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Christopher Jepsen
UCD School of Economics
UCD Geary Institute for Public Policy,
University College Dublin

Peter Mueser
University of Missouri-Columbia

Kenneth Troske
University of Kentucky

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Second Chance for High-School Dropouts? A Regression Discontinuity Analysis of Postsecondary Educational Returns to General Educational Development Certification

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Christopher Jepsen*
University College Dublin
Belfield
Dublin 4, Ireland
+353 (1) 716-8320
Christopher.jepsen@ucd.ie

Peter Mueser
University of Missouri-Columbia
118 Professional Building
Columbia, MO 65211
(573) 882-6427
mueserp@missouri.edu

Kenneth Troske
University of Kentucky
335 BA Gatton B&E Bldg
Lexington, KY 40506-0034
(859) 257-1282
ktroske@uky.edu

Abstract:

In this paper, we evaluate the educational returns to General Educational Development (GED) certification using state administrative data. We use fuzzy regression discontinuity (FRD) methods to account for the fact that GED test takers can repeatedly retake the test until they pass it and the fact that test takers have to pass each of five subtests before receiving the GED. We generally find positive effects of the GED on multiple measures of postsecondary education. Although the GED increases the likelihood of postsecondary attendance substantially, the GED impact on overall credits completed is much more modest: The GED causes an average increment of only two credits for men and six credits for women. The effects of the GED on postsecondary awards are inconclusive, likely related to the small percentage of awards received by GED test takers.

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I. Introduction

Many postsecondary institutions require high school graduation or high school equivalency certification for admission to degree-seeking programs. Such certification therefore may be an important path to obtaining labor-market skills for high-school dropouts. However, the extent of such benefits is not clear, as many of those with certification do not successfully pursue schooling or training options, and dropouts who do not obtain certification often have access to alternative postsecondary educational opportunities.

Until 2014, the General Educational Development (GED) test provided the sole means of high school equivalency certification supported by states, and it was the most widely accepted alternative to a high school diploma for admission to degree-seeking programs at postsecondary institutions. In this paper, we evaluate the postsecondary education returns to GED certification using state administrative data. Because GED test takers can repeatedly retake the test until they pass it, we utilize a fuzzy regression discontinuity (FRD) design based on the discontinuity in the first GED test attempt. This technique provides an estimate of the impact of the GED for individuals who are near the cutoff for passing the GED test, while also allowing us to remove possible bias that results from retaking the test. This estimator also allows us to account for the fact that test takers need to receive a minimum score on the five subtests that make up the GED, as well as receiving an overall minimum score, before obtaining the GED certification. We estimate one FRD model based solely on the discontinuity in passing the GED generated by overall test score, as well as a multiple-discontinuity FRD model that includes the lowest subtest score discontinuity in addition to the overall test score discontinuity. The two approaches yield similar results.

We find sizable, positive effects of the GED on the likelihood of attendance: nearly five percentage points for men and 10 percentage points for women. The GED effect on course completion is of a similar magnitude, suggesting that completing the postsecondary courses taken is not a major challenge for GED test takers who begin a course. However, the GED impact on the average amount of human capital obtained is quite low: less than one class for men and approximately two classes for women. The relationship between the

GED and award receipt is inconclusive. Fewer than five percent of GED test takers receive any type of postsecondary award such as a degree or certificate. This paper is the first of which we are aware that uses regression discontinuity models to estimate the educational returns to the GED.

II. GED Literature

Early work on the GED used survey data from the National Longitudinal Survey of Youth (NLSY) and High School and Beyond (HSB) survey. Most of these papers focused on the labor-market returns to the GED, see, for example, Cameron and Heckman (1993), Heckman and LaFontaine (2006), Murnane, Willett, and Boudett (1995, 1999), Tyler (2004), and Heckman, Humphries, and Kautz (2014).

Much less work has looked at the educational returns to the GED. Cameron and Heckman (1993), Tyler, Murnane, and Willett (2003), Heckman and LaFontaine (2006), Heckman, Humphries, and Mader (2011), and Heckman, Humphries, and Kautz (2014) estimate the raw differences in postsecondary schooling between high school graduates and GED recipients.

Murnane, Willett, and Boudett (1997) apply models that use NLSY GED recipients and high school dropouts to estimate the impact of the GED on postsecondary education and training. They include multiple years of data for each person and estimate a random-effects probit model to account for person-specific correlations in unobservables. The authors find modest, positive effects of GED certification on postsecondary education and other training for both men and women, although they find that fewer than half of GED recipients participate at all.

Tyler and Lofstrom (2010) use administrative data on eighth-grade students in Texas to study the effects of the GED on postsecondary education. They compare GED recipients with high school graduates, comparing individuals with similar likelihoods of dropping out of high school based on cognitive and noncognitive skills. They find that high school graduates are much more likely to pursue postsecondary education than GED recipients with similar probabilities of dropping out of high school.

Patterson, Song, and Zhang (2009) provide a descriptive analysis of postsecondary education attendance among a random sample of GED test takers. They find that test takers who receive GED certification have higher attendance rates than test takers who do not obtain certification, but 77 percent of GED test takers who attend postsecondary institutions only attend for one semester. Nearly 80 percent of attendees go to public two-year institutions.

Our analysis provides several contributions to the GED literature. Few papers have explicitly studied the causal effect of the GED on postsecondary education. Most, such as Heckman, Humphries, and Kautz (2014), provide descriptive comparisons of educational outcomes between GED recipients and dropouts and/or high school graduates, not regression-based analyses designed to identify the causal impact of the GED. None of these papers uses a regression discontinuity analysis of the GED's effects on education outcomes. The results in Murnane, Willett, and Boudett (1997) are limited by a lack of recent data and small samples, roughly 300 GED recipients and 300 high school dropouts of each gender. In contrast, in our analyses we will use administrative data from a single state for nearly 100,000 individuals who took the GED between 1995 and 2005. We match these data with education data covering the period 1995 to 2009, providing us with education data for several years after individuals took the GED.

We also look in more detail at education outcomes. In addition to the dichotomous attendance decision, we look at course completion, the number of credits earned, and whether an award such as a certificate or degree is received. We also distinguish between attendance at two-year and four-year institutions.

We also contribute to the RD literature by presenting a model that includes multiple discontinuities in a fuzzy RD setting. Previous RD papers on multiple discontinuities have focused solely on sharp rather than fuzzy discontinuities (see, for instance, Papay, Murnane, and Willett, 2011; Reardon and Robinson, 2012; and Wong, Steiner, and Cook, 2013).

III. GED Test and GED Data

Each state maintains a testing program providing high school equivalency certification for dropouts. Up through 2013, all states used the GED test, and, although passing criteria in the 1990s differed in minor ways across states, such differences had all but disappeared by the turn of the century. The focus here will be on the GED test taken by test takers in a single state during the period 1995-2005. Although new tests were adopted in 2014 in all states, the basic structure of the testing program, and in particular the ability of test takers to take the test multiple times, remains unchanged.[1]

During the period of our analysis, both versions of the GED test consisted of five subtests: reading, writing, social studies, science, and mathematics, with a maximum time for completion set at 7.5 hours. GED certification required minimum scores on each subtest as well as a minimum combined score across the five subjects of 2250. Thus, test takers could score above 2250 on the test but still not obtain GED certification if they failed to obtain the minimum score on each subtests. An individual's GED score at any given time was based on a composite of all subtests taken over a two-year period, where the score on each subtest was the highest score over that period; that is, the score from any given GED subtest attempt was "valid" for two years before it expired. Many individuals who failed the test retook the test within two years, and they often only retook certain subtests rather than retaking the entire exam.[2]

Prior to 2014, the last revision of the GED occurred in 2002. The 2002 revision altered the certification criteria in several ways. First, the minimum passing subtest score was raised from 400 prior to 2002 to 410 (missing subtest scores coded as zeros). Scores from the earlier version could not be combined with the 2002 version, so students who had not passed the exam prior to 2002 had to "start over" and meet the criteria under the new version of the test. In unreported results (available from the authors upon request), we find that the estimated GED impact is qualitatively, although less precisely estimated, in each time period (1995-2001 and 2002-2005).

