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TAKING THE EASY WAY OUT:
HOW THE GED TESTING PROGRAM INDUCES STUDENTS TO DROP OUT

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ABSTRACT

We exploit an exogenous increase in General Educational Development (GED) testing requirements
to determine whether raising the difficulty of the test causes students to finish high school rather than
drop out and GED certify. We find that a six point decrease in GED pass rates induces a 1.3 point
decline in overall dropout rates. The effect size is also much larger for older students and minorities.
Finally, a natural experiment based on the late introduction of the GED in California reveals, that adopting
the program increased the dropout rate by 3 points more relative to other states during the mid-1970s.

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1 Introduction

Since the publication of *A Nation at Risk* in 1983, educational policy has shifted towards establishing minimum competency tests and elevated high school graduation requirements. One often-expressed fear is that higher requirements might cause more students to drop out rather than graduate. Facing rising costs for obtaining a formal high school diploma, many students may search for alternative methods to complete their secondary schooling.

One widely used alternative to graduation is General Educational Development (GED) certification. GED credentials accounted for as many as 15-18% of all high school credentials issued in the U.S. until the test was made harder in 2002 (see Figure 1). Table 1 describes the five GED sub-tests. As currently configured, the GED is a 7 1/2 hour multiple choice test that high school dropouts take to certify that they are the academic "equivalents" of students who remain in high school and graduate. Obtaining a GED is much easier than staying in school and graduating in the traditional fashion. The median preparation time for the exam is only 20-30 hours and the focus is on general knowledge and not specific facts learned in school (Malizio and Whitney, 1981). The test measures concepts at or below the ninth grade level and, for many years, GED minimum passing scores on each sub-test were set only slightly above what could be achieved by chance (Quinn, 2008).

This paper examines the effect of variation in GED passing standards on high school dropping out and GED certification rates. Conditional on meeting certain age requirements, GED certification offers the option of dropping out of high school and exam certifying rather than graduating. In our main analysis, we exploit the timing of an exogenously mandated change in GED passing standards in 1997 to explore the relationship between high school continuation decisions and the relative cost of GED certification.

A large literature documents the low labor market returns to GED certification.[1] Relatively few papers have addressed whether the availability of the GED option might induce some students to drop out of school rather than graduate. Only two papers provide empir-

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[1]See, e.g., Cameron and Heckman (1993) and Heckman and LaFontaine (2006).

ical evidence on this question. Both Chaplin (1999) and Lillard (2001) estimate the effect of the GED option on high school continuation and dropout rates by exploiting cross-state variation in GED testing policies over time. Controlling for state, year and age fixed effects, both authors find that many state GED policies are statistically significant predictors of high school continuation rates. Policies that provide exemptions to age restrictions for GED testing or that make the GED relatively more easy to pass are generally found to lower high school continuation rates. States with lower GED requirements are also found to have higher GED test-taking rates.

One potential problem with the identification strategies employed in previous studies is that they assume that variation in the GED requirements are exogenously determined by states. If states change GED requirements in response to changes in state-level dropout rates, estimates will be biased.

We avoid this potential endogeneity problem by exploiting a natural experiment. In 1997, the GED Testing Service mandated that all states meet new minimum and mean score requirements. The new passing requirement was set so that all GED candidates were required to score a minimum of 40 on each test and a mean of 45 across all five tests in order to obtain the credential. This national mandate forced some states to raise passing standards while other states were unaffected. We exploit this variation in our estimation strategy. In states that were required to raise standards, acquiring a GED credential suddenly became more difficult. This change may cause some students at the margin of dropping out to stay in school and graduate rather than pursue the now more costly GED option.

We find that students react strongly to changes in GED requirements. Difference-in-difference estimates show that a 6 percentage point decrease in the probability of passing the GED causes a statistically significant 1.3 percentage point decline in the overall dropout rate. This translates into roughly 40,000 fewer dropouts per year for these cohorts. We find even stronger effects for older students who are less restricted in their GED testing and school leaving decisions. The percentage of students enrolled in 12th grade who do not

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graduate declines by 3 points more in states that were required to raise GED requirements relative to those that were not required to. As expected, students enrolled in lower grade levels are largely unaffected due to age restrictions on GED testing and school leaving.

GED policy changes also have larger effects on minorities because at any grade they tend to be older and hence less subject to minimum age requirements and further behind majority students in meeting graduation requirements. The percentage of blacks and Hispanics enrolled in 12th grade who fail to graduate decreases by 4.8 and 6.2 points respectively. By comparison, the white dropout rate declines by 1.3 percentage points. This explains part of the higher GED certification rates among minorities documented in Cameron and Heckman (1993).

A natural experiment based on the introduction of the GED program in California produces an estimate of how much abolishing the GED program would raise graduation rates. In 1974, California became the last state to award a high school equivalency diploma to civilians who successfully passed the GED.[2] Prior to establishing the GED, California had statistically significantly higher graduation rates than the rest of the U.S. After adopting the GED program, California graduation rate levels immediately fell to match those in other states. While graduation rates also fell in the rest of the country, difference-in-difference estimates show that high school graduation fell by 3 percentage points more in California compared to the rest of the U.S. during this time.

Our overall findings agree qualitatively with those of previous studies in showing that the GED induces youth out of school, but our estimated effect sizes are generally smaller. For example, Lillard (2001) estimates that a change in requirements of the magnitude analyzed in this paper would lower dropout rates by 1.9 points compared to our estimate of 1.3. This suggests that previous estimates may be biased by potential endogeneity in the timing of GED policy changes. Our finding that minorities and males are more strongly affected by GED policy changes is new to the literature. We also provide the first empirical estimates

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[2]Prior to 1974, the GED program in California was restricted to veterans and military personnel.

of the effect of completely eliminating the GED program on high school graduation rates.

This paper proceeds as follows. Section two presents evidence on the relationship between GED policies and dropout rates. Section three discusses the 1997 GED policy change we analyze and motivates our empirical analysis by examining GED testing and dropout trends before and after the change. Section four presents a state level fixed effect model that refines the difference-in-difference estimates of Section three. Section five presents empirical estimates of the impact of the 1997 changes on dropout rates based on this model. Section six estimates the effect of eliminating the GED program on dropout rates using the introduction of the GED program in California as a natural experiment. Section seven concludes with a discussion of our main findings and their implications for policy.

2   Preliminary Evidence on the Effects of GED Policies and Incentives

Despite the lower level of academic preparation required, the GED Testing Service (GEDTS) heavily promotes its credential as the equivalent of a traditional high school diploma (Quinn, 2008). As a result, GED credentials are perceived as an attractive alternative to graduating from high school by many students. Evidence on this point is provided by a recent NCES study. The Education Longitudinal Study (ELS) follows a representative sample of 10th graders enrolled in the spring of 2002 through graduation and beyond. In the spring of 2004, the study asked those not enrolled in school who had not received a regular high school diploma why they decided to drop out. See Table 2. Over 40% of dropouts stated that they did not complete high school because they "thought it would be easier to get a GED." This was the second most cited reason behind "missed too many school days" (43.5%). It also placed far above what are commonly believed to be primary reasons for dropping out of school such as pregnancy (27.8%), work (27.8%) and marriage (6.8%).[3]

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[3]Answers are not necessarily mutually exclusive and therefore percentages do not sum to one hundred.

The close relationship between trends in GED testing among school age youth and the national dropout rate provide empirical evidence supporting student responses to the ELS survey. Figure 2 plots the dropout rate series both including and excluding GED recipients as graduates. It also plots the percentage of GED test takers ages nineteen or under in each year. Increases in the fraction of students who choose not to complete high school are associated with rising GED test taking among secondary school-age youth. Both time series move together in response to national GED policy changes. When GED age requirements are decreased, or passing standards are lowered, both GED testing rates for the young and dropout rates rise. When standards and age requirements are increased, dropout rates fall and GED testing by the young declines.

As shown in Heckman and LaFontaine (2008a), the dropout rate that includes GED recipients as dropouts reached historic lows in the early 1970s and rose afterward. In contrast, the dropout rate that counts GEDs as high school graduates, steadily declines over the entire period. In the first few years depicted, the two measures are nearly equal. They begin to diverge sharply after 1970, coinciding with the rapid expansion of the GED testing program (Figure 1).

During the early 1970s, states began to eliminate age restrictions on GED testing in an attempt to make GED credentials more accessible to young dropouts (Quinn, 2008). Prior to this time, most states required that individuals be at least 20 years old in order to take the GED. Another important change that occurred in 1970 was that Adult Basic Education (ABE) programs began targeting younger populations by lowering the minimum age requirement for participation from 18 to 16 (Heckman and LaFontaine, 2008b). In the same year, Adult Secondary Education (ASE) programs were introduced as well. These programs are major producers of GED credentials. In 1972, 20% of GED credentials issued each year were through ABE programs and this grew to over 40% by 1980 (Heckman and LaFontaine, 2008b).

Following these changes, both the dropout rate and the percentage of young GED test

takers began to rise. While data on the percentage of test takers nineteen and under is not available until 1974, Figure 3 shows that the average age of GED testing dropped precipitously in the early 70s. In 1970, the average GED test taker was 29 years old while only three years later the average age declined to only 25.[4] The average age has remained low since then except for a sharp increase in 1974 that coincides with the introduction of Pell grants financing higher education, which initially required at least a GED to qualify.[5]

Lowering age requirements made the GED an attractive option for dropouts. This evidence does not answer the question of whether or not the GED induces students to drop out of school. However, it is interesting to note that dropout rates increased the most during the early 1970s and have never been as low as they were before age restrictions on GED testing were removed.

3   1997 GED Policy Changes

Although the survey and time series evidence on the relationship between GED testing and youth dropout behavior is strongly suggestive, it does not determine whether the observed relationships are causal. To obtain parameter estimates with a causal interpretation, we exploit exogenous variation in the difficulty of passing the GED arising from a nationally mandated toughening of GED passing score requirements in 1997. Prior to that year, states fell into one of three groups: (1) 19 states with a requirement of a minimum score of 40 on each sub-test and a mean score of 45 across all sub-tests; (2) 26 states with a 35 minimum and 45 mean requirement and; (3) a group of 5 states where GED candidates had to achieve a 40 minimum on each test and/or a mean score of 45 across all tests.

