Appendix Tables 2B, 3B, and 4B replicate Tables 2, 3, and 4 restricting our sample of ABE test-takers to individuals for whom we can confirm that ABE enrollment preceded their first GED attempt

attempt for our Multi and Math RD samples. We find evidence that earning a GED has large positive impacts on the probability that test-takers in our non-ABE sample are enrolled in college during the first two quarters after their first GED attempt, but no evidence of a positive impact (and sporadic, significant negative impacts²³) after that. Across our Multi and Math RD estimates, non-ABE test-takers who pass the GED are 66-75 percentage points more likely to be enrolled in college in the first two semesters after taking the GED for the first time, but no more likely to be enrolled after that. For test-takers in our ABE sample, we find evidence of large positive impacts of earning the GED on the probability of being enrolled for the first 5-7 quarters after the first GED attempt. In our Multi RD sample, ABE test-takers are 19-47 percentage points more likely to be enrolled in college in the first seven quarters after they take the GED. In our Math RD sample, ABE test-takers are 26-40 percentage points more likely to be enrolled in college in each of the second to fifth quarters after they take the GED. (We note that the point estimate for ABE test-takers in the quarter immediately following the GED is positive but imprecise).

Table 4 presents IV estimates of the impact of earning a GED credential on a range of summary postsecondary outcomes for each of our estimation samples. (Appendix A presents the mean values of the outcome variable for individuals to the left of the relevant threshold for each subsample to aid in interpreting the magnitude of these results). Here, we find more striking evidence of the heterogeneous impact of earning a GED for ABE and non-ABE test-takers. We find no significant effect of earning a GED on ever enrolling in college, persisting in college for 4+ or 8+ quarters, or earning a degree or certificate for non-ABE test-takers in either the Multi or Math RD samples noting only a single negative significant point estimate on being enrolled for 8+ quarters in the Multi specification. For ABE test-takers, in contrast, we find strong evidence that earning a GED has large, positive effects on ever enrolling and persisting in college, though we find no significant positive effects on earning a degree or certificate. Overall, our Multi RD and Math RD LATE estimates show that ABE GED passers are 33.4-52.8 percentage points more likely to ever enroll in college. ABE GED passers enroll for an additional 1.6-2.8 quarters in college, results which are driven by increased enrollment in two-year colleges. ABE GED passers are also 25.4-33.7 percentage points more likely to persist²⁴ for 4 or more quarters during the first 16 quarters after their first

²³These negative impacts could reflect some stopping out for non-ABE dropouts to the right of the threshold who enrolled in college immediately after passing the GED but did not persist while additional dropouts who were to the left of the threshold based on their first GED attempt continue to enroll.

²⁴Note that the sample size declines slightly as we examine persistence outcomes; this is because we exclude individuals who we do not observe for at least 4 or 8 quarters from the corresponding persistence estimates. Similarly, we exclude individuals who we do not observe for at least four quarters from the AA degree or certificate completion estimates, and we exclude individuals who we do not observe for all 16 quarters from the BA degree completion

GED attempt. Moreover, we find evidence of positive effects on the number of quarters enrolled and enrollment for 4+ quarters for men, women, white, and non-white ABE GED passers, with positive and generally significant point estimates across the Multi and Math RD specifications. We also note positive, significant point estimates on enrolling in college for 8+ quarters for female and nonwhite ABE GED passers in the Multi RD specification. We detect no difference in postsecondary degree or certificate attainment for marginal GED passers in any group or subgroup.

6 Discussion

We present strong evidence that earning a GED credential has a powerful impact on the educational investments made by students who self-select into public ABE classes, but find no evidence of similar effects for recent dropouts who do not enroll in ABE. Previous studies that do not observe participation in ABE programs have found that while earning a GED may somewhat increase rates of college enrollment, marginal passers earn few credits and do not remain in college for long (Heckman, Humphries, & Kautz 2014; JMT 2016). Our results suggest that this conventional wisdom about GED holders may not apply to individuals who participate in ABE courses, including GED preparation classes; within this subgroup of GED completers, marginal passers appear to be much more likely to enroll and persist in college, though they are no more likely to earn degrees or certificates. The magnitudes of our LATE estimates are striking; they represent a doubling or tripling of college-going rates relative to the population of ABE test-takers who score just below the passing threshold on their first GED attempt, and are much larger than effects reported elsewhere in the GED literature. (JMT, for instance, report increased enrollment of 4-8 percent for all test-takers in Missouri.)

ABE students represent an important subgroup from a policy perspective, as they receive a significant portion of public investment in the GED. While the average GED test-taker may study independently or enroll in a private class to prepare for the test, ABE students in GED prep classes are enrolled in taxpayer-funded test preparation. When policy makers consider whether to dedicate resources to promote GED certification, this is the primary population those resources benefit.

Bedard (2001) presents a signalling model whereby increased access to college erodes the quality of the signal of a high school diploma and pushes some students to drop out of high school. It is feasible that Bedard's stylized signalling story plays some role in student sorting into educational

estimates.

attainment groups, but her analysis does not account for the ability of dropouts to re-engage with higher education through the GED as their perceived costs and benefits change over time (particularly if schooling builds human capital). ABE students are older than the typical dropout when they take the GED, and may represent a subgroup of dropouts whose disutility or psychic costs of classroom education have diminished enough that they recognize positive returns to pursuing additional schooling. Individuals who were driven away from the traditional education system in their youth and join ABE demonstrate a renewed commitment to classroom learning in pursuit of their GED credential that appears to carry them into higher education.

Given the absence of significant effects on earning a postsecondary degree or certificate for ABE GED passers, it is reasonable to question whether ABE GED passers benefit from increases in college enrollment or whether they simply face additional costs without experiencing economic gain. Jaeger and Page (1996) demonstrated strong degree effects (or sheepskin effects) in the wage returns to education, with degree holders earning substantially more than individuals with the same years of education who lack a degree. Thus, although research finds that earnings rise marginally with additional college credits, individuals who enroll but fail to earn a college degree miss out on a substantial portion of the return to postsecondary credentials, a particular concern given the rising costs of higher education (Oreopoulos & Petronijevic 2013). It is unclear if this applies to ABE GED passers who enroll in higher education but do not attain a credential, or if this population is accessing higher education for other purposes, such as building job-specific skills or earning credits in fields where coursework is rewarded but formal credentials are generally not expected (Bard, 2019). We plan to extend this study to examine the effect of obtaining a GED on a range of employment outcomes, including earnings, in the hopes of answering some of these questions.

In conclusion, even if Heckman and Rubinstein (2001) are correct that, on average, “GED’s are ‘wise guys’ who lack the abilities to think ahead, persist in tasks, or to adapt to environments,”²⁵ our results provide evidence that the students who prove the exception to the rule are those who self-sort into publicly subsidized ABE courses. As such, we should not necessarily be alarmed that the mixed signal the GED sends to the labor market is not generating large returns for marginal GED passer in the overall population of test-takers. If ABE students increased access to postsecondary education translates to similar labor market benefits, as we will investigate in the future, public investments in the GED may have large returns even if the GED remains, on average, a mixed signal.

²⁵We view this characterization of GED holders as unsubstantiated and unnecessarily pejorative.

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Table 1. Summary statistics for subgroups of GED test-takers in Massachusetts, 2002-2013

	All Test-Takers (1)	All Non-ABE (2)	All ABE (3)	Non-ABE Multi (4)	Non-ABE Math (5)	ABE Multi (6)	ABE Math (7)
<i>A. Student Characteristics</i>							
Age at 1st GED attempt	24.08 (8.75)	18.85 (1.60)	27.69 (9.97)	18.81 (1.58)	18.84 (1.59)	26.73 (9.48)	26.88 9.53
Observations	102,761	22,203	17,759	18,874	15,281	10,265	8621
Male	0.54 —	0.57 —	0.50 —	0.57 —	0.55 —	0.55 —	0.53 —
Observations	103,059	21,979	17,759	18,686	15,121	10,265	8621
Non-white	0.52 —	0.38 —	0.53 —	0.34 —	0.34 —	0.42 —	0.42 —
Observations	103,059	22,203	17,759	18,874	15,281	10,265	8621
Native English Speaker		0.81 —	0.73 —	0.84 —	0.84 —	0.81 —	0.82 —
Observations		22,203	17,438	18,874	15,281	10,152	8522
Low Income**		0.66 (0.47)		0.63 (0.48)	0.65 (0.48)		
Observations		22,203		18,874	15,281		
Special Education**		0.27 (0.45)		0.25 (0.43)	0.25 (0.43)		
Observations		22,203		18,874	15,281		
Receiving Public Assistance*			0.47 (0.50)			0.46 (0.50)	0.46 (0.50)
Observations			17,239			10,020	8411
Employed*			0.31 (0.46)			0.28 (0.45)	0.28 (0.45)
Observations			17,239			10,020	8411
Valid NSC Query		1.00 (0.00)	0.87 (0.33)	1.00 (0.00)	1.00 (0.00)	0.96 (0.19)	0.96 (0.19)
Observations (GED)		22,203	17,759	18,874	15,281	10,265	8621
<i>B. GED</i>							
Passed First Time	0.62 (0.48)	0.73 (0.44)	0.43 (0.50)	0.86 (0.35)	0.92 (0.27)	0.71 (0.45)	0.80 (0.40)
Retook Test	0.34 (0.47)	0.25 (0.44)	0.49 (0.50)	0.16 (0.37)	0.11 (0.31)	0.29 (0.46)	0.22 (0.42)
Ever Passed GED	0.82 (0.39)	0.90 (0.31)	0.68 (0.47)	0.97 (0.16)	0.98 (0.14)	0.91 (0.29)	0.92 (0.27)
Observations (GED)	103,059	22,203	17,759	18,874	15,281	10,265	8621

* Data comes from ABE administrative files. Refers to status at the time of enrolling adult basic education program. ** Data comes from K-12 administrative files. Low-income indicates ever qualifying for free or reduced price lunch; special education indicates ever qualifying for special education services. Column 1 includes all individuals who completed the GED in Massachusetts from 2002-2013. The Multi RD samples includes test completers who either passed the GED on their first attempt or failed their first attempt while passing 4 of the 5 subtests or passing all 5 subtests, but failing to attain the minimum passing total score (2250). The Math RD samples include test-completers whose first attempt math subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests such that earning the minimum passing score (410) in math would be sufficient to reach the minimum passing total score (2250). All samples are limited to individuals who score between 300-600 on their binding subtest or between 2050-3000 if their total score was binding. Standard deviations for sample means are in parentheses.