[1] Beginning in 2014, a new version of the GED test, which changed the structure of its subtests, became available. This new version was adopted as the exclusive measure of high school equivalency by 36 states, but other states substituted alternative high school equivalency tests or allowed test takers a choice. Alternative tests include the Educational Testing Service HiSET test, and McGraw-Hill's Test Assessing Secondary Completion. See Coffey Consulting (2014).

[2] Students could take the test up to six times in any two-year period.

Our basic sample consists of any individual who took the GED test for the first time in one state between 1995 and 2005.[3] For each individual, we have data on the most recent ten test scores for each individual for each version of the test, 1995 to 2001 and 2002 to 2008. We exclude 86 individuals who took the test ten or more times in either time period because we do not know when the first attempt occurred. We exclude individuals who took the GED test while incarcerated because their educational outcomes are affected by their incarceration. Individuals who received their GED through the U.S. military's DANTE program are excluded because DANTE program participants who took the test but did not pass are not in the data. Finally, we exclude individuals who took the GED as part of the GED Option program. This program, offered in several states, allows high school students at risk of dropping out to use the GED test to help achieve a high school diploma rather than GED certification.

Postsecondary data are available for each public institution in the state. The data, provided by the state, are available for each term (spring, summer, or fall) from summer 1994 through spring 2009. We have information on attendance, course completion, number of credits earned, and the receipt of awards such as certificates, associate's degrees, and bachelor's degrees. This information is available separately for two-year and four-year institutions.

Test Score: Examining Discontinuities

Because the "final" GED test score—obtained by combining the highest subtests taken over a two-year period—determines GED certification, it is an obvious candidate for a conventional regression discontinuity analysis. For individuals who meet the minimum subtest score, the overall test score on the "final" GED test score is a sharp regression discontinuity. However, this approach ignores both the fact that some whose scores meet the overall test score threshold do not satisfy the minimum on each of the subtest scores, and that some individuals retake the test. Justification for this approach rests on the observation that 90-95 percent of those whose overall test scores exceeds the threshold

[3] As discussed in Jepsen, Mueser, and Troske (2015), this state has labor-market and demographic characteristics similar to many U.S. states.

also pass the subtest minimum, and that only about one in seven test takers retakes the test.

Jepsen, Mueser, and Troske (2015) show that the final test score is not a valid candidate for a regression discontinuity analysis (sharp or fuzzy). Figure 1 shows the distribution of final GED test scores, along with the distribution of first test scores. Specifically, the figure contains fitted values from a local linear regression that is based on a triangular kernel with a bandwidth covering eight scores (80 points), allowing for a discontinuity just below 2250.[4] The log discontinuity in the density of final test scores is close to 1.0, implying that the density to the right of 2250 is nearly three times that of that immediately to the left, a difference that is easily statistically significant at the 0.1 percent level ($p<0.001$). The very high retake probability for those close to the cutoff point has caused a dramatic redistribution in the final score. Even though only 16 percent of individuals retake the test, this small proportion of retakers is sufficient to alter the distribution very dramatically. Jepsen, Mueser, and Troske (2015) also demonstrate discontinuities in several demographic variables such as sex, age, and race. Thus, the central assumptions of the RD model are violated if we take the final test score as the continuous running variable (see Imbens and Lemieux, 2008; McCrary, 2008).

The analysis here will use the first test score—for all test takers over the period 1995-2005—as the continuous variable underlying GED certification. Although GED certification is not predicted perfectly by the first score, there is a strong discontinuity in the relationship between first test score and ultimate GED certification, allowing us to apply a Fuzzy Regression Discontinuity (FRD) design.

The FRD design requires that the first test score display continuous relationships with all pre-existing factors that may predict GED certification and postsecondary education outcomes. Figure 1 also presents the distribution of the first test score, again plotting fitted values of a local linear regression allowing for a discontinuity at 2250. In contrast to the final score, there is essentially no discontinuity at the 2250 threshold. Jepsen, Mueser, and Troske (2015) also show that there is no discontinuity in the

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[4] These methods correspond to those recommended by McCrary (2008).

characteristics of individuals around this threshold. The first test score is therefore suitable for a FRD design.

IV. Fuzzy Regression Discontinuity Methods

Single Discontinuity Design[5]

Because individuals above the test threshold are appreciably more likely to receive GED certification than those below, these data are appropriate for a fuzzy regression discontinuity (FRD) design for estimating the GED impact for individuals near that test threshold.

In our context, the equation predicting GED certification is written:

$$(1)\quad GED = \alpha_{wl} + \alpha_{wrl}D_r + \sum_{j=1}^{p} \beta_{wlj}[D_l(T-2250)]^j + \sum_{j=1}^{p} \beta_{wrj}[D_r(T-2250)]^j$$
$$+X\eta_w + \varepsilon,$$

where T is the total score on the first GED test, D_r is a dummy indicating whether that score equals or exceeds the passing threshold, D_l is a dummy indicating whether that score is below the passing threshold, p indicates the order of the polynomial, and X is a vector with the following set of covariates: earnings in four semesters prior to first GED attempt, age, age squared, race, year of first GED test, semester of the year (fall, spring, or summer), and dummies for the year the first test was taken. For simplicity, we report the results from the quadratic model where $p=2$.[6] The estimated parameter α_{wrl} indicates the discontinuity at the threshold.

The analogous equation predicting the outcome variable is written:

$$(2)\; Y = \alpha_{yl} + \alpha_{yrl}D_r + \sum_{j=1}^{p} \beta_{ylj}[D_l(T-2250)]^j + \sum_{j=1}^{p} \beta_{yrj}[D_r(T-2250)]^j + X\eta_w + \epsilon.$$

The estimate of the GED's impact is based on the relative size of the regression discontinuities estimated in equations (1) and (2). Assuming that the discontinuity in (1) induces the discontinuity in equation (2), the impact of the GED can be written:

[5] The formal model presented here follows closely from that presented in Imbens and Lemieux (2008), McCrary (2008), and Jepsen, Mueser, and Troske (2015).
[6] The results from the cubic model (p=3) are less precisely estimated but show a similar pattern.

(3) $\tau = \frac{\alpha_{yrl}}{\alpha_{wrl}}$.

Imbens and Lemieux (2008) and Hahn, Todd and van der Kaauw (2001) document that the FRD can be formulated as an instrumental variables (IV) system, where the treatment variable (GED certification for our purposes) is instrumented with dummy variables capturing the discontinuity. In fact, Imbens and Lemieux (2008) suggest using the IV formulation to estimate FRD models. Equation (1) is then the auxiliary equation. The outcome variable can be fitted with the following specification:

(4) $$Y = \alpha_0 + \tau\widehat{GED} + \sum_{j=1}^{p} \beta_{lj}[D_l(T-2250)]^j + \sum_{j=1}^{p} \beta_{rj}[D_r(T-2250)]^j + X\eta_w + \mu,$$

where $\widehat{GED}$ is the predicted value from equation (1). Since the polynomial is of the same order in equations (1) and (4), estimates of τ based on equations (1) through (3) are numerically identical to those based on equations (1) and (4).

Multiple-Discontinuity Design

The approach above focuses on the overall GED test score, but it ignores the fact that individuals who have scores at or above 2250 face a discontinuity based on their *subtest* scores. Furthermore, it ignores the fact that those individuals who have subtest scores that are below the subtest threshold do *not* obtain the GED if their overall scores exceed the threshold, in contrast to those with higher subtest scores. It is possible to identify sharper discontinuities based on both the total score and the lowest subtest score, essentially generalizing the FRD design to multiple dimensions.