Starting January 1st 1997, all states had to meet the new standard of a minimum score

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[4]Heckman and LaFontaine (2008a) show that the baby boom and the subsequent baby bust only account for a small portion of the variation in average age of GED test takers.

[5]The Federal Pell Grant Program provides need-based grants to low-income undergraduate and certain post-baccalaureate students to promote access to postsecondary education. (U.S. Department of Education Website, http://www.ed.gov/programs/fpg/index.html). The sharp rise in the average age in 1974 was possibly due to a pent up demand for college among older dropouts.

of 40 on each test and a mean score of 45. This standard forced the second group of states to raise their minimum score requirement on each test from 35 to 40 and the third group of states to eliminate the and/or scoring option. The first group of states that previously met the new standards did not change requirements. Figure 4 shows the geographic distribution of the states by type.

According to a norming study conducted by the American Council on Education, only 67% of graduating high school seniors are able to meet a minimum score requirement of 40 and a mean score requirement of 45. A minimum of 35 and a mean of 40 was obtained by 69% and 73% scored at the 40 and/or mean of 45 threshold. See Table 3. Therefore, the change in difficulty of passing the GED was far greater in the third group relative to the other two. This is also evident from the actual observed changes in pass rates in the three types of states before and after 1997. See the far right-hand column of Table 3.

Due to the much larger change in difficulty of obtaining the GED, we will use this third group of 5 states as our "treatment" group. The "control" group is the set of states that were not required to raise their GED passing requirements.[6] In our analysis, we compare GED testing and dropout rates in treatment and control states in the years 1994-1996 to the same rates measured in 1998-2000. We exclude 1997 from our empirical analysis because the change in GED requirements occurred in the middle of the school year. The reform could cause some students to drop out and take the GED early in the year and others to stay in school after the requirements were changed later in the same year.

For this analysis, we compute three measures of annual dropout rates using the Common Core of Data (CCD) and a methodology similar to that developed by Kominski (1990).[7] The measures are: (1) the *overall dropout* rate, defined as the percentage of students enrolled in

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[6]In the appendix to this paper, we use the group of states that were required to minimally raise the difficulty of obtaining a GED to test the exogeneity assumption. The results from this analysis are consistent with the results reported in the text.

[7]The Common Core of Data (CCD) are collected from state departments of education and contain the number of students enrolled in each grade level in a given year in each state, as well as the number of high school diplomas issued in that year. From these annual counts, approximate annual exit rates from each grade can be computed. See the appendix for more details on the construction of these measures.

the 10th, 11th and 12th grades in year t who are not enrolled and have not graduated in year $t + 1$; (2) the *lower level* dropout rate, defined as the percentage of students enrolled in 10th and 11th grades in year t who are not enrolled in year $t + 1$; and (3) the *upper level* dropout rate, given by the percentage of students enrolled in 12th grade in year t who did not graduate in year $t + 1$.[8] These rates are yearly exit rates from school and therefore differ in levels from more commonly reported cohort dropout rates (See e.g. Heckman and LaFontaine, 2008a). All dropout rate calculations are then weighted by the fraction of the U.S. 15-17 year old population that resides in each state for our sample period. Figure 5 plots our measures of GED test taking and dropout rates by year in treatment and control states during our sample period.[9]

We define dropout rates in this manner for the following reasons. First, we need to compute yearly exit rates from schooling to capture the timing of the school leaving decision before and after the GED policy change. Second, we seek to examine whether there are differential effects by grade and age.[10] If students are dropping out to take the GED, we would expect to find larger effects for students enrolled in upper grade levels since they are older and less restricted by school leaving and GED testing age requirements. Third, these measures are less sensitive to migration than estimated cohort rates at the state level. Cohort dropout and graduation rates are generally calculated on the basis of up to 5 year lags of enrollment and diploma counts (e.g. diplomas issued in the spring of year t over fall 8th grade enrollment in year t-5). Our exit rates are only lagged one year and therefore less sensitive to migration.[11] Finally, high rates of 9th grade retention make it difficult to

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[8]The labels "overall", "lower" and "upper" are our own and are not based on any official definitions. All formulas used to compute each of the dropout rate measures are included in the appendix.

[9]The plots by race are available in the web appendix. Data on GED testing by age is from the 1994-2000 GED Statistical reports (See GED Testing Service, Various). Population totals by age are obtained from the Census bureau.

[10]The age of students is not available in CCD data so we use the grade level as a proxy measure.

[11]A 1997 immigration reform generally made it more difficult to legally emigrate and reside in the U.S. To test the sensitivity of our Hispanic estimates to this reform, we compare Hispanic dropout rates in high immigration control states to the large estimates we find in treatment states. We find no significant declines in dropout rates in these control states suggesting that bias due to migration is minimal. See the appendix for these results.

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calculate yearly exit rates between that grade and 10th grade. Students enrolled in 9th grade are also almost universally younger than 16 and therefore not allowed to take the GED test in all states.

If high school students respond to changes in GED score requirements, we would expect to find an increase in GED testing in states facing a tough reform in the period just prior to implementation of the requirements. We would also expect lower levels of GED test taking in the years following the adoption of the new requirements. Figure 6 presents the average GED test taking rate by age pre- and post-1997. The unadjusted mean difference-in-difference estimates and standard errors are also reported for each age group at the top of the figure. For the control group, average GED testing rates remained essentially flat over the two periods for all age groups. In contrast, treatment group states exhibit a sharp decline in GED testing post-1997. This decline is particularly marked for the older cohorts (ages 18-19) since they face fewer legal restrictions in both leaving school and taking the GED test. The estimated change in the treatment group GED test taking rate for the older cohorts relative to that of the control group is about 0.74 points and is statistically significant at the 1% level.[12] This is a 20% decline relative to the average GED test taking rate in treatment states prior to the change. Also, before raising passing requirements, treatment group states had much higher GED testing rates than did states in the control group. This difference in GED testing levels is nearly eliminated following the toughening of GED requirements in treatment states.

The overall dropout rates pre- and post-1997 across all races in both control and treatment states are presented in Figure 7. Unadjusted difference-in-difference estimates and standard errors are again reported at the top of each set of figures. The overall dropout rate declines sharply across all race groups in the treatment states, with the largest declines occurring for blacks and Hispanics.[13] The estimated change in the 10th-12th grade dropout rate across

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[12]All standard errors are Huber-White robust standard errors clustered by state.

[13]The estimates by race are not directly comparable with the 'all races' category since the former include fewer states as a result of missing enrollment data by race. All estimates by race are restricted to the same sub-sample of states.

all races combined is -1.3% and is statistically significant at the 1% level. The equivalent effect for whites is -0.5 percentage points whereas for blacks and Hispanics it is -0.9 and -1.7 percentage points respectively, although only statistically significant for Hispanics.

In contrast to the overall effect, the lower level dropout rate in treatment states does not show any significant declines. See Figure 8. Lower level dropout rates decline in both treatment and control states for whites, blacks and Hispanics and none of the difference-in-difference estimates are statistically significantly different from zero.

As we saw for GED test taking rates, the estimated effect of the GED reform on dropout rates is the largest for older students. See Figure 9. The estimated change in the 12th grade dropout rate across all race groups combined is 3.1 points and is statistically significant at the 1% level. As with the overall dropout rate, minorities show the largest effects. Whereas the 12th grade dropout for whites decreases by 1.4 points, black and Hispanic dropout rates decline by 4.4 and 7 points more in treatment states, respectively. Nearly all of the decline in dropout rates following the toughening of GED standards in treatment states is being driven by students enrolled in 12th grade deciding to remain in school rather than pursue the now more costly GED.

Students enrolled in lower grade levels in treatment states provide a second control group in our analysis. Most of this group is not affected by changes in GED requirements because they are too young to take the GED test without obtaining a special exemption.[14] The finding that the lower level dropout rate declines only slightly while upper level rates drop sharply in response to the reform is further evidence that we have isolated a causal estimate of the effect of mandated changes in GED passing standards on dropping out and not a spurious relationship driven by changes in educational inputs that affect all students (*e.g.* increased spending per pupil or number of teachers per pupil).

Figure 10 shows one reason to expect that the estimated effect of the reform is stronger

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[14]Special exemptions to age requirements vary by state and include such conditions as teenage pregnancy, residence in a juvenile detention facility and enrollment in Job Corps programs. The 2006 GED Statistical Report contains additional information on this topic. (See GED Testing Service, Various).

for minority students. For whites, 25.6% of the students are 18 and above in the fall of 12th grade. The corresponding figures for blacks and Hispanics are 37.7% and 38.7%. Far more minority students are in the age group that is not restricted by mandatory school leaving age requirements or GED minimum age requirements. Thus more minority students are at risk of being induced out of school by the GED at any given grade level. In addition, minority students are farther behind than white students at each grade level, making the GED a more attractive option for them. See Agodini and Dynarski (1998).

4   State Level Fixed Effect Model

One difficulty in isolating the effect of changes in GED passing standards on dropout rates is that both minimum school leaving age requirements and GED testing age requirements changed in the sample period under study. See Table 5. During our sample period, three of the five states in our treatment group both raised and lowered their GED minimum age requirement. Two of these three states also raised the minimum age at which students can drop out of school. States included in our control group also made changes in their age requirements.

To control for these potentially confounding changes in age requirements and other sources of unobservables across states, we estimate a state fixed-effect regression. The model is

$$Y_{i,t} = \gamma(D_{treat} \cdot D_{\text{post 97}}) + \pi D_{\text{post 97}} + \theta_i + \psi X_{i,t} + \varepsilon_{i,t}$$

where $Y_{i,t}$ is the dropout rate for state i in year t and D_{treat} and $D_{\text{post 97}}$ are defined as

$$D_{treat} = \begin{cases} 1 \text{ if the state eliminated the and/or GED score option in 1997} \\ 0 \text{ if the state was not required to raise GED standards in 1997} \end{cases}$$

$$D_{\text{post 97}} = \begin{cases} 1 \text{ if } 1998 \leq \text{year} \leq 2000 \\ 0 \text{ otherwise} \end{cases}.$$

The θ_i are time-invariant state level fixed effects and the $X_{i,t}$ are control variables that

vary by states over time. These include, dummy indicators for both the minimum age required to take the GED and the minimum age required to drop out of school, as well as measures of state level unemployment rates and per capita income to control for changes in labor market conditions during the sample period.[15] The parameter of interest is γ, which is the conditional difference-in-difference estimate of the treatment effect of the reform in GED standards on the high school dropout rate.