Table 2

Discontinuities in baseline characteristics and outcomes, Multi and Math RD samples

	Multi RD		Math RD	
	Non-ABE Sample (1)	ABE Sample (2)	Non-ABE Sample (3)	ABE Sample (4)
Age at 1st GED attempt	0.235 (0.163)	-1.268 (0.987)	0.255 (0.345)	-2.254 (1.847)
Observations	18,453	9579	15,281	8109
Male	-0.036 (0.051)	-0.004 (0.051)	0.048 (0.108)	-0.034 (0.095)
Observations	18,269	9579	15,121	8109
Non-white	-0.045 (0.048)	0.054 (0.050)	-0.098 (0.102)	0.034 (0.094)
Observations	18,453	9579	15,281	8109
Native English Speaker	-0.031 (0.038)	0.014 (0.041)	0.008 (0.080)	-0.038 (0.075)
Observations	18,453	9578	15,281	8108
Special Education**	0.017 (0.044)		0.153 (0.094)	
Observations	18,453		15,281	
Low Income**	0.028 (0.049)		0.053 (0.103)	
Observations	18,453		15,281	
Receiving Public Assistance*		-0.004 (0.051)		0.069 (0.097)
Observations		9577		8107
Employed*		-0.049 (0.047)		0.016 (0.087)
Observations		9577		8107
Retook Test	-0.891*** (0.022)	-0.846*** (0.027)	-0.905*** (0.047)	-0.830*** (0.050)
Observations	18,453	9579	15,281	8109
Ever Passed GED	0.130*** (0.015)	0.150*** (0.025)	0.198*** (0.026)	0.283*** (0.040)
Observations	18,453	9579	15,281	8109

* Data comes from ABE administrative files. Refers to status at the time of enrolling adult basic education program. ** Data comes from K-12 administrative files. Low-income indicates ever qualifying for free or reduced price lunch; special education indicates ever qualifying for special education services. See notes for Table 1 for a description of the sub-samples included here. Columns (2)-(5) reports discontinuities in estimates for the test-takers characteristics for the indicated sub-sample, whose group means are tabulated in columns Table 1, and are calculated as described in the body of the paper. Regressions include GED quarter and year fixed effects. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level.*** Significant at the 1 percent level.

Table 3

Estimated Impact of Earning a GED on Postsecondary Enrollment by Quarter

Quarters since GED	Multi RD				Math RD			
	Non-ABE		ABE		Non-ABE		ABE	
	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations
1	0.694 (0.218)***	18,684	0.257 (0.117)**	9748	0.732 (0.291)**	15,119	0.087 (0.104)	8215
2	0.753 (0.246)***	18,684	0.316 (0.122)***	9798	0.656 (0.326)**	15,119	0.291 (0.109)***	8259
3	0.145 (0.243)	18,684	0.393 (0.127)***	9848	0.083 (0.327)	15,119	0.392 (0.112)***	8299
4	-0.187 (0.241)	18,683	0.465 (0.121)***	9882	-0.205 (0.322)	15,119	0.398 (0.105)***	8328
5	-0.417 (0.240)*	18,601	0.329 (0.115)***	9903	-0.453 (0.326)	15,050	0.256 (0.101)**	8347
6	-0.581 (0.239)**	18,548	0.189 (0.107)*	9924	-0.591 (0.317)*	15,006	0.118 (0.094)	8363
7	-0.312 (0.229)	18,480	0.192 (0.105)*	9937	-0.427 (0.302)	14,946	0.119 (0.090)	8376
8	-0.282 (0.230)	18,423	0.120 (0.098)	9956	-0.424 (0.311)	14,901	0.030 (0.085)	8392
9	-0.403 (0.228)*	18,362	0.050 (0.106)	9565	-0.351 (0.314)	14,853	-0.039 (0.088)	8056
10	-0.425 (0.221)*	18,296	0.088 (0.099)	9427	-0.438 (0.305)	14,796	0.029 (0.081)	7936
11	-0.242 (0.218)	18,227	0.025 (0.104)	9034	-0.026 (0.318)	14,740	-0.017 (0.084)	7614
12	-0.228 (0.219)	18,168	0.099 (0.104)	8828	-0.091 (0.316)	14,689	0.045 (0.085)	7437
13	-0.114 (0.232)	17,477	0.098 (0.110)	8481	-0.138 (0.338)	14,146	-0.069 (0.089)	7153
14	-0.188 (0.222)	16,821	0.060 (0.098)	8311	-0.413 (0.328)	13,633	-0.057 (0.078)	7011
15	-0.241 (0.246)	16,048	0.128 (0.098)	7929	-0.454 (0.299)	13,018	-0.034 (0.075)	6700
16	-0.086 (0.252)	15,357	0.103 (0.092)	7615	-0.165 (0.312)	12,478	0.023 (0.068)	6432

This table reports regression discontinuity estimates of the impact of earning a GED on postsecondary enrollment by quarter for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, gender and fixed effects for quarter and year of GED. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4: Multi RD

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	0.076 (0.296)	0.068 (0.293)	0.149 (0.824)	0.078 (0.402)	0.410 (0.416)	0.528*** (0.158)	0.676*** (0.197)	0.403 (0.264)	0.497** (0.202)	0.572** (0.252)
Observations	18,686	10,717	7969	12,385	6301	10,265	5638	4627	5923	4342
Ever Enrolled (2 year)	-0.011 (0.306)	0.215 (0.305)	-0.561 (0.828)	-0.069 (0.413)	0.419 (0.432)	0.481*** (0.152)	0.552*** (0.182)	0.475* (0.264)	0.436** (0.194)	0.544** (0.243)
Observations	18,411	10,548	7863	12,195	6216	10,230	5617	4613	5899	4331
Ever Enrolled (4 year)	-0.206 (0.205)	-0.213 (0.200)	-0.230 (0.552)	-0.031 (0.272)	-0.352 (0.301)	0.047 (0.070)	0.084 (0.086)	-0.027 (0.119)	-0.042 (0.087)	0.155 (0.116)
Observations	18,411	10,548	7863	12,195	6216	10,230	5617	4613	5899	4331
Quarters Enrolled	-1.800 (2.296)	0.157 (2.121)	-8.035 (7.222)	0.049 (3.140)	-2.224 (3.154)	2.810*** (0.908)	2.514** (0.990)	3.668** (1.690)	2.716** (1.175)	2.985** (1.417)
Observations	18,686	10,717	7969	12,385	6301	10,265	5638	4627	5923	4342
Enrolled 4+ Quarters	-0.261 (0.267)	0.084 (0.250)	-1.340 (0.863)	-0.178 (0.353)	-0.158 (0.387)	0.337*** (0.127)	0.359** (0.149)	0.360 (0.219)	0.322** (0.156)	0.329 (0.212)
Observations	18,683	10,714	7969	12,384	6299	10,019	5514	4505	5810	4209
Enrolled 8+ Quarters	-0.342 (0.209)	-0.114 (0.184)	-1.150 (0.749)	-0.052 (0.281)	-0.585* (0.302)	0.154** (0.078)	0.096 (0.083)	0.259* (0.145)	0.089 (0.094)	0.245* (0.137)
Observations	18,423	10,551	7872	12,234	6189	9966	5484	4482	5787	4179
Earned Any Degree or Certificate	-0.024 (0.144)	-0.009 (0.133)	-0.063 (0.404)	-0.093 (0.196)	0.101 (0.198)	0.016 (0.052)	-0.013 (0.050)	0.070 (0.100)	-0.085 (0.065)	0.112 (0.087)
Observations	18,400	10,541	7859	12,191	6209	9980	5492	4488	5784	4196

This table reports regression discontinuity estimates of the impact of earning a GED on the outcomes indicated in each row for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, and gender. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. The Multi RD sample includes test completers who either passed the GED on their first attempt or failed their first attempt while passing 4 of the 5 subtests or passing all 5 subtests, but failing to attain the minimum passing total score (2250). Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4: Math RD

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	0.088 (0.398)	-0.163 (0.337)	0.884 (1.288)	-0.082 (0.601)	0.236 (0.551)	0.334** (0.140)	0.369* (0.191)	0.322 (0.203)	0.296 (0.194)	0.344* (0.202)
Observations	15,121	8364	6757	9911	5210	8621	4582	4039	5013	3608
Ever Enrolled (2 year)	-0.295 (0.392)	-0.375 (0.334)	-0.010 (1.181)	-0.356 (0.588)	-0.258 (0.547)	0.338** (0.135)	0.347** (0.176)	0.363* (0.203)	0.325* (0.189)	0.348* (0.194)
Observations	14,906	8238	6668	9769	5137	8589	4562	4027	4991	3598
Ever Enrolled (4 year)	-0.049 (0.251)	-0.144 (0.208)	0.255 (0.789)	-0.015 (0.367)	-0.093 (0.366)	-0.039 (0.062)	-0.085 (0.085)	-0.009 (0.091)	-0.168** (0.085)	0.076 (0.095)
Observations	14,906	8238	6668	9769	5137	8589	4562	4027	4991	3598
Quarters Enrolled	-2.198 (2.988)	-2.053 (2.342)	-1.610 (10.297)	-3.214 (4.525)	-1.192 (4.112)	1.643** (0.794)	0.350 (0.956)	2.851** (1.278)	1.401 (1.127)	1.760 (1.112)
Observations	15,121	8364	6757	9911	5210	8621	4582	4039	5013	3608
Enrolled 4+ Quarters	-0.205 (0.360)	-0.236 (0.288)	0.009 (1.188)	-0.335 (0.520)	-0.057 (0.526)	0.254** (0.111)	0.103 (0.144)	0.383** (0.169)	0.240 (0.157)	0.247 (0.159)
Observations	15,119	8362	6757	9911	5208	8439	4495	3944	4931	3508
Enrolled 8+ Quarters	-0.277 (0.277)	-0.257 (0.212)	-0.234 (0.967)	-0.119 (0.402)	-0.452 (0.411)	0.060 (0.067)	-0.040 (0.078)	0.152 (0.108)	-0.035 (0.096)	0.158 (0.096)
Observations	14,901	8227	6674	9791	5110	8400	4478	3922	4915	3485
Earned Any Degree or Certificate	0.059 (0.175)	-0.029 (0.138)	0.328 (0.568)	-0.187 (0.258)	0.300 (0.254)	0.038 (0.045)	-0.058 (0.047)	0.126 (0.077)	-0.011 (0.065)	0.090 (0.063)
Observations	14,897	8233	6664	9767	5130	8403	4474	3929	4907	3496

This table reports regression discontinuity estimates of the impact of earning a GED on the outcomes indicated in each row for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, and gender. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. The Math RD sample includes test-completers whose first attempt math subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests and achieved a high enough score that earning the minimum passing score in math (410) would be sufficient to reach the minimum total passing score (2250). Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Note that scores have been rescaled throughout in increments of one instead of ten, so -20=-200, 40=400, etc.