If we create separate variables identifying whether GED overall and subtest scores meet these two criteria, the interaction between these measures identifies individuals who receive GED certification on the basis of their initial test performance. The model does not, however, conform to a sharp RD design—even if reinterpreted in two dimensions—because those who fail to meet one of the criteria may still obtain GED certification when they retake the exam. This complication also opens up the possibility that there may be multiple discontinuities, which are not present in a sharp RD design. For example, when an individual has not exceeded the *overall* score threshold, if multiple test taking cannot occur, the *subtest* threshold is irrelevant. Given the possibility of retaking the test, a subtest threshold may well influence GED certification even when the overall score falls short because those who meet the subtest criteria will have an easier time meeting the joint criteria on future tries.

Whereas the conventional FRD (or RD) setup focuses only on properly identifying the functional form of a single variable, here the functional form is multivariate. In addition to controlling for the additive impact of the overall and subtest scores, it may be necessary to recognize that the overall score and each subtest score (not just the criteria) may interact with each over. In the specification below, we therefore include continuous interactions between the overall test and subtest scores, distinguishing scores above and below the threshold.

Combining these considerations, the specification for the equation predicting GED certification, can be written:

$$(5)\ \ GED = \alpha_{wl} + \sum_{j=1}^{p} \beta_{wllj}[D_{Tl}D_{Sl}(T-2250)]^{j} + \sum_{j-1}^{p} \gamma_{wllj}[D_{Tl}D_{Sl}(S-c)]^{j}$$
$$+\phi_{wll}[D_{Tl}D_{Sl}(T-2250)(S-c)] + \alpha_{wrl}D_{Tr}D_{Sl}$$
$$+\sum_{j=1}^{p} \beta_{wrlj}[D_{Tr}D_{Sl}(T-2250)]^{j} + \sum_{j=1}^{p} \gamma_{wrlj}[D_{Tr}D_{Sl}(S-c)]^{j}$$
$$+\phi_{wrl}[D_{Tr}D_{Sl}(T-2250)(S-c)] + \alpha_{wlr}D_{Tl}D_{Sr}$$
$$+\sum_{j=1}^{p} \beta_{wlrj}[D_{Tl}D_{Sr}(T-2250)]^{j} + \sum_{j=1}^{p} \gamma_{wlrj}[D_{Tl}D_{Sr}(S-c)]^{j}$$
$$+\ \phi_{wlr}[D_{Tl}D_{Sr}(T-2250)(S-c)] + \alpha_{wrr}D_{Tl}D_{Sr}$$
$$+\phi_{w}d_{s0} + X\eta_{w} + \varepsilon,$$

where the dummy variable D_{Tl} (D_{Tr}) identifies values below (equal to or above) the cutoff on the overall score, and D_{Sl} (D_{Sr}) identifies values below (equal to or above) the cutoff on the lowest subtest score. *T* continues to designate the total score, and *S* is the lowest subtest score, with the subtest threshold *c*.[7] The dummy variable d_{S0} indicates that the

[7] For 1995-2001, *c*=400; for 2002 and after, *c*=410.

lowest subtest score is zero.[8] As above, the subscript w identifies coefficients in the equation predicting certification. The estimated coefficients β_{whkj} and γ_{whkj} (where h and k stand in for either l or r) identify the slope of the relationship of GED certification with the total score and the lowest subtest score, respectively, allowing different values depending on the scores relative to their thresholds. Discontinuities are estimated by α_{whk}. The interaction term $D_{Tr} D_{Sr}$ identifies individuals who receive a GED based on the initial test, and therefore α_{wrr} is expected to identify a major discontinuity. The smooth interaction terms are fitted with ϕ_{whk}. Note that when both the total and lowest subtest scores are above their respective thresholds, the actual scores are not relevant because GED certification is certain, so coefficients β_{wrrj}, γ_{wrrj} and ϕ_{wrr} are not fitted, effectively constraining their values to be zero. The test score and subtest score functions are of order p, and we will consider p=2 (quadratic).

In fitting the corresponding outcome function, the structure parallels this closely, except that discontinuities are omitted because they are the excluded instruments used for identifying the model. The outcome equation is therefore written as:

$$(6)\ \ Y = \alpha_l + \tau\widehat{GED} + \sum_{j=1}^{p} \beta_{llj}[D_{Tl}D_{Sl}(T-2250)]^j + \sum_{j=1}^{p} \gamma_{llj}[D_{Tl}D_{Sl}(S-c)]^j$$

$$+\phi_{ll}[D_{Tl}D_{Sl}(T-2250)(S-c)]$$

$$+\sum_{j=1}^{p} \beta_{rlj}[D_{Tr}D_{Sl}(T-2250)]^j + \sum_{j=1}^{p} \gamma_{rlj}[D_{Tr}D_{Sl}(S-c)]^j$$

$$+\phi_{rl}[D_{Tr}D_{Sl}(T-2250)(S-c)]$$

$$+\sum_{j=1}^{p} \beta_{lrj}[D_{Tl}D_{Sr}(T-2250)]^j + \sum_{j=1}^{p} \gamma_{lrj}[D_{Tl}D_{Sr}(S-c)]^j$$

$$+\phi_{lr}[D_{Tl}D_{Sr}(T-2250)(S-c)]$$

[8] In many instances, test takers choose to skip at least one subtest. As might be expected, the linear relationship assumed for the lowest test score does not apply for scores of zero.

$$+\sum_{j=1}^{p}\beta_{rrj}[D_{Tr}D_{Sr}(T-2250)]^j+\sum_{j=1}^{p}\gamma_{rrj}[D_{Tr}D_{Sr}(S-c)]^j$$

$$+\phi_{rr}[D_{Tr}D_{Sr}(T-2250)(S-c)]+\phi_0 d_{s0}+X\eta_w+\mu.$$

Estimated coefficients are analogous to those in (5). The exceptions are $\beta_{rrj}, \gamma_{rrj}$ and ϕ_{rr} in (6), for which the analogous parameters are taken to be zero in equation (5)—reflecting the fact that all individuals with such scores receive GED certification. In (6) we must capture the relationship between the scores and the outcome when the GED criteria are satisfied.

Identification comes from the fact that the function in equation (6) is mostly smooth, reflecting our belief that a continuous function will identify the relationship between test scores and earnings, whereas the function determining GED receipt in equation (5) is not. As in the case of the single-dimension FRD model introduced above, the impact estimate is identified solely by the points of discontinuity, and the model fits the other relationships quite flexibly.

As stated previously, our basic sample includes individuals who first take the GED test in 1995 to 2005. We exclude test takers in 2006 through 2008 because these individuals do not have sufficient education data after their initial GED test score. In addition, the sample is limited to individuals with initial test scores between 1500 and 3000 because there is very little variation in GED receipt outside this range. These limitations eliminate 8 percent of the cases below the threshold and 12 percent of the cases above the threshold. For the remainder of the paper, we refer to the regression analysis sample as the full sample. Consistent with previous GED research, all regressions are estimated separately for men and for women.

The outcome variables consist of multiple measures of postsecondary education participation, as measured in each of the first 15 semesters (including summer semesters) after the first GED test attempt. The first set of dependent variables is a dichotomous variable for postsecondary attendance in each semester after the first GED test attempt. The second set of dependent variables is a dichotomous variable measuring completion of at least one class (including noncredit classes) in each semester. The third dependent variable is the number of credits completed in each semester. In addition, we also consider the total cumulative number of credits earned across all 15 semesters. This latter variable measures the amount of human capital acquired in postsecondary education. The fifth dependent variable is a dichotomous variable capturing the completion of a postsecondary award such as a certificate, an associate's degree, or a bachelor's degree at any time during the 15 semesters. Finally, we also look at our measures of postsecondary education separately for two-year and four-year institutions.

In each case, we identify GED certification at the time when the dependent variable is measured. For example, in examining enrollment in a particular semester, the GED certification is identified at the beginning of that semester. For cumulative outcomes such as total credits, GED certification is measured as of the beginning of the fifteenth semester.