5 Fixed Effect Estimates

Weighted OLS estimates of γ from the full model both controlling and not controlling for changes in minimum age requirements are summarized in Table 5.[16] All other parameter estimates are available at our web appendix. Using the full specification, the overall effect of the reform is a 1.3 percentage point reduction in the dropout rate in treatment states. The estimated effect on the upper level dropout rate remains large (-3%) after adjustment (see the fifth column of numbers in Table 5). The estimated effect on the overall lower level dropout rate is still small and insignificant. In general, the estimates including state level fixed effects but not controlling for changes in minimum age requirements are smaller than estimates based on the full specification. The regression-adjusted dropout and GED testing rate estimates are for the most part smaller but in close agreement with the unadjusted difference-in-difference estimates reported in the previous section.

The fixed effects estimates by race are consistent with the unadjusted estimates as well. Again, the estimated treatment effect is greater for minorities compared to whites. The estimates for whites are very similar in both the simple unadjusted difference-in-difference models and the fixed effect models. As with our previous estimates, the largest effect is on the upper level dropout rate. Increasing GED passing requirements decreased the upper level

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[15]See Table A-1 in the appendix for the summary statistics of all variables used in these models. We do not control for high stakes testing because no treatment or control states implemented or changed testing requirements during the sample period.

[16]GLS estimates of the model are also available in the appendix and match those reported in the text. The results hold up even after controlling for serial correlation in the residuals.

dropout rate in treatment states by 1.3 percentage points for whites, 4.8 percentage points for blacks and 6.2 percentage points for Hispanics. The estimate for blacks is statistically significant at the 5% level and that for Hispanics at the 1% level.

6 Eliminating the GED Option

The evidence just presented shows that raising the difficulty of passing the GED test lowers dropout rates. A related question of policy interest is what the change in the dropout rate would be if the GED program were eliminated entirely. While no states have ever banned GED testing, the timing of the introduction of the GED across states provides a valuable natural experiment to help answer this question.

Throughout the early 1970s, many states began to lower GED age requirements and make the certificate more accessible to school-age youth (Quinn, 2008). As previously discussed, GED testing in these states rose dramatically during this time and high school graduation rates fell.

Until 1974, the one exception to this trend was California. In that year, California became the last state to adopt the GED testing program for civilians. See Allen and Jones (1992). The previous year, the California legislature amended the state education code to include provisions for the issuance of the California High School Equivalency Certificate to be given out on the basis of GED test scores (California Legislature, 1973). According to the new law, this certificate would be "deemed to be a high school diploma for the purpose of meeting the requirements of employment by all state and local public agencies."

In 1974, the GED testing program was neither as large as it is today nor as popular among school age youth. However, it was still a substantial social program that accounted for nearly 9% of all high school credentials issued and 34% of the test takers were ages 16 to 19. See Figures 1 and 2.

In order to gauge the impact of the introduction of the GED program we compare the

high school graduation rate in California to that of all other states in the three years before and after 1974. Since enrollment counts by grade are not available on a state by state basis for these years, we use an estimate of the 14 year old population four years prior as a proxy for the entering 9th grade enrollment size.[17]

Figure 11 displays the overall, male and female mean high school graduation rates pre- and post-1974 in both California and the rest of the country.[18] Difference-in-difference estimates are also reported. Prior to the introduction of the GED program, California had a high school graduation rate that was statistically significantly higher than the rest of the United States. This changed dramatically once the GED was introduced. California graduation rates immediately fell to the levels of all other states. While graduation rates fell both in California and the rest of the U.S. during this time, difference-in-difference estimates show that introducing the GED program resulted in a 3 percentage point greater drop in California relative to other states from 1975-1977.

The adverse effect of introducing the GED program on graduation rates was larger for males than females. Male graduation rates fell by 3.6 percentage points while the graduation rate for females declined by 2.6 points. One possible explanation for this is that males have better immediate employment opportunities and would, therefore, find an early exit from high school through GED certification a more attractive offer. A second explanation is that males are farther behind in school than females at any given age. This finding is also consistent with the evidence reported in Heckman and LaFontaine (2008a) who show that male graduation rates have declined more than female rates since the early 1970s.

While estimates for California are not available by race, on the basis of the results of the previous section, it is likely that expanding the national GED program to school age youth in

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[17]Population estimates for California were obtained from the California Demographic Research Unit. They provide estimates of the state population by age for the resident population on July 1st of each year. We use the July 1st 15 year old population in the next year to proxy for the previous years fall 14 year old population. U.S. population estimates by age are from the Census Bureau and are also estimates of the resident population on July 1st.

[18]Figure A-1 in the appendix displays completion rates by year for California and the rest of the country for the years 1971-1977.

the 1970s had a more adverse impact on minority graduation rates than on white rates. This could explain part of the stagnation in minority graduation and lack of convergence in white and minority rates since the mid-1970s that is documented in Heckman and LaFontaine (2008a).

The late introduction of the GED program in California provides further empirical evidence that the GED induces youth to drop out of school. This natural experiment shows that eliminating the GED option would substantially raise high school graduation rates. Arguably, estimates based on 1974 data understate the effect we would observe today if the GED were unavailable to students. Since 1974, the GED program has greatly expanded and become more popular with adolescents and young adults. Additionally, high school standards, as measured by mandatory courses and high-stakes testing requirements, have increased substantially since the mid-1980s. See Lillard and DeCicca (2001). These changes increase the cost of graduating from high school and the attractiveness of the GED option. For all of these reasons, it is plausible that our estimates based on California in the mid-1970s understate the potential impact of enacting this reform under current conditions.

7   Conclusion

This paper investigates the extent to which students enrolled in high school substitute between traditional graduation and alternative exam-based GED credentials. We find that raising the difficulty of obtaining the GED, either through increasing passing requirements or restricting access to young adults, substantially reduces estimated dropout rates. We estimate that a nationally mandated increase in GED passing standards in 1997 resulted in a 1.3 percentage point drop in the overall dropout rate in states that were required to change relative to those who did not. The observed reduction in dropout rates was stronger for older students enrolled in upper grade levels since these individuals are less restricted in both school leaving and GED testing. The twelfth grade high school dropout rate fell by 3

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percentage points following the reform.

Minorities are more sensitive to the availability of less costly GED credentials than are whites. At a given grade level, minority students tend to be older and further behind than majority students. These factors make obtaining a GED credential a more attractive alternative to high school graduation for minorities. As a result, we find that minority dropout rates exhibit the sharpest declines following the increase in GED passing standards. Black 12th grade dropout rates declined by 4.8 percentage points, those for Hispanics by 6.2 points and those for whites by 1.3 percentage points. The GED program hurts those students at the greatest risk of dropping out the most.

One additional control group in our analysis is students enrolled in lower grade levels (10th-11th) in treatment states before and after the 1997 change. The smaller observed changes in dropout behavior for this group before and after the policy change lends further support to our claim that we have isolated a causal effect. Most students enrolled in these grades are too young to drop out and take the GED without special exceptions. Whereas the estimated effect on the 12th grade dropout rate is 3 points, the effect on the 10-11th grade dropout rate is only .55 points and not statistically different from zero.

Introducing or eliminating the GED option produces even larger changes in graduation rates. Prior to the introduction of the GED program in 1974, California had significantly higher graduation rates compared to those in the rest of the country. Difference-in-difference estimates show that as soon as the California legislature established the GED program, graduation rates fell by 3 points in California relative to the rest of the U.S., and graduation levels dropped to those of the other states. We argue that eliminating the GED option today would likely have much larger effects than we find for California since the GED program is now larger and more popular among youth than it was in 1974.

The GED program has the unintended negative consequence of causing many marginal students to drop out of school rather than graduate. It has changed from its original intention of providing a second chance to adults to becoming a primary vehicle for obtaining high

school completion status among many adolescent youth. This is a source of concern because the return to GED exam certification is very small and GED recipients perform in the labor market, post-secondary schooling and society at large at a level very close to that of dropouts and far below that of high school graduates. See Heckman and LaFontaine (2008b). Given the poor performance of GED recipients relative to high school graduates, the findings reported in this paper provide clear evidence that states should adopt policies to eliminate the GED option for school age persons. Such a change in policy would not only raise high school graduation rates, but may also improve the prospective futures of many disadvantaged students.

References

Agodini, Roberto and Mark Dynarski. 1998. "Understanding the Trend Toward Alternative Certification for High School Graduates." Document PR98-39, 37, Mathematica Policy Research, Inc., Princeton, NJ.

Allen, Colleen A. and Edward V. Jones. 1992. *GED Testing Program: The First Fifty Years*. Washington, D.C.: American Council on Education.

California Legislature. 1973. "Chapter 6 of Division 6 of the Education Code, Article 9." State of California, West's Education Code, Chapter 872, pg. 1594.

Cameron, Stephen V. and James J. Heckman. 1993. "The Nonequivalence of High School Equivalents." *Journal of Labor Economics*, 11(1, Part 1):1–47.

Chaplin, Duncan. 1999. "GEDs for Teenagers: Are There Unintended Consequences?" Tech. rep., The Urban Institute.

GED Testing Service. Various. *Who Took the GED?: GED Statistical Report*. Washington, DC: American Council on Higher Education.

Heckman, James J. and Paul A. LaFontaine. 2006. "Bias Corrected Estimates of GED Returns." *Journal of Labor Economics*, 24(3):661–700.

Heckman, James J. and Paul A. LaFontaine. 2008a. "The American High School Graduation Rate: Trends and Levels.", unpublished manuscript, University of Chicago, Department of Economics.