Figure 1A: Density plot of GED test scores around multi RD threshold

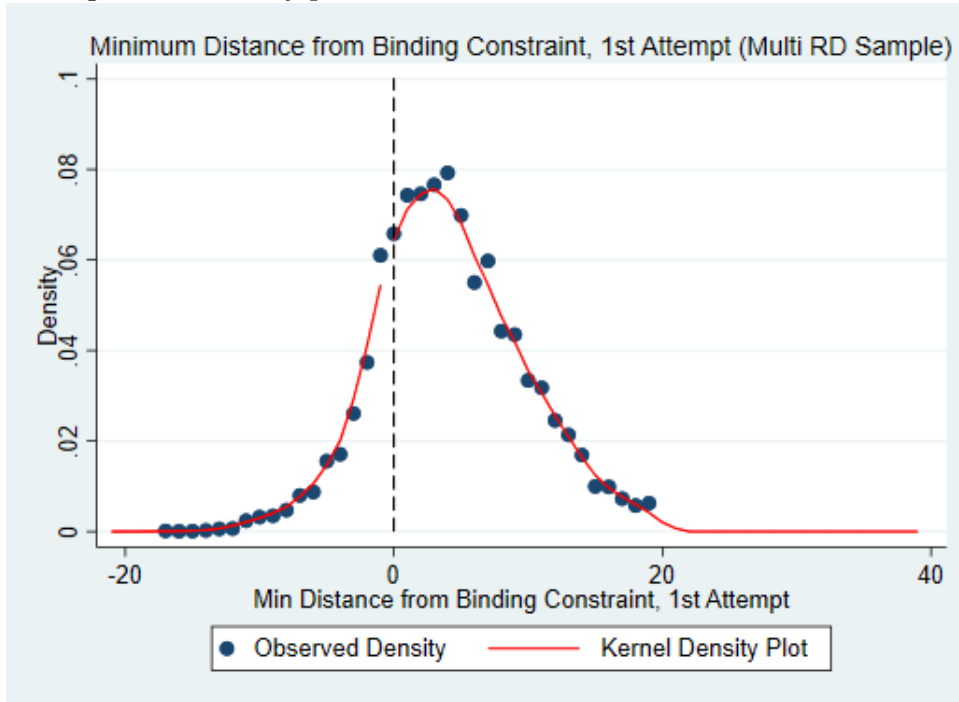
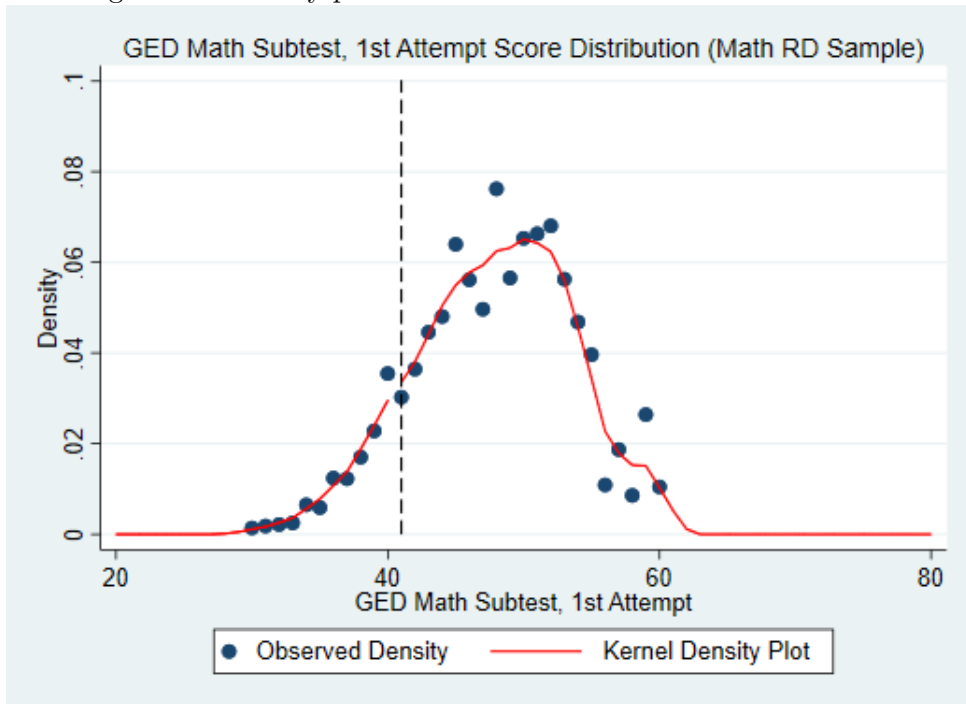


Figure 1B: Density plot of GED test scores around math RD threshold



Figure

1C: Density plot of GED test scores around total score RD threshold

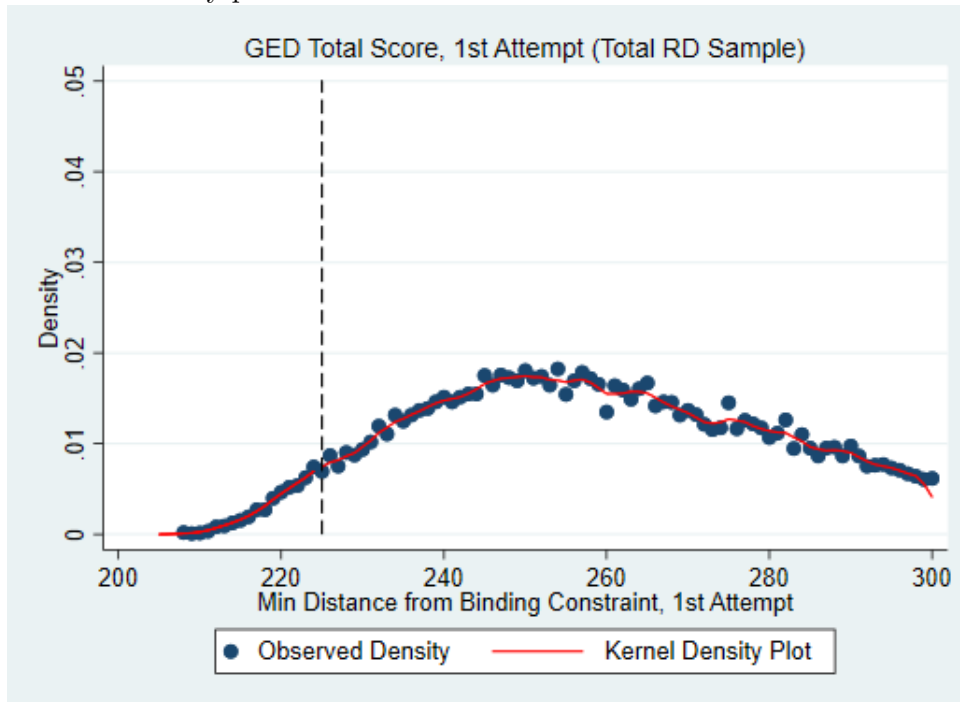


Figure 1D: Density plot of GED test scores around writing RD threshold

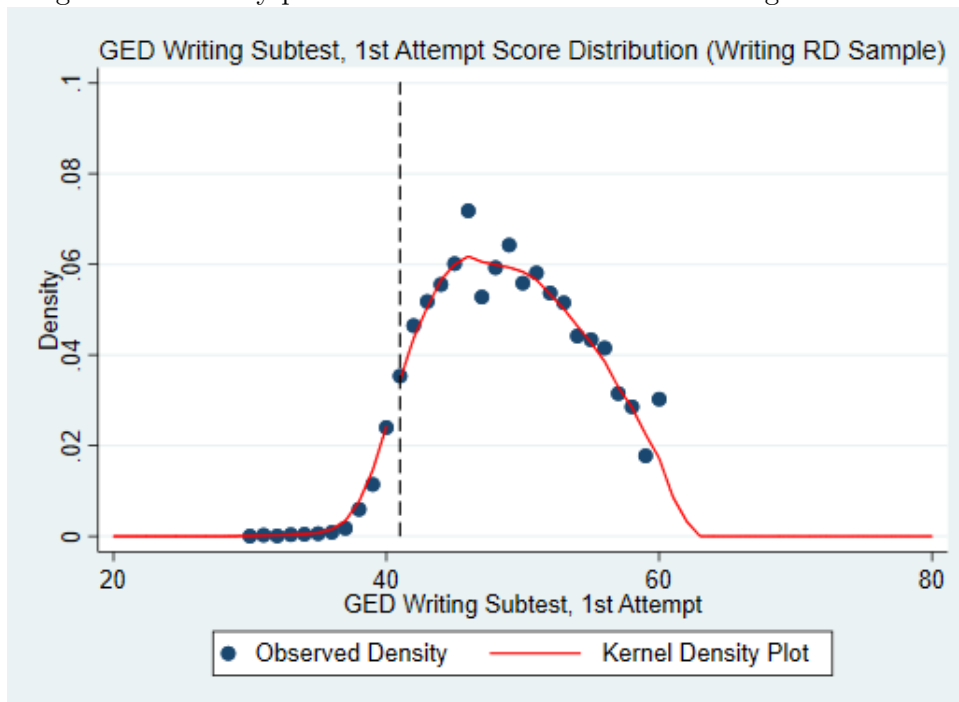


Figure 2A: First stage relationship between distance from passing threshold and ever passing the GED, Multi RD Sample