Table 1 contains the descriptive statistics for the regression sample. Most test takers receive certification, and prior earnings (in current dollars) are low. Approximately one quarter of men and one third of women attend postsecondary education and complete a class. The average number of credits earned in the regression sample is six for men and 11 for women. Only two percent of men and four percent of women received a postsecondary award.

V. Results

Figure 2 illustrates the estimation methods underlying equations (1) and (2). The top panel is for men, and the bottom panel is for women. The figure contains the likelihood of GED receipt and the total number of credits received across semesters, both as functions of first GED test score. For both men and women, the discontinuity assumed in equation (1) is clearly present in the data, confirming that those who score just above the threshold on the overall GED score are appreciably more likely to have a GED within two years. The graph also illustrates a positive discontinuity in the number of postsecondary credits. The jump in values of the postsecondary credits and the GED receipt variables at the test score threshold provide graphical support for our use of the FRD model, as well as support for a positive effect of the GED on credits obtained.

Table 2 presents estimates of the first stage of the two-stage equation for the ninth semester after the initial GED test. The dependent variable is a dichotomous variable for passing the GED test, and the model is estimated as a linear regression. Note that the first-stage estimates for all second-stage outcomes (attendance, completion, and credits) are identical for a given semester because they are all based on the same sample and the same first-stage regression.[9] The discontinuity at the threshold is associated with a 34 percentage point increase in the likelihood that men obtain GED certification, whereas the number for women is 30 percentage points (see estimates for "discontinuity," which is denoted as α_{rl} in equation (1)). All the variables are significant at the one-percent level (two-sided test).[10]

Table A.1 contains results from the multiple regression discontinuity in equation (5). Being above the cutoff for both discontinuities is associated with increases in the likelihood of receiving the GED of 54 percentage points for men and 48 percentage points for women. Even though all students who are above the cutoff for both discontinuities receive the GED, the discontinuity is below 100 percent because students below the cutoff are able to pass the GED by retaking it. The coefficients for $D_{tl} D_{sr}$ indicates that even for those who have not passed the overall score requirement, if the lowest subtest score is just above the threshold this is associated with a 17 percentage point increase (18 for women) in the likelihood of receiving the GED. Similarly, the coefficient on $D_{tr} D_{sl}$ indicates that being just above the overall threshold increases the chance of GED receipt by about 8 percentage points (2.5 for women) even for those whose lowest subtest score does not exceed the required minimum.

Table 3 contains parameter estimates for the GED impact based on the single discontinuity as in equation (4) and the multiple discontinuities as in equation (6). The dependent variable is a dummy variable for public postsecondary attendance in each semester. The impact, τ, is identified by the discontinuity in $\widehat{GED}$ as shown in the

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[9] The first-stage results vary across semesters because the dependent variable is receipt of the GED at the start of the semester and students retake the GED. In addition, the sample size varies slightly because we do not have a full panel of 15 semesters for individuals first taking the GED test toward the end of our time period (1995 to 2005).
[10] All significance tests referenced below are two-sided tests.

equations. IV models are estimated using least squares regression models in each stage even when the dependent variable is binary. The coefficient and standard error are from a separate regression for each semester and sex. Standard errors are not clustered by GED test score, as suggested by Lee and Card (2008), because such clustering actually produces smaller standard errors.[11] [12]

For men, the GED is positively associated with postsecondary attendance in the first three semesters after taking the GED test, with significant effects in semesters 4 and 5 for the multiple discontinuity model only. The effect size is 2.8 to 3.0 percentage points in the first semester, 4.1 to 4.7 percentage points in the second semester, and 4.5 percentage points in the third semester. For semesters 4 and 5, the effect size is 1.4 to 1.8 percentage points in the single discontinuity model and 2.6 percentage points in the multiple discontinuity model. After two years (six semesters), the GED effect is close to zero and is not statistically significant even at the 10-percent level. The GED is associated with roughly a ten-percentage point increase in the likelihood of attendance at any time during the 15 semesters.

For women, the GED impact is larger and persists for more semesters. As with men, the largest coefficient is two semesters after the test, with an effect size of 9.0 to 9.6 percentage points. In each of the first six semesters, the effect is positive and statistically significant at either the five- or ten-percent level, and the effects in semesters 8 and 9 are significant only in the multiple discontinuity model. For semesters 10 through 15, the effect is 2.0 percentage points or less and is never statistically significant at the ten-percent level. The effect on attending at any point during the 15 semesters is approximately 20 percentage points.

For both men and women, the GED is associated with an initial increase, sometimes sizable, in postsecondary attendance for individuals near the passing threshold, but this

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[11] We do not estimate Huber-White robust standard errors because using the "robust" command in Stata also produces smaller standard errors than those reported in the tables. Thus, we use the non-clustered, non-robust standard errors because these standard errors are the largest, allowing us to be conservative in our estimated precision of the GED impact.

[12] Note that the results in Table 3 measure postsecondary attendance in terms of semesters, whereas the results in Jepsen, Mueser, and Troske (2015) measure all outcomes, including postsecondary attendance, in terms of quarters.

increase fades after one to two years. The point estimates are generally similar between the single and multiple discontinuity model, but the standard errors are slightly smaller in the multiple discontinuity model.

In Table 4, the dependent variable is a dummy variable equal to one when individuals complete at least one class (including non-credit classes) during the semester. The GED effects for completing a class are quite similar to the effects for postsecondary attendance, particularly for women. For men, the GED effects are between 2.7 and 4.7 percentage points in the first three semesters. In the multiple discontinuity model, the impact of 2.3 to 2.4 percentage points is statistically significant. For women, the effects are between 3.2 and 8.6 percentage points in the first six semesters. When the dependent variable is completing a class at any time in the 15 semesters after the first test, the GED impact is 8.8 to 10.4 percentage points for men and 16.6 to 17.8 percentage points for women.

The results for attendance and class completion suggest that, for students with test scores near the cutoff for passing, the GED has sizable impacts on getting high school dropouts into postsecondary classrooms. In Table 5, we focus instead on the amount of human capital obtained while enrolled. The dependent variable for the first 15 rows is the number of credits completed in each semester. In the bottom row of the table, the dependent variable is the cumulative number of credits earned across all semesters.

Consistent with the results for previous tables, the GED is associated with short-run increases in credits earned. For the first three semesters after the GED test, the estimated GED impact is 0.23 to 0.40 credits for men and 0.44 to 0.76 credits for women. In semesters 4 through 6, the estimated GED impact is between 0.24 and 0.4 credits for women, although the impacts in semesters 4 and 5 are statistically insignificant in the single discontinuity model at the ten-percent level. After this period, the GED effect is statistically significant from zero at the 10-percent level for only one coefficient. In all the outcomes measured, the GED is associated with a short-term increase in postsecondary attendance and human capital, with no discernable effect after three years (nine semesters).

Looking at the cumulative human capital effects, measured by total credits received, the GED impact is approximately two credits for men and six credits for women. However, the effect for men is imprecisely estimated and therefore is not statistically different from zero at the ten-percent level. Because a typical class is three credits, the effect can be translated into two-thirds of a class for men and nearly two classes for women. Put another way, the typical full-time course load in postsecondary education is approximately 30 credits. In terms of years of schooling, the effects are under 0.1 years for men and 0.2 years for women. Thus, the average human capital attainment as measured by credits is extremely modest.

Our final outcome measure is the receipt of an award. Public postsecondary institutions offer a variety of awards, from short-term certificates (usually available only in two-year institutions) to degrees at the undergraduate and graduate levels. Table 6 contains results for three dependent variables: (1) receiving any type of award, (2) receiving an award from a two-year institution, and (3) receiving an award from a four-year institution. As illustrated in Table 1, few GED test takers receive such awards. Thus, it is not surprising that the GED does not have a consistent, statistically significant effect on award receipt. Where the dependent variable is equal to one for the receipt of any type of award, coefficients in Table 6 are 0.3 to 1.1 percentage points for men and 1.5 to 2.3 percentage points for women, and all are statistically insignificant at the 10-percent level. Because most GED test takers attend two-year institutions, the effects are similar for awards given by two-year institutions, whereas the GED impacts for awards at four-year institutions are very close to zero (0.2 to 0.5 percentage points).