Heckman, James J. and Paul A. LaFontaine. 2008b. "Testing the Test: What the GED Reveals and Conceals.", unpublished book manuscript, University of Chicago, Department of Economics.

Kominski, Robert. 1990. "Estimating the National High School Dropout Rate." *Demography*, 27(2):303–311.

Lane Community College. 2008. "Online GED Preparation, GED 2002 Changes.", https://teach.lanecc.edu/ged/ged2002.htm (accessed May 9, 2008).

Lillard, Dean R. 2001. "Do General Educational Development Certificate Policies Induce Youth Out of High School?", unpublished manuscript, Cornell University.

Lillard, Dean R. and Philip DeCicca. 2001. "Higher Standards, More Dropouts? Evidence Within and Across Time." *Economics of Education Review*, 20(5):459–473.

Malizio, Andrew G. and Douglas R. Whitney. 1981. *Who Takes the GED Tests?: A National Survey of Spring 1980 Examinees*. Washington, DC: American Council on Education.

National Center for Education Statistics. 2006. *Education Longitudinal Study of 2002 (ELS:2002/04), First Follow-up, Student Survey, 2004*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

National Commission on Excellence in Education. 1983. *A Nation at Risk: The Imperative for Educational Reform: A Report to the Nation and the Secretary of Education, United States Department of Education*. Washington, D.C.: National Commission on Excellence in Education.

Quinn, Lois M. 2008. "An Institutional History of the GED.", unpublished manuscript.

Van Slyke, Caren. 2005. *GED 2005-2006 (Kaplan)*. New York: Simon and Schuster.

A   Appendix

A.1   Data Sources

This article uses the Common Core of Data (CCD) to construct annual exit rates from secondary schooling. The CCD data are collected each year by the National Center for Education Statistics from state and local departments of education. The data provide aggregate annual counts of enrollments and diplomas issued (excluding GED certificates, certificates of completion and other alternative credentials) at the state, district and even school level. We use the aggregate state counts to construct various dropout measures using the methodology summarized in the next section. Many states do not report estimates by race for all years. These tend to be states that do not have large minority populations and therefore our estimates should not be overly biased due to their exclusion. In a very small number of cases, the estimated dropout rate was negative and these were set to missing. We experimented with a number of imputation procedures to correct for missing values. These were found not to affect our results in any substantial manner. The final measures used in the paper do not contain imputations and all estimates by race are restricted to the same sample of states to make the estimates comparable across groups. To be included in the analysis, states needed to have at least two observations for each dropout measure in both the pre and post treatment periods. It was not necessary to drop any treatment states in the analysis by race. The estimates by race should be considered more cautiously than the overall estimates due to these data limitations. For the analysis not by race only a few state-year observations are missing for the treatment and control states.

A summary of all the variables used in our analysis broken down by treatment status and time period are listed in table A-1. GED testing rates by age at the individual state level are obtained from multiple years of the annual GED statistical reports published by the American Council on Education (ACE). GED age requirements by state are also from this source. Mandatory school leaving age for each state was obtained from various years of the

Digest of Education Statistics. Annual measures at the state level of unemployment rates and per capita income were obtained from the Bureau of Labor Statistics and the Census Bureau, respectively. Population estimates at the state level for each age are obtained from the U.S. Census Bureau. For the California analysis, population estimates were obtained from the California Demographic Research Unit due to a lack of data available on the state level from the Census Bureau. Diplomas issued in California and the U.S. were obtained from various years of the Digest of Education Statistics.

A.2 Definitions

Weighted GED Test Taking Rate Across Groups:

Let i denote state and t denote years. The rate is

$$\sum_{i=1}^{51} \frac{G(a)_{i,t}}{P(a)_{i,t}},$$

with $i = 1, ..., 51$ and $t = 1994, ..., 2000$, where

$$G(a)_{i,t} = \quad \text{Number of GED Test Takers Age } a \text{ in state } i \text{ in year } t.$$

$$P(a)_{i,t} = \quad \text{Population Age } a \text{ in state } i \text{ in year } t.$$

The number of states included in each sum is the number of states in groups 1 and 3 as defined in the text, dropping any states with fewer than two observations per period.

Overall Dropout Rate (10th-12th Grade) in state i in year t:

$$DO_{i,t} = \left(\frac{P(15-17)_{i,t}}{\sum\limits_{i=1}^{51} P(15-17)_{i,t}} \right) \cdot \frac{(E(10)_{i,t-1} + E(11)_{i,t-1} + E(12)_{i,t-1}) - (E(11)_{i,t} + E(12)_{i,t} + H_{i,t})}{(E(10)_{i,t-1} + E(11)_{i,t-1} + E(12)_{i,t-1})},$$

with $i = 1, ..., 51$ and $t = 1994, ..., 2000$, where

$$P(15 - 17)_{i,t} = \quad \text{Population Age 15-17 for } i, t.$$

$$E(10)_{i,t} = \quad \text{Enrollment in Grade 10 for } i, t.$$

$$E(11)_{i,t} = \quad \text{Enrollment in Grade 10 for } i, t.$$

$$E(12)_{i,t} = \quad \text{Enrollment in Grade 10 for } i, t.$$

$H_{i,t}$ is the number who graduate in state i at time t. These are people who were enrolled in school in the previous year.

Upper Level Dropout Rate (12th Grade) in state i in year t:

$$DU_{i,t} = \left(\frac{P(15 - 17)_{i,t}}{\sum_{i=1}^{51} P(15 - 17)_{i,t}} \right) \cdot \frac{E(12)_{i,t-1} - H_{i,t}}{E(12)_{i,t-1}},$$

with $i = 1, ..., 51$ and $t = 1994, ..., 2000$.

Lower Level Dropout Rate (10th-11th Grade) in state i in year t:

$$DL_{i,t} = \left(\frac{P(15 - 17)_{i,t}}{\sum_{i=1}^{51} P(15 - 17)_{i,t}} \right) \cdot \frac{(E(10)_{i,t-1} + E(11)_{i,t-1}) - (E(11)_{i,t} + E(12)_{i,t})}{(E(10)_{i,t-1} + E(11)_{i,t-1})},$$

with $i = 1, ..., 51$ and $t = 1994, ..., 2000$.

Weighted dropout rates by group are obtained by summing across the states in each group.

A.3   Robustness Checks

This section reports seven alternative specifications of our model in the main text to test the robustness of the results. See Table A-2. As in the main text, we only report the γ estimates for each check. For the full set of parameter estimates please refer to the web appendix.

A.3.1 Alternate Control Group

As one check of the exogeneity of the policy change assumption, we re-estimate the model using states that were required to raise the GED minimum score requirement rather than states that did not change. These are the lightly shaded states in Figure 4. These states were also required to change GED policies but the increase in difficulty was much smaller.

The first row of table A-2 summarizes our overall results and results by race using this alternate control group. The estimated effect on the upper level dropout rate is in general larger than the effect obtained from our main control group. On the other hand, the effect on the lower level dropout rate is in general smaller except for whites. However, these results are generally consistent with the results reported in the text.

A.3.2 Southern States Only

With the exception of Nebraska, all treatment group states are located in the South. This suggests that while the timing of the score requirement change was exogenous, the states that were required to change were not a random sample of states. States likely set GED standards endogenously to reflect conditions in the state, i.e. states with traditionally higher dropout rates have lower GED testing standards. As a further robustness check of our main results, we estimate the model using only treatment and control states located in the South. The estimates, shown in the second row of table A-1, are very similar to those reported in the text for nearly all groups. The one exception is that the white upper level dropout estimate is now very small and statistically insignificant.

A.3.3 Excluding States that Changed Minimum Age Requirements

A number of states in both our treatment and control groups either raised or lowered the minimum age for GED testing or the minimum age for school leaving during the period under study. Our fixed effect model controls for these changes. Alternatively, we estimate the model excluding these states to be sure that these changes are not driving our results.

In row 3 of table A-1, we drop all states that changed the minimum school leaving age and in row 4 we estimate the model dropping all states that changed either school leaving age or minimum GED testing ages after 1997. Our estimates are robust to these specifications.

A.3.4 GLS Estimation

The fifth row in table A-2 reports estimates our full specification using Generalized Least Squares (GLS) instead of OLS. Except for the slightly larger estimates on the 10th-11th grade dropout rate measures, the estimates are very similar to those reported in the text.

A.3.5 GLS with AR-1 Auto-Correlation Error Structure

As an alternative specification we include a panel specific AR-1 autocorrelation error structure in the GLS specification. The fifth row of table A-2 reports our estimates. The results across all races and dropout rate measures are consistent with those reported in the main text.

A.3.6 High Immigrant Control States

In 1997, a minor immigration reform was passed that made it generally more difficult to emigrate and reside legally in the U.S. Given the large estimated effects we found for Hispanics, we would like to verify that this is not due to unaccounted for changes in immigration that may bias the estimates. In the final row of table A-2, we use only states with high rates of immigration in the control group. The control group is now California and Florida while the treatment group remains unchanged. Since we only have two control states, we estimate the unadjusted difference-in-difference model rather than the full state fixed effect specification. If changing immigration patterns are responsible for the declines in Hispanic dropout rates rather than the increase in GED standards, we would expect to find significantly reduced effect sizes from this analysis. This is not the case. While the overall estimated Hispanic effect declines, the estimates for the upper level Hispanic dropout rate remain large.

Table 1. Description of the Five GED Subject Tests (2002 GED Test Series)

Test Area	Topics Covered	Question Type and Time Limit
Language Arts, Writing	Sentence Structure, Organization, Usage, Mechanics Essay Writing	Part I: 50 multiple-choice questions in 75 minutes Part II: 1 essay in 45 minutes
Social Studies	U.S. History, World History, Geography, Economics, Civics and Government	50 multiple-choice questions in 70 minutes
Science	Life Science, Physical Science, Earth and Space Science	50 questions in 80 minutes
Language Arts, Reading	Fiction, Nonfiction, Drama Poetry	40 questions in 65 minutes
Mathematics	Number Operations and Number Sense, Measurement and Geometry, Data Analysis, Statistics and Probability, Algebra, Functions and Patterns	Part I: 25 questions in 45 minutes with a calculator Part II: 25 questions in 45 minutes without a calculator

Source: Kaplan 2005-2006 GED Preparation Book.