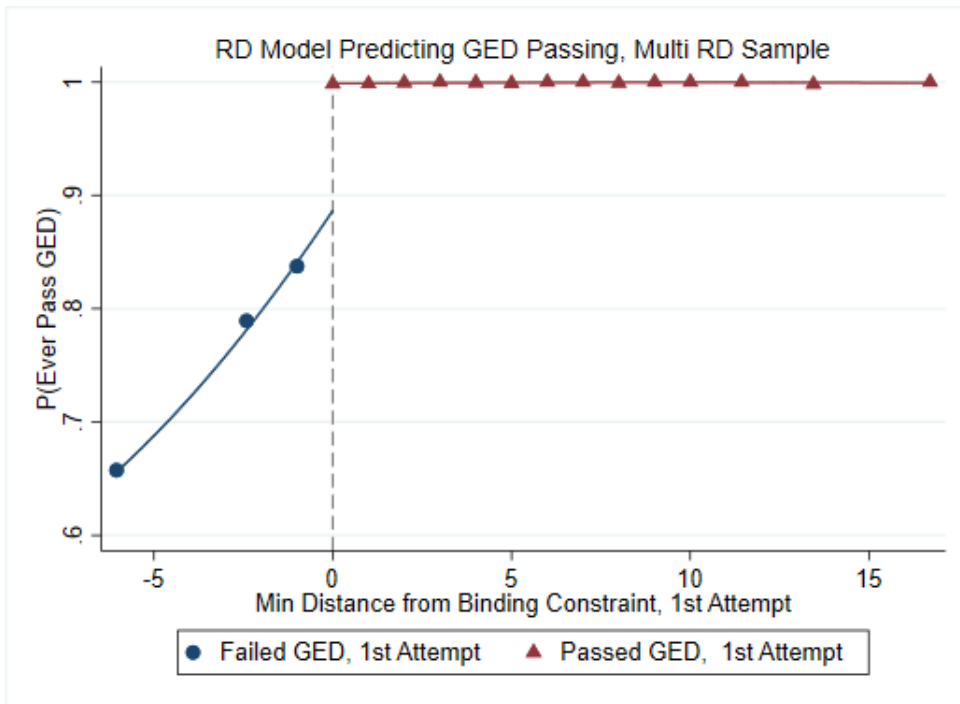


Figure 2B: First stage relationship between distance from passing threshold and ever passing the GED, Math RD Sample

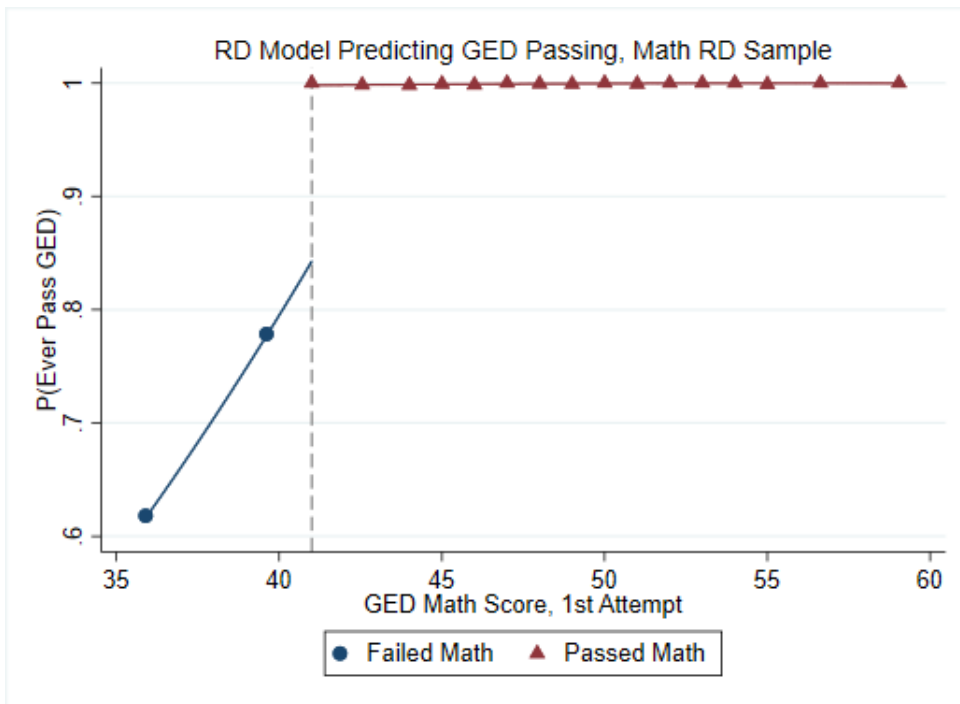


Figure 2C: First stage relationship between distance from passing threshold and ever passing the GED, Total Score RD Sample

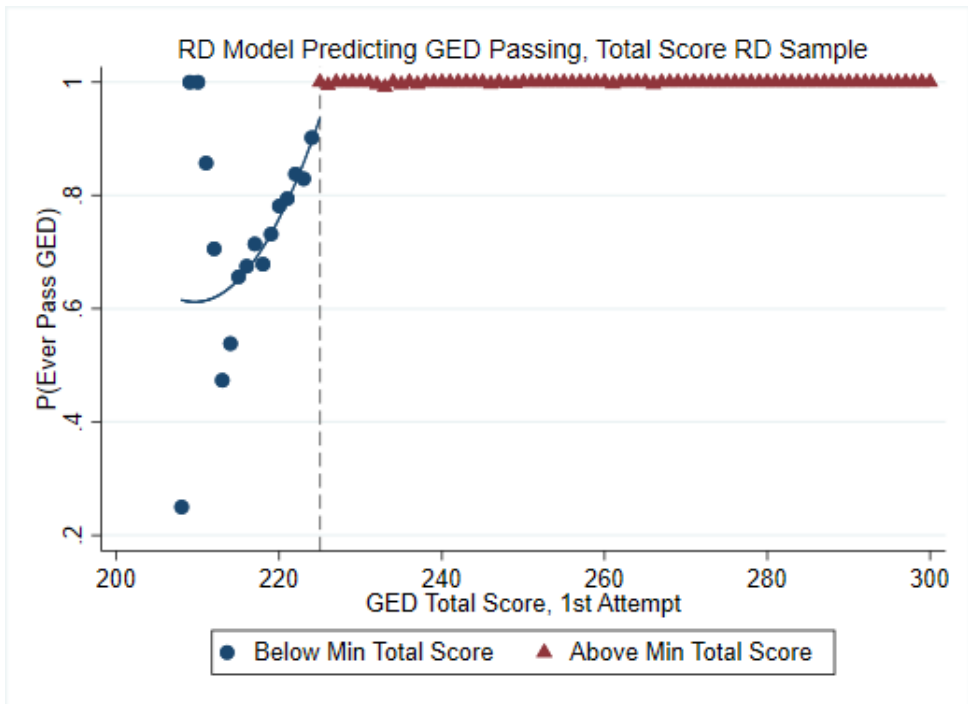


Figure 2D: First stage relationship between distance from passing threshold and ever passing the GED, Writing RD Sample

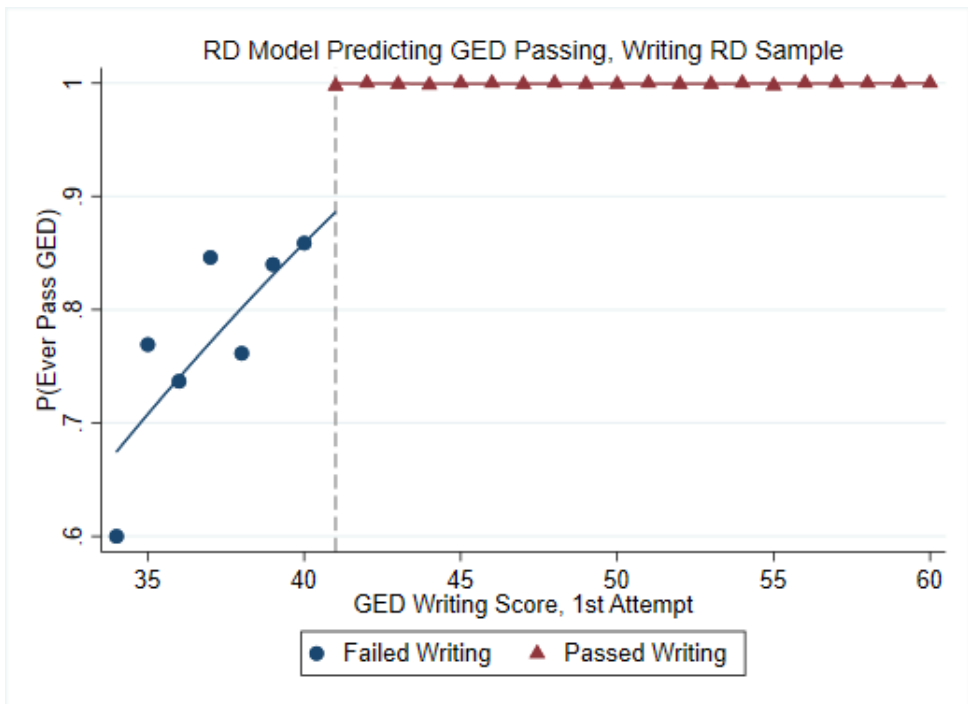


Figure 3A: Reduced form relationship between distance from passing threshold and college enrollment, Multi RD Sample