In Tables A.2 to A.4, we estimate the GED effects on attendance, course completion, and credits separately for two-year and four-year institutions. The tables only contain results from the single discontinuity model (equations 1 and 2); results for multiple discontinuity models are similar and are available from the authors upon request. For both men and women, the GED effects are much stronger for two-year institutions, very similar to the effects in Tables 3 through 5 for overall postsecondary education attendance and credits. As in previous tables, the effects are strongest in the first year (the first three semesters) for men and in the first two years (six semesters) for women.

There are some positive effects for four-year schools, particularly for women. The GED is associated with increased four-year attendance in the first two years, with effect sizes of 0.5 to 2.0 percentage points; the impact on attendance at any time is 4.7 percentage points. The course completion effects for women at four-year institutions are slightly weaker, with three statistically significant effects (10-percent level) in the first six semesters. The effect sizes are at most 1.7 percentage points for four-year schools, compared with effects sizes as large as 7.7 percentage points for two-year schools. For credits, there are significant effects in semester 3 (0.13 credits) and 6 (0.15 credits), although the latter effect is only significant at the 10-percent level. For men, the few significant results for four-year schools appear to be the result of randomness rather than evidence of consistent, significant impact of the GED on postsecondary outcomes at four-year schools.

When interpreting out results it is worth noting that our estimates are not the same as we would obtain by simply examining the relationship between postsecondary schooling and GED certification. This reflects the fact individuals are more likely to obtain postsecondary schooling if their initial test scores are higher whether or not they obtained GED certification. In fact, for both men and women, 1-3 percent of those with scores near the threshold attend postsecondary schooling in the first semester after taking the test even when they do not obtain a GED, but about 6 percent of individuals with initial tests scores between 2500 and 3000 do. For those who do obtain a GED, the numbers are 4-8 percent for those near the threshold and 8-12 percent for those with scores 2500-3000. It is clear that a simple comparison between those with GED certification and those without does not produce a causal impact.

If we were to simply compare those who had obtained GED certification controlling for initial score, we also expect to obtain a biased estimate, since those who with a given initial test score who ultimately obtain GED certification by taking the test again may differ in systematic ways from those who don't. In particular, if those who retake the test are particularly likely to attend postsecondary school even in the absence of certification, we expect a potentially substantial positive bias. In fact, we find that attendance differences between those receiving GED certification and those who do not, controlling for initial test score, are appreciably greater for later quarters than the estimates we obtain, very likely reflecting unmeasured differences.

As with any FRD design, our effect estimates are for compliers at the threshold, that is, test takers whose ultimate receipt of GED certification is determined by whether their initial score is above or below the threshold. If the impact is appreciably different for "always takers" (those who get certification regardless of whether they are above or below or the threshold) or "never takers" (those who fail to obtain certification regardless of whether they are above or below the threshold), this estimate may not reflect their returns. Similarly, if those who obtain scores far above the threshold gain more or less from GED certification, our estimates may be misleading. One might speculate that high scorers benefit more from the GED because they are most likely to attend postsecondary schooling. Although we cannot test this possibility directly, we might expect that GED certification would be particularly strongly associated with postsecondary attendance for those with higher initial tests score. In fact, our tabulations show that the relationship between postsecondary attendance and GED certification does not increase with higher test score (results available upon request).

VII. Conclusion

This paper investigates the relationship between GED receipt and multiple measures of postsecondary education. We use a fuzzy regression discontinuity method to estimate plausibly causal effects of the GED for individuals who have test scores near the threshold for passing the first time they attempt the GED test. We use a single-discontinuity model based on the overall test score and a multiple discontinuity model that includes the overall test score and lowest subtest score discontinuities. The results are quite similar for the two approaches.

We find large effects of the GED on the likelihood of attendance and class completion, especially at two-year institutions. The effects are roughly twice as large for women as for men. For example, the attendance effect in semester 2 is 4.7 percentage points for men and 9.6 percentage points for women (Table 3). The effects for credits completed are modest. In a given semester, the GED effect is no more than 0.4 credits for men and 0.8 credits for women. The cumulative effect on credits for the five years following the first test is around two credits (although not statistically different from zero at the ten-percent level) for men and six credits for women. The effect of the GED on postsecondary awards is inconclusive, probably reflecting the small percentage of awards received by GED test takers.

The pattern of results suggests that the GED is useful in helping individuals enroll in postsecondary institutions. This result is expected given that many postsecondary institutions *require* a GED (or high school degree) in order to enroll of their programs. However, the GED has much less pronounced effects on the amount of human capital obtained at these institutions. The modest increase in the number of credits earned after five years – approximately five credits for women and two credits for men – are unlikely to produce large labor-market effects. Our results provide valuable insight on the findings in Jepsen, Mueser, and Troske (2015), who find that the GED has a positive effect on postsecondary school attendance but no employment or earnings impacts. Understanding how to increase the human capital attainment of GED recipients – through increased attendance *and* increased duration of attendance – is vital to improving their future labor-market success.

VIII. References

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Table 1 – Descriptive Statistics for GED Test Takers 1995-2005

	Men	Women
GED Certification	80.4%	81.6%
Received Award	2.0%	4.5%
Nonwhite	21.6%	19.9%
Age at First Test	22.8 (8.1)	24.9 (9.7)
Prior Earnings	$1,702 ($2,849)	$1,481 ($2,338)

Semesters since 1st GED test	Men Attend Pct	Men Complete Class Pct	Men Credits Mean	Men Credits Std. Dev.	Men Obs.	Women Attend Pct	Women Complete Class Pct	Women Credits Mean	Women Credits Std. Dev.	Women Obs
1	5.2%	4.6%	0.39	(1.99)	44,378	7.9%	7.2%	0.62	(2.51)	41,967
2	6.0%	5.3%	0.46	(2.20)	44,378	9.4%	8.4%	0.73	(2.71)	41,967
3	5.7%	5.0%	0.44	(2.16)	44,378	9.6%	8.7%	0.76	(2.79)	41,967
4	4.8%	4.3%	0.37	(2.00)	44,378	8.2%	7.4%	0.64	(2.57)	41,967
5	4.6%	4.1%	0.35	(1.92)	44,378	7.6%	7.0%	0.59	(2.46)	41,967
6	4.4%	3.9%	0.35	(1.97)	44,378	7.6%	7.0%	0.60	(2.48)	41,967
7	3.9%	3.5%	0.29	(1.78)	44,378	6.7%	6.1%	0.51	(2.27)	41,967
8	3.7%	3.4%	0.28	(1.73)	44,378	6.3%	5.7%	0.47	(2.19)	41,967
9	3.6%	3.2%	0.28	(1.72)	44,378	6.4%	5.9%	0.49	(2.25)	41,967
10	3.2%	2.9%	0.23	(1.56)	44,378	5.9%	5.4%	0.43	(2.07)	41,967
11	3.2%	2.9%	0.24	(1.58)	43,290	5.6%	5.2%	0.42	(2.05)	40,989
12	3.2%	2.9%	0.24	(1.60)	42,404	5.7%	5.2%	0.43	(2.09)	40,235
13	2.9%	2.5%	0.20	(1.43)	41,178	5.4%	4.9%	0.39	(1.97)	39,092
14	2.8%	2.6%	0.21	(1.49)	40,087	5.2%	4.7%	0.37	(1.92)	38,010
15	2.8%	2.5%	0.21	(1.56)	39,332	5.0%	4.6%	0.37	(1.94)	37,207
Cumulative	24.3%	22.2%	6.52	(20.5)	39,332	34.8%	32.6%	11.6	(27.0)	37,207

Notes: Standard deviations for continuous variables are in parentheses.