Note: Since its inception in 1942 the GED has undergone three major revisions. The most notable changes in 2002 relative to the 1988 GED Test Series are: (1) More graphic materials. (2) Longer reading passages. (3) Edit/correct written documents. (4) Use of scientific calculator on part of the mathematics section. (5) More business and real life context related readings. (Lane Community College: Online GED Preparation Website).

Table 2. Percentage of Spring 2002 HS sophomores who had not Completed a HS Degree by Spring 2004, by Reason for Leaving School

Reason for leaving school	Percent
Missed too many school days	43.5
Thought it would be easier to get GED	**40.5**
Getting poor grades/failing school	38.0
Did not like school	36.6
Could not keep up with schoolwork	32.1
Became pregnant*	27.8
Got a job	27.8
Thought could not complete course requirements	25.6
Could not get along with teachers	25.0
Could not work at same time	21.7
Had to support family	20.0
Did not feel belonged there	19.9
Could not get along with other students	18.7
Was suspended from school	16.9
Had to care for a member of family	15.5
Became father/mother of a baby	14.4
Had changed schools and did not like new one	11.2
Thought would fail competency test	10.5
Did not feel safe	10.0
Was expelled from school	9.9
Got married/planned to get married	6.8

Note: This indicator shows the percentage of high school students in the spring of their sophomore year who, in the spring 2 years later, were not in school and had not graduated with a regular diploma or certificate of attendance. The 1 percent of sophomores who left school and earned a General Educational Development (GED) certificate or other form of equivalency certificate as of the spring 2 years later are counted as having left school without a regular diploma or certificate of attendance.

Source: Reproduced from U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/04), "First Follow-up, Student Survey, 2004," previously unpublished tabulation (January 2006).

*Percentage of female respondents only. The reason could only be selected by female respondents.

Table 3. Percentage of High School Seniors Meeting Various GED Score Requirements and the Actual Change in Pass Rates Pre- and Post-1997

GED Score Standard	Number of States Prior to 1997 Change	% of HS Seniors Meeting Requirements*	Actual Change in Pass Rate**
Minimum 40 or Mean 45	5	73%	-7.43%
Minimum 35 and Mean 45	26	69%	-1.68%
Minimum 40 and Mean 45	19	67%	-1.26%

Source: The percentage of high school seniors in the GED norming study meeting the given score requirement is from the 1987 GED statistical report. The actual change in pass rates are from authors' calculation based on various GED statistical reports.

*GED Norming studies are based on the performance of a representative sample of high school seniors. Depending on their performance GED scores are normalized to obtain a normal distribution of mean 50 and standard deviation 10.

**In states that went from indicated requirement pre-1997 to Minimum 40 and Mean 45 post-1997.

Table 4. Changes in GED Testing and Mandatory Schooling Age Requirements by Treatment Status, 1994-2000

Policy Change	Treatment Group	Control Group
Raised Minimum GED Age Requirement	MS (17 to 18, 1997), NE (16 to 18, 1998), NM (16 to 17, 2000).	AR (16 to 18, 2000), KY (16 to 19 ,1997 and 2000), MO (16 to 18, 1997), OK (16 to 18, 1997 and 2000), OR (16 to 18, 2000), SD (17 to 19, 1997 and 16 to 18, 1999), UT (17 to 18, 1997 and 2000), WI (18 to 18.5, 1999).
Lowered Minimum GED Age Requirement	MS (18 to 16, 2000), NE (17 to 16, 1995), NM (18 to 16, 1999).	KY (19 to 16, 1999), MO (18 to 16, 1995), OK (18 to 16, 1995 and 1999), OR (18 to 16, 1999), SD (18 to 17, 1995 and 19 to 16, 1998), UT (18 to 17, 1995 and 1999), WI (18.5 to 18, 1995).
Raised Minimum School Leaving Age Requirement	MS (16 to 17, 1997), NM (16 to 18, 1997).	DC (17 to 18, 1997).
Lowered Minimum Leaving Age Requirement	None.	None.

Source: GED Testing Service Annual Reports: "Who Took the GED?" (various years) and Digest of Education Statistics (various years).
Note: The year of change as well as the initial and final value for the age requirment are reported in parentheses.

Table 5. Weighted OLS Fixed Effects Estimates of the Impact of the 1997 GED Reform on Various Dropout Rate Measures

	Not Controlling for Minimum Age Requirements				Controlling for Minimum Age Requirements			
Dependent Variable	**All Races**	**Whites**	**Blacks**	**Hispanics**	**All Races**	**Whites**	**Blacks**	**Hispanics**
10th-12th Grade Dropout Rate	-1.21% (.35)	-0.47% (.15)	-0.83% (.94)	-2.68% (.43)	-1.29% (.37)	-0.43% (.15)	-1.29% (.98)	-2.74% (.40)
10th-11th Grade Dropout Rate	-0.46% (.51)	-0.02% (.43)	0.37% (1.48)	-1.38% (.60)	-0.55% (.54)	0.00% (.45)	0.09% (1.61)	-1.38% (.50)
12th Grade Dropout Rate	-2.86% (.67)	-1.38% (.82)	-4.02% (1.76)	-5.99% (.30)	-2.95% (.65)	-1.32% (.88)	-4.84% (1.82)	-6.16% (.46)
GED Testing Rate Ages 16-19	-0.55% (.16)	… …	… …	… …	-0.57% (.18)	… …	… …	… …
GED Testing Rate Ages 16-17	-0.34% (.15)	… …	… …	… …	-0.36% (.17)	… …	… …	… …
GED Testing Rate Ages 18-19	-0.76% (.21)	… …	… …	… …	-0.77% (.25)	… …	… …	… …

Note: Huber-White robust standard errors are in parentheses (clustered by state). Model is estimated using OLS. State 15-17 year old populations by race are used as weights. The estimate reported above is the interaction between the treatment state dummy and the post 1997 dummy, where the treatment state dummy is equal to 1 for treatment states and the post 1997 dummy is equal to 1 for the years 1998-2000, otherwise both dummies are equal to 0. States with fewer than two observations per period are dropped for 'all races' regressions. States with fewer than two observations per period for any of the dropout rate measures by race are dropped for by race regressions. Treatment states are those states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. Control states are those that already had high enough standards by 1997. These include: AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. Control states dropped from 'all races' regressions due to missing and negative dropout rates include: NJ. Control states dropped from regression by race due to missing and negative dropout rates include: AR, ID, KY, MO, ND, NJ, NY, SD, UT, WA, WV. No treatment states are dropped.

There are 142-144 state-year observations for the regressions for 'all races' and 82-84 for the by race regressions.