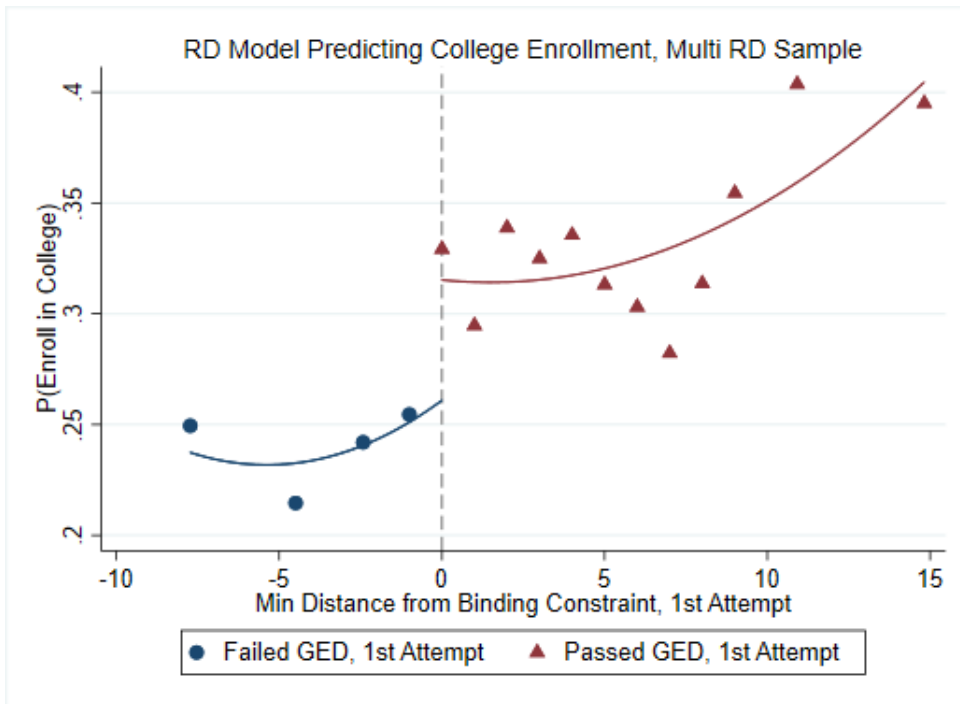


Figure 3B: Reduced form relationship between distance from passing threshold and college enrollment, Math RD Sample

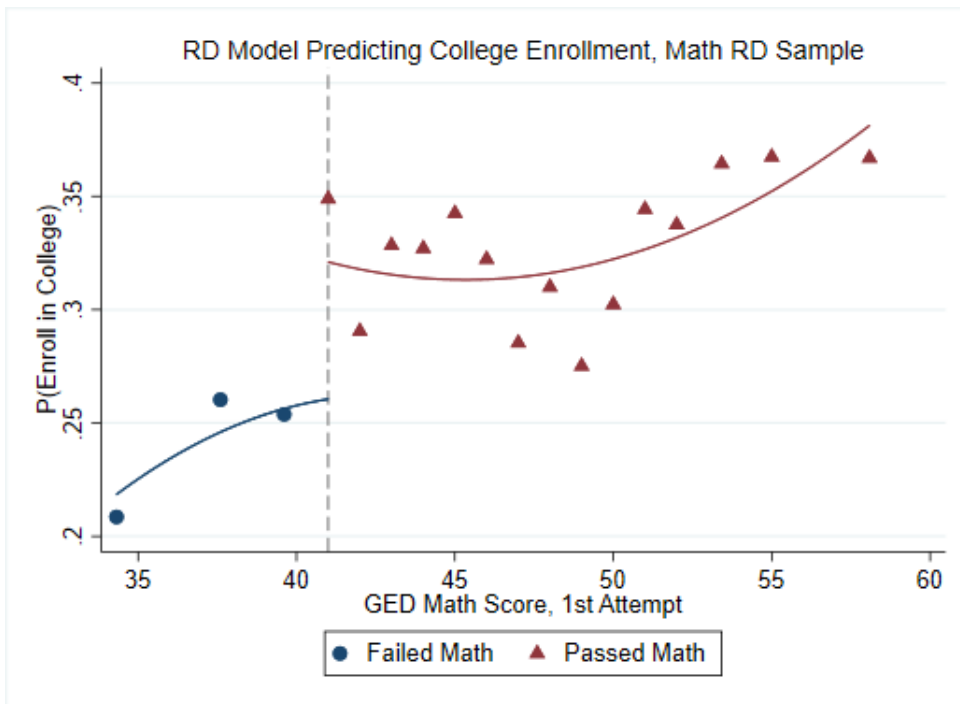


Figure 3C: Reduced form relationship between distance from passing threshold and college enrollment, Total Score RD Sample

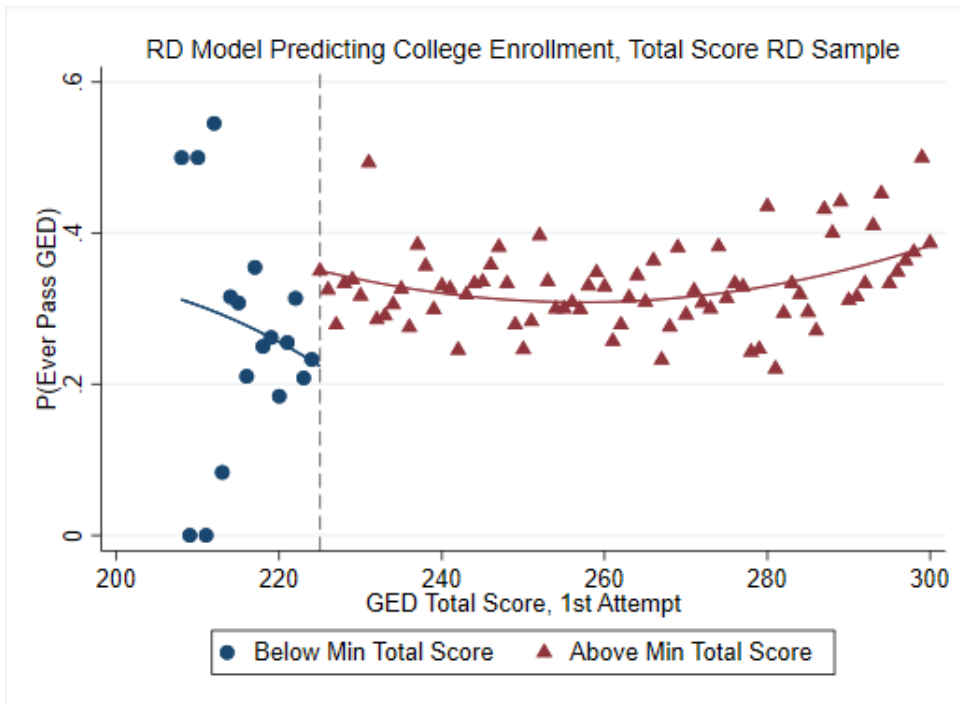
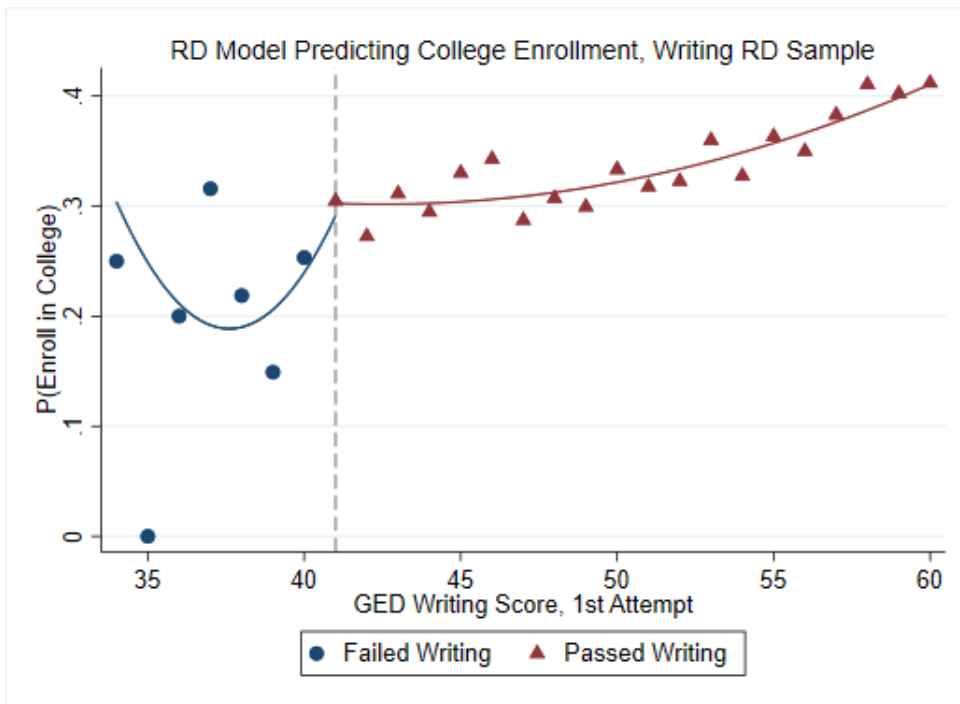


Figure 3D: Reduced form relationship between distance from passing threshold and college enrollment, Writing RD Sample