Table 2 – Single Regression Discontinuity Equation Parameter Estimates for the Ninth Semester after the First Test, First Stage

Dependent Variable is GED Receipt

Dependent variable	Men			Women		
Is GED receipt	Coefficient	Std. Error		Coefficient	Std. Error	
D_{Tr} = Discontinuity	0.34086	(0.00675)	**	0.30101	(0.00664)	**
D_{Tr} (T-2250)	0.00190	(0.00004)	**	0.00251	(0.00005)	**
D_{Tl} (T-2250)	0.00060	(0.00003)	**	0.00056	(0.00003)	**
$[D_{Tr}\ (T\text{-}2250)]^2$	0.00205	(0.00007)	**	0.00289	(0.00008)	**
$[D_{Tl}\ (T\text{-}2250)]^2$	-0.00061	(0.00004)	**	-0.00056	(0.00003)	**
Observations	44,378			41,967		
Adjusted R-squared	0.5969			0.6142		

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Separate regressions are estimated for men and for women. Each regression also contains controls for earnings in each of the four quarters before initial GED test, a dummy variable for nonwhite, age, age squared, two dummy variables for the three semesters in a year, a dummy variable for each year the test was taken, and a constant. Variable names refer to the appropriate terms in equation (1).

Table 3: Estimated GED Impact on Postsecondary Attendance

Semesters since 1st GED test	Men						Women					
	Single Discont.			Multiple Discont.			Single Discont.			Multiple Discont.		
	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.028	(0.009)	**	0.030	(0.008)	**	0.055	(0.010)	**	0.052	(0.010)	**
2	0.047	(0.012)	**	0.041	(0.010)	**	0.096	(0.015)	**	0.090	(0.013)	**
3	0.045	(0.014)	**	0.045	(0.012)	**	0.075	(0.018)	**	0.074	(0.016)	**
4	0.014	(0.014)		0.026	(0.011)	**	0.034	(0.019)	*	0.043	(0.016)	**
5	0.018	(0.015)		0.026	(0.012)	**	0.045	(0.020)	**	0.058	(0.017)	**
6	0.016	(0.015)		0.018	(0.012)		0.039	(0.022)	*	0.041	(0.018)	**
7	-0.003	(0.014)		-0.002	(0.012)		0.033	(0.021)		0.021	(0.018)	
8	0.004	(0.014)		-0.0003	(0.012)		0.020	(0.021)		0.033	(0.017)	*
9	0.013	(0.014)		0.003	(0.012)		0.016	(0.022)		0.031	(0.018)	*
10	0.006	(0.014)		0.003	(0.011)		-0.0001	(0.021)		0.015	(0.017)	
11	0.016	(0.014)		0.007	(0.011)		-0.012	(0.022)		0.003	(0.018)	
12	0.017	(0.014)		0.0002	(0.012)		-0.009	(0.022)		-0.0005	(0.018)	
13	0.003	(0.014)		0.0003	(0.011)		0.007	(0.022)		0.006	(0.018)	
14	0.002	(0.014)		0.004	(0.012)		0.016	(0.022)		0.015	(0.018)	
15	0.003	(0.014)		0.008	(0.012)		0.002	(0.022)		0.020	(0.018)	
Any	0.086	(0.035)	**	0.105	(0.029)	**	0.209	(0.046)	**	0.187	(0.037)	**

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Table 4: Estimated GED Impact on Postsecondary Course Completion

Semesters since 1st GED test	Men						Women					
	Single Discont.			Multiple Discont.			Single Discont.			Multiple Discont.		
	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.027	(0.008)	**	0.030	(0.007)	**	0.050	(0.010)	**	0.049	(0.009)	**
2	0.047	(0.012)	**	0.039	(0.010)	**	0.086	(0.014)	**	0.080	(0.013)	**
3	0.044	(0.013)	**	0.043	(0.011)	**	0.066	(0.018)	**	0.069	(0.015)	**
4	0.013	(0.013)		0.024	(0.011)	**	0.032	(0.018)	*	0.035	(0.016)	**
5	0.018	(0.014)		0.023	(0.011)	**	0.038	(0.020)	*	0.047	(0.016)	**
6	0.010	(0.014)		0.013	(0.011)		0.041	(0.021)	**	0.047	(0.017)	**
7	0.0002	(0.014)		0.001	(0.011)		0.033	(0.021)		0.018	(0.017)	
8	0.003	(0.014)		-0.001	(0.011)		0.023	(0.020)		0.029	(0.017)	*
9	0.006	(0.014)		-0.001	(0.011)		0.007	(0.021)		0.022	(0.017)	
10	0.005	(0.013)		0.004	(0.011)		-0.001	(0.020)		0.008	(0.017)	
11	0.013	(0.013)		0.004	(0.011)		-0.014	(0.021)		0.007	(0.017)	
12	0.018	(0.014)		0.003	(0.011)		-0.014	(0.021)		0.009	(0.017)	
13	0.003	(0.013)		0.0005	(0.011)		0.009	(0.021)		0.005	(0.017)	
14	-0.005	(0.013)		#####	(0.011)		0.005	(0.021)		0.009	(0.017)	
15	0.003	(0.013)		0.004	(0.011)		-0.0001	(0.021)		0.017	(0.017)	
Any	0.088	(0.034)	**	0.104	(0.028)	**	0.178	(0.045)	**	0.166	(0.037)	**

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Table 5: Estimated GED Impact on Postsecondary Credits Completed

Semesters since 1st GED test	Men						Women					
	Single Discont.			Multiple Discont.			Single Discont.			Multiple Discont.		
	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.23	(0.08)	**	0.24	(0.07)	**	0.45	(0.10)	**	0.44	(0.09)	**
2	0.40	(0.12)	**	0.30	(0.10)	**	0.75	(0.14)	**	0.75	(0.12)	**
3	0.29	(0.13)	**	0.30	(0.11)	**	0.74	(0.17)	**	0.76	(0.15)	**
4	0.05	(0.13)		0.16	(0.11)		0.28	(0.18)		0.31	(0.15)	**
5	0.13	(0.13)		0.20	(0.11)	*	0.24	(0.19)		0.42	(0.16)	**
6	0.08	(0.14)		0.13	(0.11)		0.41	(0.20)	**	0.43	(0.17)	**
7	-0.03	(0.13)		0.03	(0.11)		0.28	(0.19)		0.18	(0.16)	
8	0.08	(0.13)		0.01	(0.11)		0.08	(0.19)		0.24	(0.16)	
9	0.09	(0.13)		0.00	(0.11)		0.12	(0.20)		0.28	(0.16)	*
10	0.09	(0.12)		0.06	(0.10)		0.03	(0.19)		0.01	(0.15)	
11	0.12	(0.12)		0.06	(0.10)		-0.26	(0.20)		-0.09	(0.16)	
12	0.15	(0.13)		0.08	(0.11)		-0.13	(0.20)		0.10	(0.16)	
13	0.00	(0.12)		0.07	(0.10)		0.02	(0.19)		-0.02	(0.16)	
14	-0.03	(0.13)		0.01	(0.10)		-0.13	(0.19)		0.02	(0.16)	
15	0.02	(0.13)		0.03	(0.11)		-0.15	(0.20)		-0.05	(0.16)	
Cumulative	2.00	(1.69)		1.95	(1.42)		5.99	(2.65)	**	5.78	(2.15)	**

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Table 6: Estimated GED Impact on Postsecondary Award Receipt

	Men				Women			
	Single Discont.		Multiple Discont.		Single Discont.		Multiple Discont.	
Award type	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Any award	0.011	(0.011)	0.003	(0.009)	0.023	(0.020)	0.015	(0.016)
2-year award	0.009	(0.010)	-0.001	(0.008)	0.021	(0.018)	0.013	(0.015)
4-year award	0.002	(0.006)	0.004	(0.005)	0.005	(0.010)	0.005	(0.008)

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. In each regression, the number of observations is 44,378 for men and 41,967 for women.