Figure 1. GED Credentials Issued as a Percentage of All High School Completers, 1960-2006
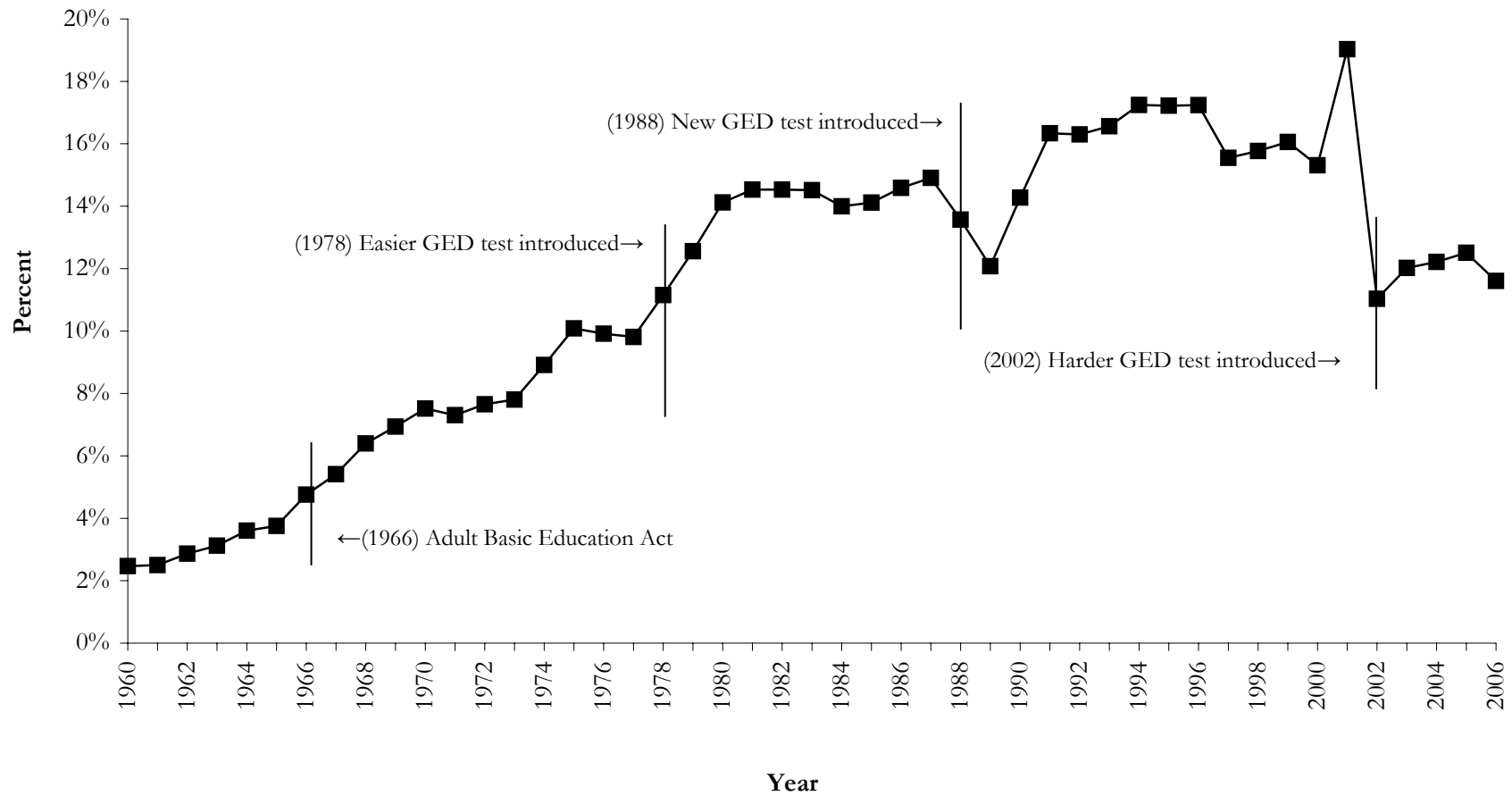
SOURCE: Public and private high school graduate totals from NCES Digest of Educational Statistics (2005) Table 101; GED Credentials Issued from GED Statistical Reports (Various Years).
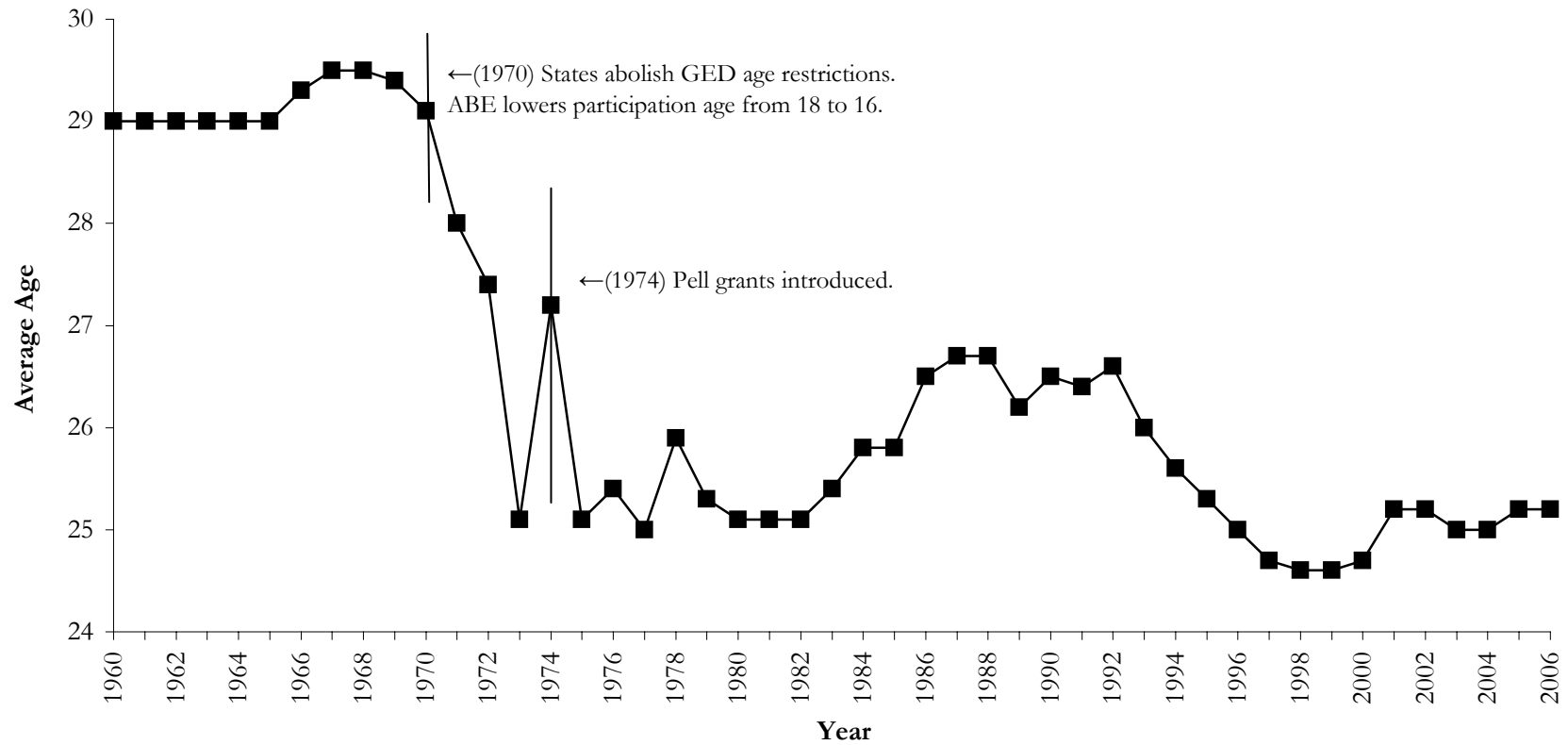NOTE: The figure plots proportion of GEDs issued each year over the number high school completers that year (regular high school graduates and GED recipients).

Figure 2. U.S. High School Dropout Rate Including and Excluding GED Recipients, 1968-2005
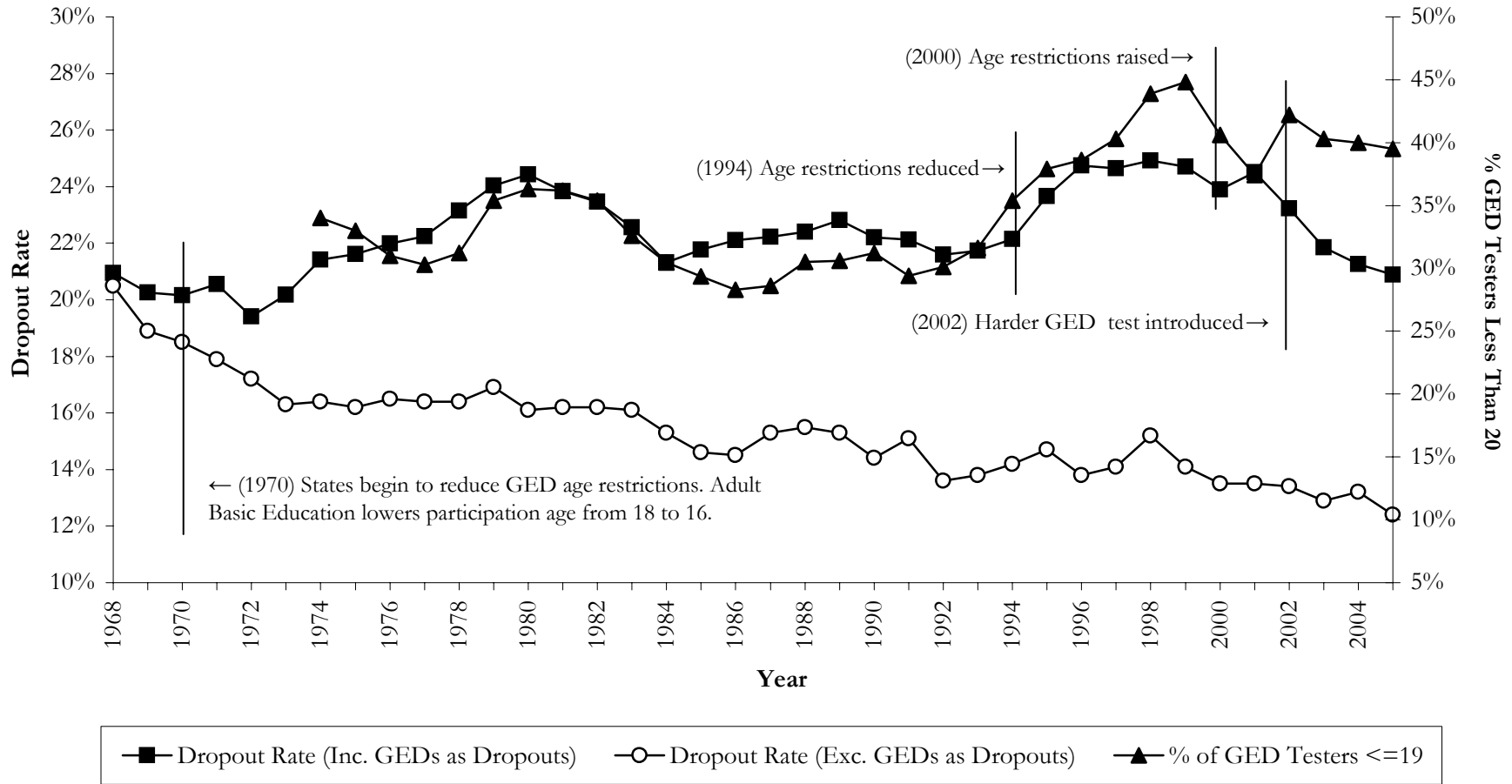
Note: The true dropout rate is calculated from NCES and CPS data as the fraction of public and private school 8th graders who do not obtain a regular high school diploma. The NCES dropout rate is one minus the status completion rate. The status completion rate is computed as the percentage of 18- through 24-year-olds who are not enrolled in high school and who have any type of high school credential. High school credential includes a high school diploma or equivalent credential such as a General Educational Development (GED) certificate. The status completion rate is calculated from CPS October 1968-2000 data.

Figure 3. Average Age of GED Test Takers from the GED Testing Service, 1960-2006

←(1970) States abolish GED age restrictions.
ABE lowers participation age from 18 to 16.

←(1974) Pell grants introduced.

Source: American Council on Education, General Educational Development Testing Service Statistical Reports.
Notes: The Federal Pell Grant Program provides need-based grants to low-income undergraduate and certain postbaccalaureate students to promote access to postsecondary education. (U.S. Department of Education Website).

Figure 4. States That Were Required to Raise GED Passing Standards in 1997

■ States that were required to eliminate the and/or score option (treatment group).
▨ States that were required to raise the GED minimum score requirement from 35 to 40.
☐ States that were not required to raise standards in 1997 (control group).

Source: GED Testing Service: 2001 GED Statistical Report.