Appendix A

Means of outcome variables for individuals below binding threshold

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Multi RD										
Ever Enrolled in College	0.354	0.295	0.422	0.315	0.396	0.250	0.189	0.307	0.228	0.269
Ever Enrolled (2 year)	0.316	0.252	0.390	0.281	0.352	0.209	0.151	0.263	0.189	0.227
Ever Enrolled (4 year)	0.071	0.064	0.077	0.059	0.084	0.027	0.025	0.029	0.026	0.029
Quarters Enrolled	1.561	1.169	1.999	1.356	1.779	0.819	0.596	1.025	0.727	0.897
Enrolled 4+ Quarters	0.177	0.128	0.231	0.149	0.206	0.094	0.067	0.119	0.088	0.100
Enrolled 8+ Quarters	0.076	0.054	0.100	0.070	0.083	0.033	0.023	0.041	0.027	0.038
Earned Any Degree or Certificate	0.033	0.023	0.046	0.035	0.032	0.014	0.007	0.021	0.014	0.015
	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Math RD										
Ever Enrolled in College	0.362	0.287	0.415	0.325	0.400	0.247	0.184	0.287	0.249	0.245
Ever Enrolled (2 year)	0.331	0.256	0.385	0.296	0.369	0.209	0.148	0.248	0.210	0.209
Ever Enrolled (4 year)	0.075	0.072	0.076	0.069	0.080	0.026	0.027	0.026	0.028	0.025
Quarters Enrolled	1.706	1.317	1.980	1.536	1.885	0.773	0.594	0.886	0.802	0.749
Enrolled 4+ Quarters	0.193	0.147	0.225	0.170	0.218	0.089	0.069	0.102	0.092	0.087
Enrolled 8+ Quarters	0.086	0.069	0.098	0.077	0.096	0.031	0.024	0.035	0.033	0.029
Earned Any Degree or Certificate	0.038	0.031	0.044	0.042	0.034	0.011	0.008	0.013	0.015	0.008
	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Total Score RD										
Ever Enrolled in College	0.350	0.292	0.416	0.332	0.365	0.270	0.192	0.337	0.223	0.302
Ever Enrolled (2 year)	0.300	0.239	0.367	0.290	0.308	0.221	0.132	0.298	0.171	0.256
Ever Enrolled (4 year)	0.068	0.059	0.079	0.048	0.085	0.030	0.021	0.037	0.020	0.037
Quarters Enrolled	1.392	0.917	1.905	1.393	1.392	0.846	0.474	1.165	0.592	1.020
Enrolled 4+ Quarters	0.150	0.083	0.221	0.156	0.144	0.100	0.055	0.139	0.089	0.107
Enrolled 8+ Quarters	0.060	0.034	0.088	0.072	0.050	0.030	0.019	0.040	0.011	0.043
Earned Any Degree or Certificate	0.043	0.021	0.066	0.048	0.038	0.023	0.009	0.036	0.005	0.036
	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Writing RD										
Ever Enrolled in College	0.342	0.302	0.510	0.281	0.425	0.227	0.187	0.394	0.178	0.294
Ever Enrolled (2 year)	0.290	0.247	0.480	0.246	0.351	0.190	0.153	0.340	0.146	0.250
Ever Enrolled (4 year)	0.074	0.061	0.122	0.051	0.104	0.029	0.026	0.043	0.021	0.039
Quarters Enrolled	1.405	1.139	2.582	1.057	1.880	0.905	0.650	1.968	0.605	1.319
Enrolled 4+ Quarters	0.156	0.130	0.276	0.114	0.215	0.101	0.072	0.220	0.070	0.144
Enrolled 8+ Quarters	0.073	0.052	0.177	0.054	0.099	0.043	0.027	0.110	0.023	0.072
Earned Any Degree or Certificate	0.018	0.011	0.051	0.016	0.022	0.017	0.005	0.066	0.011	0.026

This table reports mean values of outcomes for the indicated subsamples.

Table 1A Summary statistics for subgroups of GED test-takers in Massachusetts, 2002-2013

	All Test-Takers (1)	All Non-ABE (2)	All ABE (3)	Non-ABE Total (4)	Non-ABE Writing (5)	ABE Total (6)	ABE Writing (7)
<i>A. Student Characteristics</i>							
Age at 1st GED attempt	24.08 (8.75)	18.85 (1.60)	27.69 (9.97)	18.80 (1.57)	18.79 (1.56)	26.20 (9.10)	26.36 9.24
Observations	102,761	22,203	17,759	13,900	14,928	7085	7281
Male	0.54 —	0.57 —	0.50 —	0.57 —	0.61 —	0.56 —	0.60 —
Observations	103,059	21,979	17,759	13,758	14,776	7085	7281
Non-white	0.52 —	0.38 —	0.53 —	0.36 —	0.33 —	0.41 —	0.39 —
Observations	103,059	22,203	17,759	13,900	14,928	7085	7281
Native English Speaker		0.81 —	0.73 —	0.83 —	0.84 —	0.80 —	0.81 —
Observations		22,203	17,438	13,900	14,928	7036	7234
Low Income**		0.66 (0.47)		0.66 (0.47)	0.64 (0.48)		
Observations		22,203		13,900	14,928		
Special Education**		0.27 (0.45)		0.24 (0.43)	0.24 (0.43)		
Observations		22,203		13,900	14,928		
Receiving Public Assistance*			0.47 (0.50)			0.45 (0.50)	0.46 (0.50)
Observations			17,239			6951	7145
Employed*			0.31 (0.46)			0.28 (0.45)	0.27 (0.45)
Observations			17,239			6951	7145
Valid NSC Query		1.00 —	0.87 —	1.00 —	1.00 —	0.96 —	0.97 —
Observations		22,203	17,759	13,900	14,928	7085	7281
<i>B. GED</i>							
Passed First Time	0.62 (0.48)	0.73 (0.44)	0.43 (0.50)	0.97 (0.18)	0.96 (0.19)	0.93 (0.26)	0.93 (0.25)
Retook Test	0.34 (0.47)	0.25 (0.44)	0.49 (0.50)	0.07 (0.26)	0.08 (0.27)	0.12 (0.32)	0.11 (0.32)
Ever Passed GED	0.82 (0.39)	0.90 (0.31)	0.68 (0.47)	0.99 (0.09)	0.99 (0.07)	0.98 (0.14)	0.99 (0.12)
Observations (GED)	103,059	22,203	17,759	13,900	14,928	7085	7281

* Data comes from ABE administrative files. Refers to status at the time of enrolling adult basic education program. ** Data comes from K-12 administrative files. Low-income indicates ever qualifying for free or reduced price lunch; special education indicates ever qualifying for special education services. Column 1 includes all individuals who completed the GED in Massachusetts from 2002-2013. The Total RD sample includes test completers who either passed the GED on their first attempt or failed their first attempt while passing all 5 subtests, but failing to attain the minimum passing total score (225). The Writing RD samples include test-completers whose first attempt math subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests such that earning the minimum passing score (410) in writing would be sufficient to reach the minimum passing total score (2250). ABE and non-ABE samples are limited to individuals for whom we observe an NSC records query and who score between 300-600 on their binding subtest or between 2050-3000 if their total score was binding. Standard deviations for sample means are in parentheses.

Table 1B Summary statistics for subgroups of GED test-takers in Massachusetts, 2002-2003 (ABE before GED)

	All Test-Takers (1)	All Non-ABE (2)	All ABE (3)	Non-ABE Multi (4)	Non-ABE Math (5)	ABE Multi (6)	ABE Math (7)
<i>A. Student Characteristics</i>							
Age at 1st GED attempt	24.08 (8.75)	18.85 (1.60)	28.41 (10.18)	18.82 (1.58)	18.84 (1.59)	27.07 (9.61)	27.13 9.61
Observations	102,761	22,203	12,803	18,453	15,281	8456	7238
Male	0.54 —	0.57 —	0.51 —	0.57 —	0.55 —	0.56 —	0.54 —
Observations	103,059	21,979	12,803	18,269	15,121	8456	7238
Non-white	0.52 —	0.38 —	0.49 —	0.34 —	0.34 —	0.41 —	0.40 —
Observations	103,059	22,203	12,803	18,453	15,281	8456	7238
Native English Speaker		0.81 —	0.73 —	0.84 —	0.84 —	0.81 —	0.82 —
Observations		22,203	12,802	18,453	15,281	8456	7238
Low Income**		0.66 (0.47)		0.64 (0.48)	0.65 (0.48)		
Observations		22,203		18,453	15,281		
Special Education**		0.27 (0.45)		0.25 (0.43)	0.25 (0.43)		
Observations		22,203		18,453	15,281		
Receiving Public Assistance*			0.44 (0.50)			0.44 (0.50)	0.45 (0.50)
Observations			12,802			8456	7238
Employed*			0.30 (0.46)			0.28 (0.45)	0.28 (0.45)
Observations			12,802			8456	7238
Valid NSC Query		1.00 (0.00)	0.87 (0.34)	1.00 (0.00)	1.00 (0.00)	0.96 (0.19)	0.96 (0.19)
Observations (GED)		22,203	12,803	18,453	15,281	8456	7238
<i>B. GED</i>							
Passed First Time	0.62 (0.48)	0.73 (0.44)	0.53 (0.50)	0.86 (0.35)	0.92 (0.27)	0.76 (0.43)	0.84 (0.36)
Retook Test	0.34 (0.47)	0.25 (0.44)	0.41 (0.49)	0.16 (0.37)	0.11 (0.31)	0.25 (0.43)	0.18 (0.39)
Ever Passed GED	0.82 (0.39)	0.90 (0.31)	0.76 (0.43)	0.97 (0.16)	0.98 (0.14)	0.93 (0.25)	0.95 (0.23)
Observations (GED)	103,059	22,203	12,803	18,453	15,281	8456	7238

* Data comes from ABE administrative files. Refers to status at the time of enrolling adult basic education program. ** Data comes from K-12 administrative files. Low-income indicates ever qualifying for free or reduced price lunch; special education indicates ever qualifying for special education services. Column 1 includes all individuals who completed the GED in Massachusetts from 2002-2013. The Multi RD samples includes test completers who either passed the GED on their first attempt or failed their first attempt while passing 4 of the 5 subtests or passing all 5 subtests, but failing to attain the minimum passing total score (2250). The Math RD samples include test-completers whose first attempt math subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests such that earning the minimum passing score (410) in math would be sufficient to reach the minimum passing total score (2250). ABE and non-ABE samples are limited to individuals for whom we observe an NSC records query and who score between 300-600 on their binding subtest or between 2050-3000 if their total score was binding. Standard deviations for sample means are in parentheses.

Table 2A

Discontinuities in baseline characteristics and outcomes, Total and Writing RD samples

	Total RD		Writing RD	
	Non-ABE Sample (1)	ABE Sample (2)	Non-ABE Sample (3)	ABE Sample (4)
Age at 1st GED attempt	0.091 (0.406)	2.277 (2.494)	-0.119 (0.556)	-8.517** (4.109)
Observations	13,900	6701	14,928	6902
Male	0.137 (0.128)	-0.096 (0.133)	-0.167 (0.171)	0.223 (0.211)
Observations	13,758	6701	14,776	6902
Non-white	-0.207* (0.121)	0.215* (0.129)	-0.029 (0.168)	-0.055 (0.213)
Observations	13,900	6701	14,928	6902
Native English Speaker	0.122 (0.096)	0.155 (0.106)	0.108 (0.130)	0.351** (0.172)
Observations	13,900	6700	14,928	6901
Special Education**	0.151 (0.110)		-0.016 (0.152)	
Observations	13,900		14,928	
Low Income**	-0.066 (0.120)		0.061 (0.170)	
Observations	13,900		14,928	
Receiving Public Assistance*		0.161 (0.134)		-0.168 (0.219)
Observations		6700		6901
Employed*		0.076 (0.121)		-0.287 (0.197)
Observations		6700		6901
Retook Test	-0.885*** (0.054)	-0.973*** (0.065)	-0.799*** (0.075)	-0.941*** (0.106)
Observations	13,900	6701	14,928	6902
Ever Passed GED	0.196*** (0.020)	0.026 (0.031)	0.187*** (0.025)	0.021 (0.046)
Observations	13,900	6701	14,928	6902

* Data comes from ABE administrative files. Refers to status at the time of enrolling adult basic education program. ** Data comes from K-12 administrative files. Low-income indicates ever qualifying for free or reduced price lunch; special education indicates ever qualifying for special education services. See notes for Table A.1 for a description of the sub-samples included here. Columns (2)-(5) reports discontinuities in estimates for the test-takers characteristics for the indicated subsample, whose group means are tabulated in columns Table A.1, and are calculated as described in the body of the paper. Regressions include GED quarter and year fixed effects. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level.*** Significant at the 1 percent level.