Table A.1 – Multiple Regression Discontinuity Equation Parameter Estimates, First Stage

Dependent Variable is GED Receipt

Dependent variable	Men			Women		
Is GED receipt	Coefficient	Std. Error		Coefficient	Std. Error	
$D_{Tr}D_{Sr}$ = Double discontinuity	0.544	(0.00745)	**	0.483	(0.00779)	**
$D_{Tl}D_{Sr}$	0.170	(0.02139)	**	0.179	(0.02160)	**
$D_{Tr}D_{Sl}$	0.079	(0.01346)	**	0.025	(0.01406)	*
$D_{Tl}D_{Sl}$ (T-2250) (S-c) / 1000	-0.0003	(0.00016)	*	-0.00222	(0.00023)	**
$D_{Tl}D_{Sr}$ (T-2250) (S-c) / 1000	0.07962	(0.02132)	**	-0.06333	(0.01916)	**
$D_{Tr}D_{Sl}$ (T-2250) (S-c) / 1000	-0.00075	(0.00036)	**	-0.00161	(0.00068)	**
$D_{Tl}D_{Sl}$ (T-2250)	0.001874	(0.00005)	**	0.002163	(0.00006)	**
$D_{Tl}D_{Sl}$ (S-c)	-0.001469	(0.00020)	**	0.000172	(0.00022)	
$D_{Tl}D_{Sr}$ (T-2250)	0.003477	(0.00049)	**	0.004339	(0.00047)	**
$D_{Tl}D_{Sr}$ (S-c)	0.001406	(0.00223)		-0.004219	(0.00201)	**
$D_{Tr}D_{Sl}$ (T-2250)	0.000589	(0.00011)	**	0.000585	(0.00011)	**
$D_{Tr}D_{Sl}$ (S-c)	0.001353	(0.00031)	**	0.003218	(0.00033)	**
$[D_{Tl}D_{Sl}\text{ (T-2250)}]^2$	0.001543	(0.00009)	**	0.002397	(0.00012)	**
$[D_{Tl}D_{Sl}\text{ (S-c)}]^2$	-0.001413	(0.00106)		0.008078	(0.00126)	**
$[D_{Tl}D_{Sr}\text{ (T-2250)}]^2$	0.003767	(0.00260)		0.005824	(0.00241)	**
$[D_{Tl}D_{Sr}\text{ (S-c)}]^2$	-0.000656	(0.06368)		0.018208	(0.05331)	
$[D_{Tr}D_{Sl}\text{ (T-2250)}]^2$	-0.000609	(0.00023)	**	-0.000678	(0.00024)	**
$[D_{Tr}D_{Sl}\text{ (S-c)}]^2$	0.002582	(0.00112)	**	0.012631	(0.00130)	**
d_{S0} = Lowest subtest score is ze	0.056727	(0.10921)		-0.573492	(0.13593)	**
Observations	44,378			41,967		
Adjusted R-squared	0.6569			0.6784		

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Separate regressions are estimated for men and for women. Each regression also contains controls for earnings in each of the four quarters before initial GED test, a dummy variable for nonwhite, age, age squared, two dummy variables for the three semesters in a year, a dummy variable for each year the test was taken, and a constant. Variable names refer to the appropriate terms in equation (5).

Table A.2: Estimated GED Impact on Postsecondary Attendance, by School Type

Single Discontinuity Model

Semesters	Men						Women					
Since 1st	Two-year schools			Four-year schools			Two-year schools			Four-year schools		
GED Test	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.026	(0.008)	**	0.002	(0.003)		0.049	(0.007)	**	0.005	(0.002)	**
2	0.039	(0.012)	**	0.008	(0.005)	*	0.085	(0.013)	**	0.012	(0.003)	**
3	0.040	(0.013)	**	0.005	(0.005)		0.065	(0.014)	**	0.010	(0.005)	**
4	0.009	(0.013)		0.006	(0.006)		0.027	(0.014)	**	0.008	(0.004)	*
5	0.009	(0.013)		0.010	(0.006)	*	0.035	(0.016)	**	0.011	(0.005)	**
6	0.008	(0.014)		0.008	(0.006)		0.020	(0.018)		0.020	(0.006)	**
7	-0.008	(0.013)		0.006	(0.006)		0.029	(0.020)		0.004	(0.005)	
8	-0.006	(0.013)		0.010	(0.007)		0.025	(0.022)		-0.004	(0.005)	
9	0.002	(0.013)		0.011	(0.007)		0.021	(0.015)		-0.005	(0.006)	
10	0.002	(0.012)		0.005	(0.007)		0.000	(0.018)		0.001	(0.005)	
11	0.012	(0.012)		0.006	(0.007)		-0.012	(0.013)		0.000	(0.008)	
12	0.016	(0.012)		0.003	(0.007)		-0.011	(0.017)		0.003	(0.008)	
13	-0.002	(0.012)		0.006	(0.007)		-0.006	(0.015)		0.015	(0.005)	**
14	0.001	(0.012)		0.001	(0.007)		0.020	(0.015)		-0.004	(0.008)	
15	0.004	(0.012)		-0.001	(0.008)		0.002	(0.016)		0.001	(0.008)	
Any	0.073	(0.034)	**	0.021	(0.018)		0.165	(0.045)	**	0.046	(0.025)	*

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Table A.3: Estimated GED Impact on Postsecondary Course Completion, by School Type
Single Discontinuity Model

Semesters Since 1st GED Test	Men						Women					
	Two-year schools			Four-year schools			Two-year schools			Four-year schools		
	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.046	(0.010)	**	0.002	(0.003)		0.046	(0.010)	**	0.004	(0.003)	
2	0.077	(0.014)	**	0.007	(0.005)		0.077	(0.014)	**	0.009	(0.005)	*
3	0.055	(0.017)	**	0.006	(0.005)		0.055	(0.017)	**	0.011	(0.006)	*
4	0.025	(0.017)		0.005	(0.005)		0.025	(0.017)		0.008	(0.007)	
5	0.031	(0.018)	*	0.009	(0.006)		0.031	(0.018)	*	0.006	(0.007)	
6	0.025	(0.020)		0.008	(0.006)		0.025	(0.020)		0.017	(0.008)	**
7	0.029	(0.019)		0.006	(0.006)		0.029	(0.019)		0.003	(0.008)	
8	0.023	(0.019)		0.009	(0.006)		0.023	(0.019)		0.001	(0.008)	
9	0.014	(0.019)		0.011	(0.007)	*	0.014	(0.019)		-0.006	(0.009)	
10	-0.005	(0.018)		0.005	(0.007)		-0.005	(0.018)		0.003	(0.009)	
11	-0.014	(0.019)		0.003	(0.007)		-0.014	(0.019)		-0.002	(0.010)	
12	-0.014	(0.019)		0.002	(0.007)		-0.014	(0.019)		0.001	(0.011)	
13	-0.002	(0.019)		0.004	(0.007)		-0.002	(0.019)		0.011	(0.011)	
14	0.009	(0.018)		0.000	(0.007)		0.009	(0.018)		-0.004	(0.011)	
15	-0.001	(0.018)		-0.001	(0.007)		-0.001	(0.018)		0.004	(0.011)	
Any	0.070	(0.032)	**	0.023	(0.018)		0.141	(0.044)	**	0.036	(0.024)	

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Table A.4: Estimated GED Impact on Postsecondary Credits Completed, by School Type
Single Discontinuity Model