Figure 5.
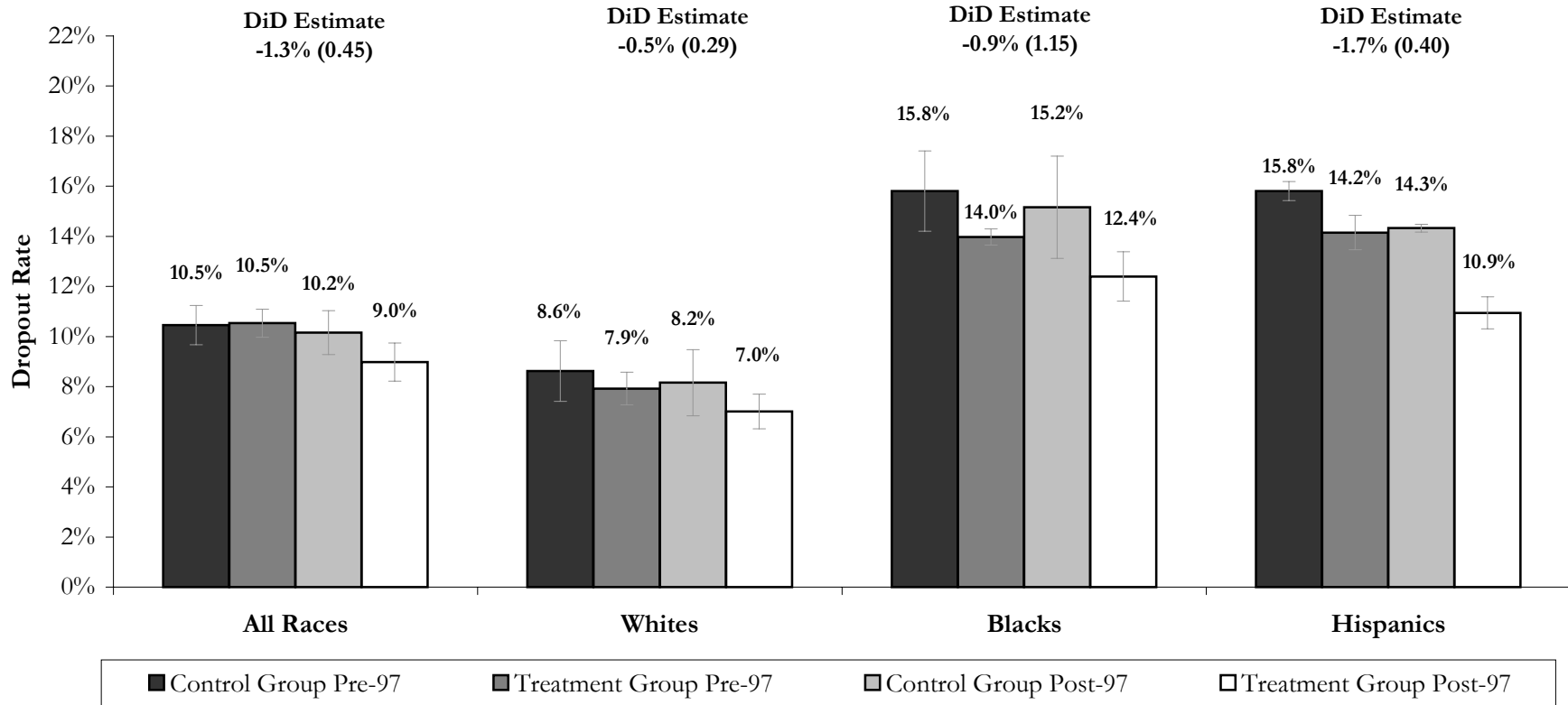## GED Testing and Dropout Rates by Year, Treatment vs. Control States
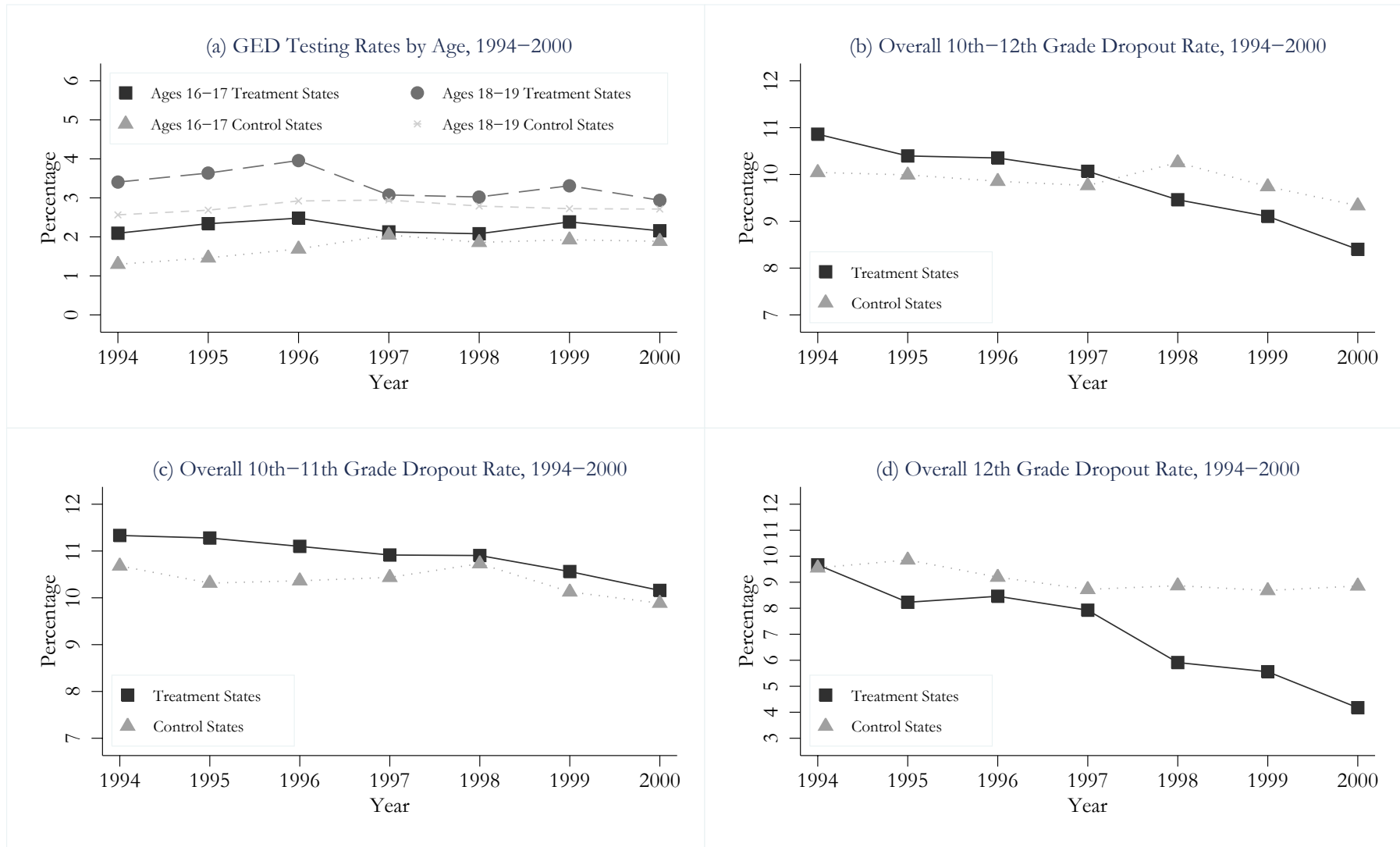
Note: GED testing rates are calculated from yearly GED Statistical Reports as the percetage of the state population in the given age range who take the GED in that year.
Dropout rates are calculated from the Common Core of Data (CCD) as the exit rate for those in the indicated grades in the given year. See the appendix for further details.
States required to raise GED pass requirements (treatment states) are: LA, MS, NE, NM, TX. States that did not change pass requirements (control states) are: AR, CA, CO,
DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. NJ is excluded in all dropout calculations due to data errors.