Table 2B

Discontinuities in baseline characteristics and outcomes, Multi and Math RD samples (ABE before GED)

	Multi RD		Math RD	
	Non-ABE Sample (1)	ABE Sample (2)	Non-ABE Sample (3)	ABE Sample (4)
Age at 1st GED attempt	0.235 (0.163)	-1.230 (1.160)	0.255 (0.345)	-3.329 (2.178)
Observations	18,453	8133	15,281	6972
Male	-0.036 (0.051)	0.016 (0.060)	0.048 (0.108)	-0.075 (0.112)
Observations	18,269	8133	15,121	6972
Non-white	-0.045 (0.048)	0.037 (0.058)	-0.098 (0.102)	0.047 (0.110)
Observations	18,453	8133	15,281	6972
Native English Speaker	-0.031 (0.038)	0.058 (0.047)	0.008 (0.080)	0.045 (0.088)
Observations	18,453	8133	15,281	6972
Special Education**	0.017 (0.044)		0.153 (0.094)	
Observations	18,453		15,281	
Low Income**	0.028 (0.049)		0.053 (0.103)	
Observations	18,453		15,281	
Receiving Public Assistance*		0.019 (0.060)		0.133 (0.113)
Observations		8133		6972
Employed*		-0.097* (0.054)		0.021 (0.102)
Observations		8133		6972
Retook Test	-0.891*** (0.022)	-0.872*** (0.030)	-0.905*** (0.047)	-0.824*** (0.057)
Observations	18,453	8133	15,281	6972
Ever Passed GED	0.130*** (0.015)	0.145*** (0.025)	0.198*** (0.026)	0.232*** (0.042)
Observations	18,453	8133	15,281	6972

This table recreates Table 2 using the sample of ABE participants for whom we can confirm that ABE enrollment preceded their first GED attempt. Regressions include GED quarter and year fixed effects. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 3A: Total Score and Writing RD

Estimated Impact of Earning a GED on Postsecondary Enrollment by Quarter

Quarters since GED	Total Score RD				Writing RD			
	Non-ABE		ABE		Non-ABE		ABE	
	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations
1	0.102 (0.952)	13,757	0.987 (0.736)	6875	0.394 (0.587)	14,775	0.539 (0.348)	7084
2	-0.090 (1.082)	13,757	0.498 (0.698)	6897	0.659 (0.667)	14,775	-0.062 (0.363)	7106
3	-0.912 (1.122)	13,757	0.387 (0.724)	6923	-0.064 (0.673)	14,775	-0.041 (0.393)	7131
4	-1.268 (1.110)	13,757	1.207 (0.776)	6935	-0.056 (0.659)	14,774	0.081 (0.373)	7142
5	-1.445 (0.973)	13,694	0.911 (0.728)	6944	-0.214 (0.645)	14,714	0.183 (0.356)	7151
6	-1.248 (1.171)	13,659	0.795 (0.672)	6954	-0.243 (0.624)	14,676	-0.178 (0.349)	7163
7	0.378 (1.131)	13,606	0.969 (0.672)	6958	-0.506 (0.609)	14,626	0.115 (0.340)	7167
8	0.181 (1.040)	13,568	0.801 (0.618)	6959	-0.488 (0.597)	14,585	0.260 (0.325)	7171
9	-0.634 (1.004)	13,528	0.376 (0.635)	6686	-0.167 (0.596)	14,544	-0.033 (0.395)	6915
10	-0.285 (0.912)	13,476	0.731 (0.654)	6594	-0.029 (0.575)	14,495	-0.167 (0.396)	6826
11	-0.926 (0.913)	13,434	1.013 (0.556)*	6320	-0.387 (0.568)	14,450	0.182 (0.547)	6551
12	-1.805 (1.424)	13,395	0.826 (0.463)*	6167	-0.390 (0.514)	14,410	0.091 (0.534)	6386
13	-0.654 (1.091)	12,899	1.294 (0.572)**	5917	0.436 (0.735)	13,889	0.152 (0.566)	6134
14	-0.211 (0.962)	12,421	0.476 (0.477)	5808	0.168 (0.818)	13,369	-0.040 (0.539)	6019
15	7.018 (16.109)	11,857	0.460 (0.548)	5529	0.612 (1.587)	12,773	0.244 (0.509)	5733
16	4.727 (11.597)	11,368	0.311 (0.425)	5300	0.612 (1.406)	12,245	-0.025 (0.563)	5496

This table reports regression discontinuity estimates of the impact of earning a GED on postsecondary enrollment by quarter for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, gender and fixed effects for quarter and year of GED. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. The Multi RD sample includes test completers who either passed the GED on their first attempt or failed their first attempt while passing 4 of the 5 subtests or passing all 5 subtests, but failing to attain the minimum passing total score (2250). The Writing RD sample includes test-completers whose first attempt writing subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests and achieved a high enough score that earning the minimum passing score in writing (410) would be sufficient to reach the minimum total passing score (2250). Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 3B: Multi and Math RD Samples (ABE before GED)

Estimated Impact of Earning a GED on Postsecondary Enrollment by Quarter (ABE before GED)

Quarters since 1s test	Multi RD				Math RD			
	Non-ABE		ABE		Non-ABE		ABE	
	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations	Coefficient	Observations
1	0.694 (0.218)***	18,684	0.269 (0.150)*	8519	0.732 (0.291)**	15,119	0.095 (0.131)	7236
2	0.753 (0.246)***	18,684	0.374 (0.158)**	8521	0.656 (0.326)**	15,119	0.389 (0.138)***	7238
3	0.145 (0.243)	18,684	0.471 (0.167)***	8522	0.083 (0.327)	15,119	0.490 (0.146)***	7239
4	-0.187 (0.241)	18,683	0.507 (0.159)***	8522	-0.205 (0.322)	15,119	0.451 (0.137)***	7239
5	-0.417 (0.240)*	18,601	0.437 (0.154)***	8522	-0.453 (0.326)	15,050	0.329 (0.133)**	7239
6	-0.581 (0.239)**	18,548	0.235 (0.141)*	8522	-0.591 (0.317)*	15,006	0.138 (0.122)	7239
7	-0.312 (0.229)	18,480	0.251 (0.138)*	8522	-0.427 (0.302)	14,946	0.101 (0.118)	7239
8	-0.282 (0.230)	18,423	0.154 (0.128)	8522	-0.424 (0.311)	14,901	0.005 (0.112)	7239
9	-0.403 (0.228)*	18,362	0.078 (0.139)	8146	-0.351 (0.314)	14,853	-0.082 (0.114)	6915
10	-0.425 (0.221)*	18,296	0.131 (0.132)	8005	-0.438 (0.305)	14,796	0.022 (0.106)	6795
11	-0.242 (0.218)	18,227	0.077 (0.148)	7616	-0.026 (0.318)	14,740	-0.009 (0.115)	6479
12	-0.228 (0.219)	18,168	0.184 (0.149)	7414	-0.091 (0.316)	14,689	0.092 (0.115)	6309
13	-0.114 (0.232)	17,477	0.208 (0.161)	7091	-0.138 (0.338)	14,146	-0.111 (0.124)	6037
14	-0.188 (0.222)	16,821	0.064 (0.144)	6932	-0.413 (0.328)	13,633	-0.147 (0.111)	5903
15	-0.241 (0.246)	16,048	0.204 (0.139)	6577	-0.454 (0.299)	13,018	-0.085 (0.100)	5611
16	-0.086 (0.252)	15,357	0.203 (0.123)*	6269	-0.165 (0.312)	12,478	0.006 (0.088)	5345

This table replicates the analysis from Table 3 using the sample of ABE participants for whom we can confirm ABE participation preceded their first GED attempt. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4A: Total Score RD

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	-1.179 (1.426)	-3.739 (3.965)	-0.098 (1.383)	-91.619 (540.167)	1.199 (2.140)	2.093** (0.961)	1.868* (0.992)	2.296 (1.928)	2.247* (1.217)	1.943 (1.524)
Observations	13,758	7857	5901	8865	4893	6701	3755	2946	3966	2735
Ever Enrolled (2 year)	-0.581 (1.306)	-1.830 (3.080)	0.062 (1.345)	-36.790 (120.390)	1.371 (1.987)	2.139** (0.940)	1.742* (0.935)	2.505 (1.957)	2.040* (1.161)	2.434 (1.585)
Observations	13,567	7743	5824	8743	4824	6701	3755	2946	3966	2735
Ever Enrolled (4 year)	-0.455 (0.823)	-0.856 (1.842)	-0.371 (0.879)	-6.400 (24.911)	-0.412 (1.322)	-0.137 (0.398)	0.273 (0.424)	-0.869 (0.878)	-0.060 (0.468)	-0.256 (0.691)
Observations	13,567	7743	5824	8743	4824	6701	3755	2946	3966	2735
Quarters Enrolled	-8.631 (10.222)	-0.509 (22.543)	-12.376 (11.119)	-393.685 (2334.373)	0.053 (15.335)	10.851** (5.465)	9.042* (4.989)	10.826 (11.753)	12.199* (6.973)	11.114 (8.830)
Observations	13,758	7857	5901	8865	4893	6701	3755	2946	3966	2735
Enrolled 4+ Quarters	-0.362 (1.202)	2.725 (3.085)	-1.560 (1.321)	-51.517 (304.840)	1.537 (1.966)	0.853 (0.632)	1.109 (0.751)	0.389 (1.126)	1.196 (0.758)	0.495 (1.105)
Observations	13,757	7856	5901	8865	4892	6599	3698	2901	3916	2683
Enrolled 8+ Quarters	-1.119 (0.954)	-0.939 (1.393)	-1.354 (1.291)	1.230 (2.361)	-1.045 (1.079)	0.794* (0.476)	0.657 (0.555)	0.762 (0.791)	0.608 (0.476)	1.381 (1.209)
Observations	13,568	7732	5836	8763	4805	6578	3687	2891	3908	2670
Earned Any Degree or Certificate	-1.256** (0.606)	-1.776 (1.405)	-1.005 (0.658)	-22.194 (71.516)	-0.897 (0.911)	0.280 (0.255)	0.383 (0.249)	0.139 (0.510)	0.369 (0.291)	0.301 (0.479)
Observations	13,559	7739	5820	8741	4818	6597	3697	2900	3915	2682