Semesters	Men						Women					
Since 1st	Two-year schools			Four-year schools			Two-year schools			Four-year schools		
GED Test	Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.		Coeff.	Std. Err.	
1	0.20	(0.07)	**	0.03	(0.03)		0.42	(0.09)	**	0.03	(0.04)	
2	0.35	(0.11)	**	0.05	(0.05)		0.67	(0.13)	**	0.08	(0.05)	
3	0.23	(0.12)	*	0.05	(0.06)		0.61	(0.16)	**	0.13	(0.07)	**
4	0.01	(0.12)		0.04	(0.05)		0.23	(0.17)		0.05	(0.07)	
5	0.04	(0.12)		0.08	(0.06)		0.19	(0.18)		0.05	(0.08)	
6	0.02	(0.13)		0.06	(0.07)		0.26	(0.19)		0.15	(0.09)	*
7	-0.09	(0.12)		0.06	(0.06)		0.27	(0.18)		0.00	(0.08)	
8	-0.04	(0.11)		0.12	(0.07)	*	0.08	(0.17)		0.00	(0.09)	
9	0.00	(0.11)		0.09	(0.07)		0.18	(0.18)		-0.07	(0.10)	
10	0.06	(0.10)		0.03	(0.07)		-0.01	(0.16)		0.04	(0.10)	
11	0.08	(0.10)		0.05	(0.07)		-0.14	(0.16)		-0.12	(0.11)	
12	0.17	(0.10)	*	-0.03	(0.08)		-0.13	(0.17)		0.00	(0.12)	
13	-0.04	(0.09)		0.04	(0.07)		-0.03	(0.16)		0.05	(0.11)	
14	-0.03	(0.10)		0.00	(0.08)		-0.06	(0.16)		-0.06	(0.12)	
15	0.06	(0.10)		-0.05	(0.09)		-0.17	(0.16)		0.02	(0.12)	
Cumulative	1.27	(1.22)		0.73	(1.01)		5.35	(2.07)	**	0.63	(1.47)	

Notes:* and ** denote statistical significance at the ten- and five-percent level for a two-sided test, respectively. Each combination of a coefficient and standard error is from a separate regression. For each semester and gender, the number of observations matches the number of observations in Table 1.

Figure 1: Distribution of First and Final Test Scores, 1995-2005

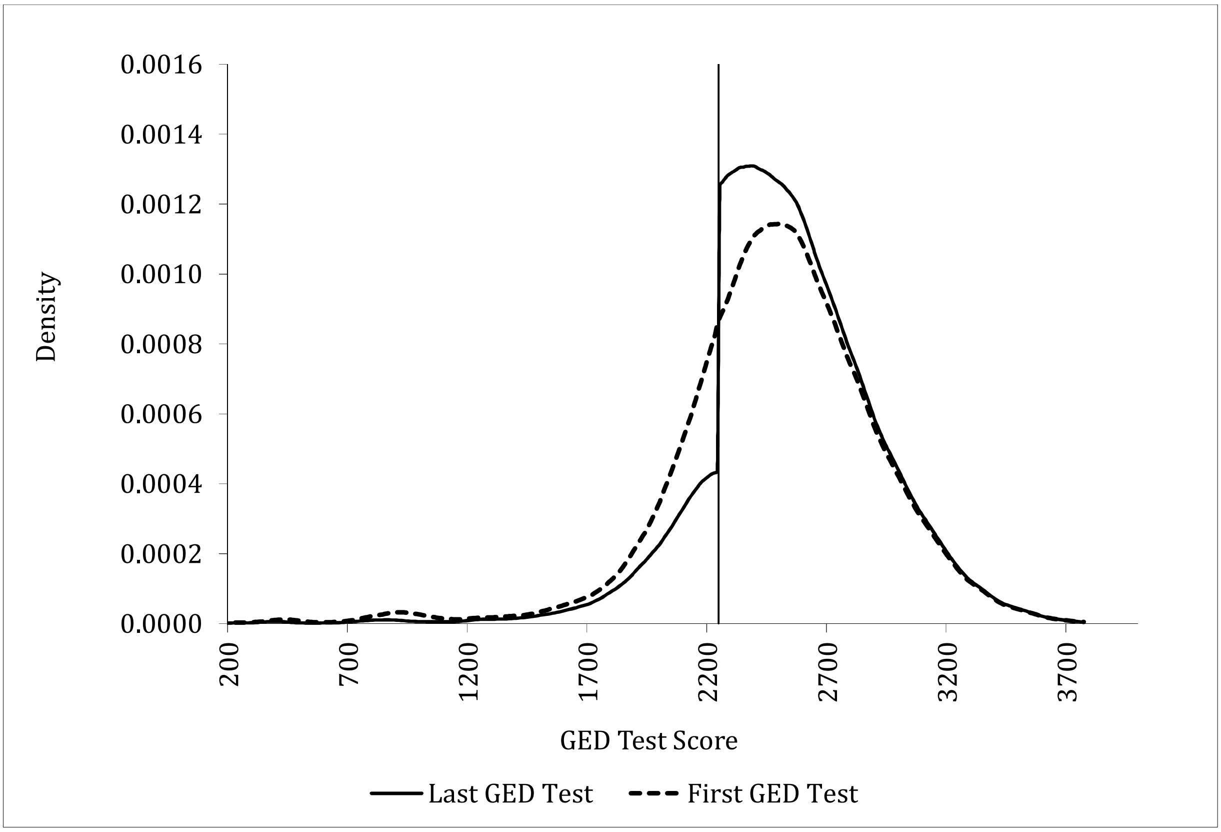
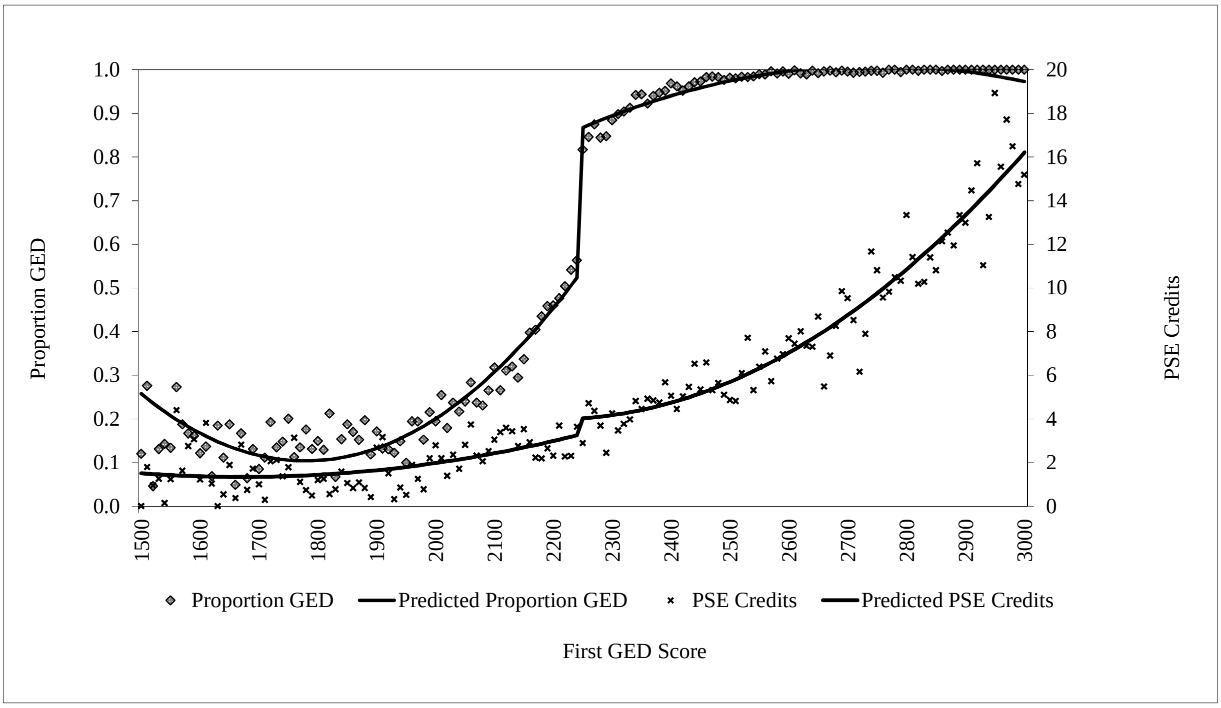


Figure 2 – Regression Discontinuity Models Predicting GED and Postsecondary Credits

Men



Women