This table reports regression discontinuity estimates of the impact of earning a GED on the outcomes indicated in each row for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, and gender. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. The Total RD sample includes test completers who either passed the GED on their first attempt or failed their first attempt while passing all 5 subtests, but failing to attain the minimum passing total score (225). Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4A: Writing RD

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	0.585 (0.842)	0.256 (0.732)	21.204 (70.036)	1.236 (0.790)	-0.476 (1.186)	0.330 (0.525)	0.529 (0.568)	-0.577 (0.883)	0.767 (0.562)	-0.690 (1.239)
Observations	14,776	8971	5805	9835	4941	6902	4112	2790	4255	2647
Ever Enrolled (2 year)	1.324 (1.040)	0.953 (0.888)	21.469 (70.983)	0.967 (0.831)	1.721 (1.765)	0.216 (0.506)	0.272 (0.534)	-0.390 (0.868)	0.660 (0.540)	-0.811 (1.202)
Observations	14,564	8837	5727	9691	4873	6902	4112	2790	4255	2647
Ever Enrolled (4 year)	-1.154* (0.691)	-0.836 (0.576)	-31.238 (90.401)	0.078 (0.524)	-3.058** (1.442)	0.122 (0.240)	0.229 (0.260)	-0.120 (0.400)	0.010 (0.240)	0.392 (0.601)
Observations	14,564	8837	5727	9691	4873	6902	4112	2790	4255	2647
Quarters Enrolled	-0.564 (6.287)	-3.193 (5.211)	181.833 (590.175)	5.253 (5.869)	-7.673 (8.988)	1.366 (3.091)	2.933 (2.954)	-2.351 (5.777)	4.150 (3.330)	-5.325 (7.283)
Observations	14,776	8971	5805	9835	4941	6902	4112	2790	4255	2647
Enrolled 4+ Quarters	0.484 (0.735)	0.036 (0.609)	39.534 (114.145)	0.559 (0.673)	0.220 (1.067)	0.120 (0.422)	0.151 (0.422)	0.076 (0.694)	0.459 (0.389)	-1.216 (1.545)
Observations	14,774	8969	5805	9834	4940	6814	4051	2763	4206	2608
Enrolled 8+ Quarters	-0.672 (0.535)	-0.530 (0.438)	-18.325 (36.176)	0.414 (0.488)	-1.731** (0.845)	0.138 (0.279)	0.366 (0.264)	-0.250 (0.464)	0.151 (0.242)	0.185 (1.250)
Observations	14,585	8840	5745	9725	4860	6795	4040	2755	4195	2600
Earned Any Degree or Certificate	-0.321 (0.451)	-0.117 (0.361)	-15.323 (46.445)	-0.143 (0.362)	-0.461 (0.759)	0.040 (0.172)	0.094 (0.140)	0.011 (0.320)	0.162 (0.157)	-0.454 (0.627)
Observations	14,555	8832	5723	9687	4868	6812	4050	2762	4205	2607

This table reports regression discontinuity estimates of the impact of earning a GED on the outcomes indicated in each row for members of the indicated subgroups. Estimates include controls for age, non-white racial/ethnic identity, and gender. Quarters enrolled is calculated for the first 16 quarters (4 years) following an individual's first GED attempt. The Writing RD samples include test-completers whose first attempt math subtest score was a binding constraint determining whether they passed the GED on their first attempt. This includes test takers who pass on their first attempt as well as all individuals who completed and passed all other subtests such that earning the minimum passing score (410) in writing would be sufficient to reach the minimum passing total score (2250). Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4B: Multi RD (ABE before GED)

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	0.076 (0.296)	0.068 (0.293)	0.149 (0.824)	0.078 (0.402)	0.410 (0.416)	0.510** (0.224)	0.559* (0.306)	0.541 (0.340)	0.469* (0.239)	0.642 (0.463)
Observations	18,686	10,717	7969	12,385	6301	8521	4752	3769	5046	3475
Ever Enrolled (2 year)	-0.011 (0.306)	0.215 (0.305)	-0.561 (0.828)	-0.069 (0.413)	0.419 (0.432)	0.352* (0.213)	0.296 (0.279)	0.499 (0.339)	0.305 (0.227)	0.490 (0.441)
Observations	18,411	10,548	7863	12,195	6216	8489	4733	3756	5023	3466
Ever Enrolled (4 year)	-0.206 (0.205)	-0.213 (0.200)	-0.230 (0.552)	-0.031 (0.272)	-0.352 (0.301)	0.098 (0.100)	0.145 (0.137)	0.032 (0.153)	0.057 (0.102)	0.171 (0.219)
Observations	18,411	10,548	7863	12,195	6216	8489	4733	3756	5023	3466
Quarters Enrolled	-1.800 (2.296)	0.157 (2.121)	-8.035 (7.222)	0.049 (3.140)	-2.224 (3.154)	3.574*** (1.279)	2.995* (1.547)	4.680** (2.163)	3.236** (1.366)	4.632* (2.679)
Observations	18,686	10,717	7969	12,385	6301	8521	4752	3769	5046	3475
Enrolled 4+ Quarters	-0.261 (0.267)	0.084 (0.250)	-1.340 (0.863)	-0.178 (0.353)	-0.158 (0.387)	0.361** (0.165)	0.317 (0.206)	0.450* (0.273)	0.324* (0.175)	0.458 (0.347)
Observations	18,683	10,714	7969	12,384	6299	8521	4752	3769	5046	3475
Enrolled 8+ Quarters	-0.342 (0.209)	-0.114 (0.184)	-1.150 (0.749)	-0.052 (0.281)	-0.585* (0.302)	0.209** (0.101)	0.167 (0.117)	0.293* (0.175)	0.147 (0.106)	0.315 (0.215)
Observations	18,423	10,551	7872	12,234	6189	8521	4752	3769	5046	3475
Earned Any Degree or Certificate	-0.024 (0.144)	-0.009 (0.133)	-0.063 (0.404)	-0.093 (0.196)	0.101 (0.198)	-0.019 (0.066)	-0.040 (0.069)	0.017 (0.122)	-0.096 (0.070)	0.086 (0.141)
Observations	18,400	10,541	7859	12,191	6209	8486	4732	3754	5022	3464

This table recreates Table 4 using the sample of ABE participants for whom we can confirm ABE enrollment preceded their first GED attempt. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

Table 4B: Math RD (ABE before GED)

Impact of Earning a GED on Postsecondary Enrollment, Persistence, and Degree Attainment

	Non-ABE					ABE				
	Pooled (1)	Men (2)	Women (3)	White (4)	Non-white (5)	Pooled (6)	Men (7)	Women (8)	White (9)	Non-white (10)
Ever Enrolled in College	0.088	-0.163	0.884	-0.082	0.236	0.207	0.260	0.164	0.118	0.271
	(0.398)	(0.337)	(1.288)	(0.601)	(0.551)	(0.194)	(0.283)	(0.269)	(0.264)	(0.286)
Observations	15,121	8364	6757	9911	5210	7238	3926	3312	4328	2910
Ever Enrolled (2 year)	-0.295	-0.375	-0.010	-0.356	-0.258	0.241	0.249	0.241	0.173	0.298
	(0.392)	(0.334)	(1.181)	(0.588)	(0.547)	(0.187)	(0.258)	(0.270)	(0.257)	(0.273)
Observations	14,906	8238	6668	9769	5137	7209	3908	3301	4307	2902
Ever Enrolled (4 year)	-0.049	-0.144	0.255	-0.015	-0.093	-0.060	-0.099	-0.034	-0.140	0.012
	(0.251)	(0.208)	(0.789)	(0.367)	(0.366)	(0.087)	(0.126)	(0.121)	(0.114)	(0.136)
Observations	14,906	8238	6668	9769	5137	7209	3908	3301	4307	2902
Quarters Enrolled	-2.198	-2.053	-1.610	-3.214	-1.192	1.830*	1.020	2.466	2.254	1.317
	(2.988)	(2.342)	(10.297)	(4.525)	(4.112)	(1.088)	(1.401)	(1.651)	(1.489)	(1.584)
Observations	15,121	8364	6757	9911	5210	7238	3926	3312	4328	2910
Enrolled 4+ Quarters	-0.205	-0.236	0.009	-0.335	-0.057	0.244*	0.113	0.346	0.314	0.164
	(0.360)	(0.288)	(1.188)	(0.520)	(0.526)	(0.143)	(0.190)	(0.213)	(0.192)	(0.214)
Observations	15,119	8362	6757	9911	5208	7238	3926	3312	4328	2910
Enrolled 8+ Quarters	-0.277	-0.257	-0.234	-0.119	-0.452	0.074	0.039	0.105	0.016	0.128
	(0.277)	(0.212)	(0.967)	(0.402)	(0.411)	(0.086)	(0.104)	(0.134)	(0.116)	(0.128)
Observations	14,901	8227	6674	9791	5110	7238	3926	3312	4328	2910
Earned Any Degree or Certificate	0.059	-0.029	0.328	-0.187	0.300	0.042	-0.023	0.107	0.016	0.074
	(0.175)	(0.138)	(0.568)	(0.258)	(0.254)	(0.056)	(0.060)	(0.095)	(0.076)	(0.084)
Observations	14,897	8233	6664	9767	5130	7206	3907	3299	4306	2900

This table recreates Table 4 using the sample of ABE participants for whom we can confirm ABE enrollment preceded their first GED attempt. Standard errors are in parentheses. * Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.