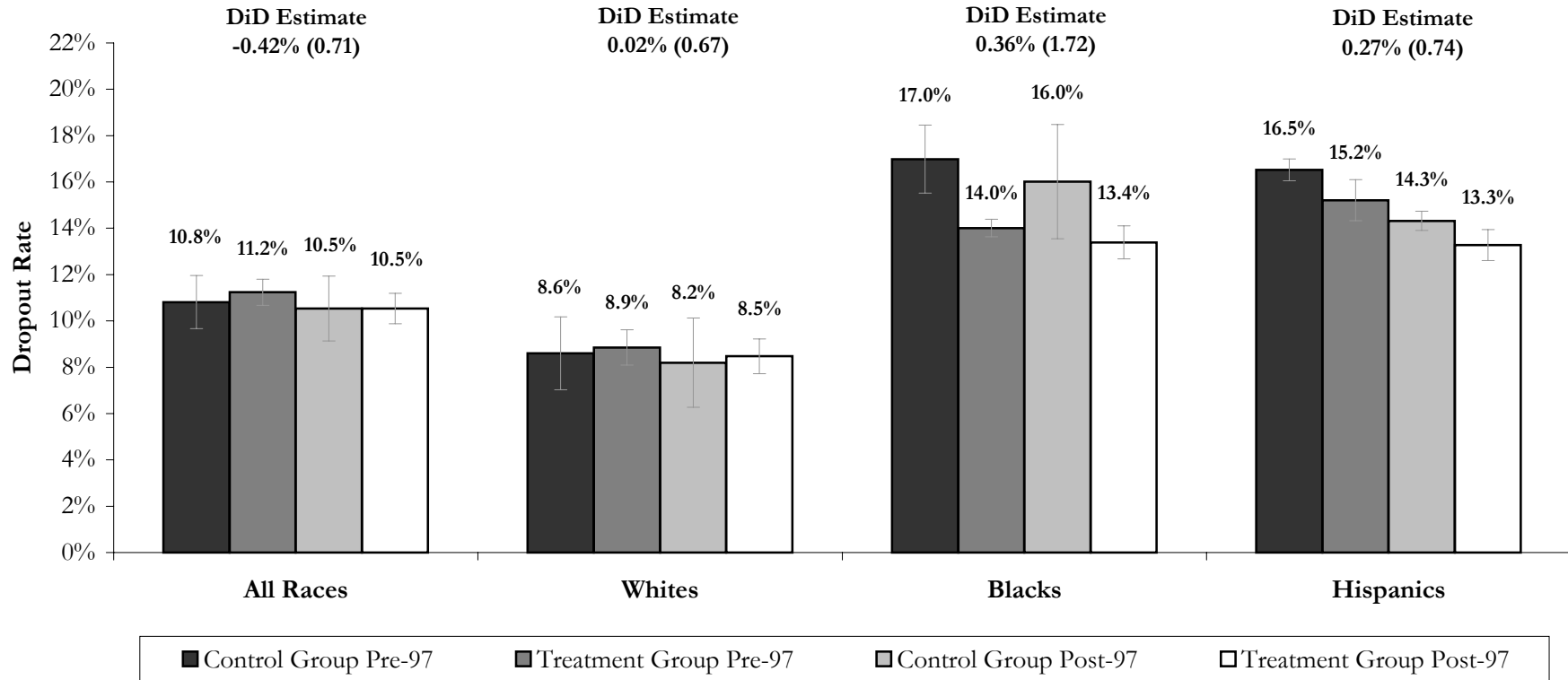**Figure 6.** Average Pre- and Post-1997 GED Test Taking Rate by Age Group
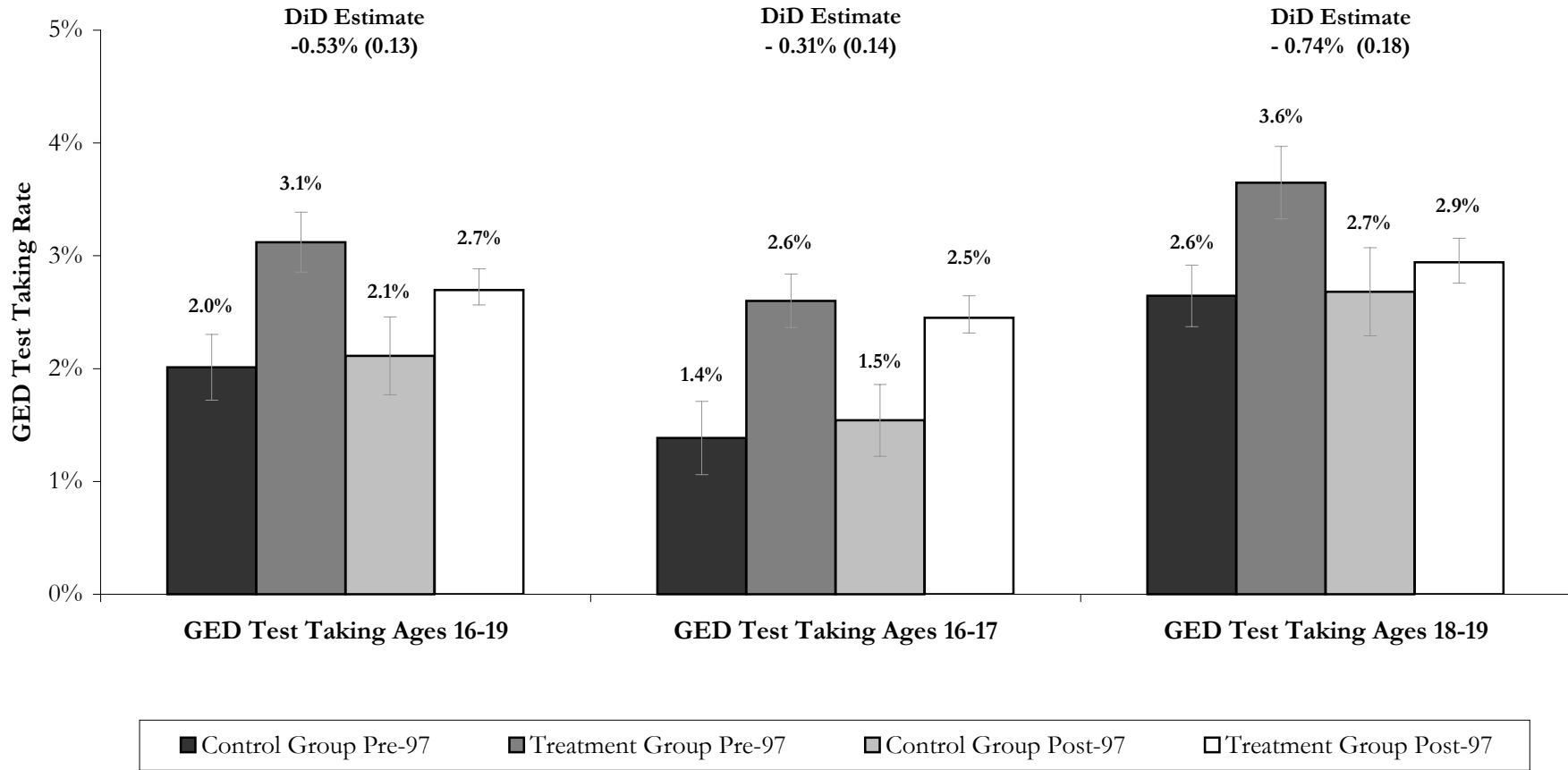
Note: GED test taking rates are defined as the ratio between total number of test takers of a given age and total population of that age. The plot above shows the average GED test taking rate for the period pre-1997 (i.e. 1994-1996) and post-1997 (i.e. 1998-2000). All estimates are weighted by the 15-17 year old population by state. Huber-White robust standard errors are in parentheses (clustered within state). The treatment group consists of states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. The control group consists of states that already had high enough standards by 1997. These include: AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. The state of NJ is dropped in order for test taking rates to be consistent with dropout rate regressions. Source: GED Testing Service Annual Reports: "Who Took the GED?" (1994-2000).

Figure 7. Average Pre- and Post-1997 10th-12th Grade Dropout Rate for Treatment and Control Group
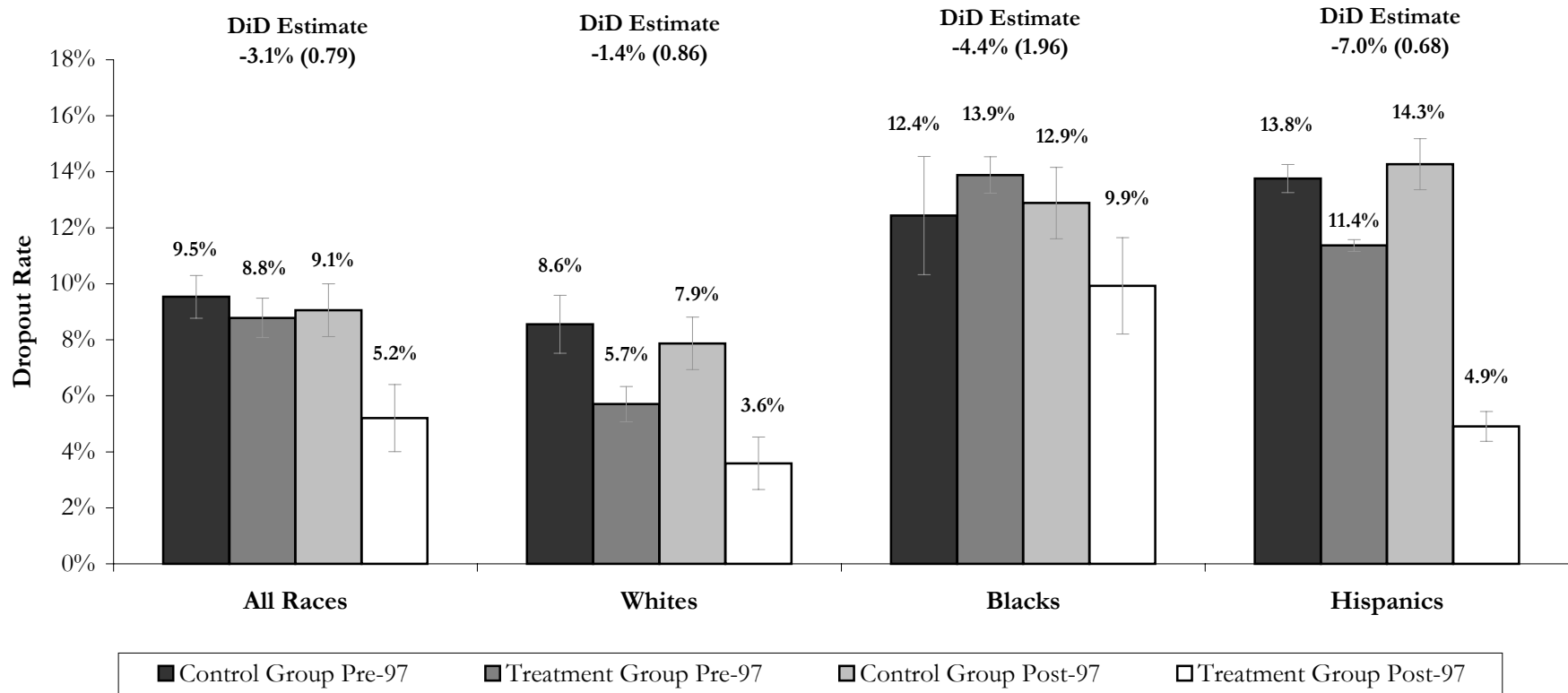
Note: The dropout rate is defined as the ratio of students enrolled in a given grade(s) in year t and the number of students enrolled in the previous grade(s) in year t-1, where t = 1994-2000. All estimates are weighted by the 15-17 year old population in the given state. The plot above shows the average dropout rate rate for the period pre-1997 (i.e. 1994-1996) and post-1997 (i.e. 1998-2000). Huber-White robust standard errors in parentheses (clustered within state). Treatment states are those states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. Control states are those that already had high enough standards by 1997. These include: AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. States with fewer than two observations per period are dropped for 'all races' category. States with fewer than two observations per period for any of the dropout rate measures by race are dropped for by race categories. Control states dropped from 'all races' regressions due to missing and negative dropout rates include: NJ. Control states dropped from regression by race due to missing and negative dropout rates include: AR, ID, KY, MO, ND, NJ, NY, SD, UT, WA, WV. No treatment states are dropped from any regressions. Since there are more missings in the dropout rates by race, the 'all races' category is not directly comparable to the categories by race. Source: Common Core of Data (CCD).

Figure 8. Average Pre- and Post-1997 10th-11th Grade Dropout Rate for Treatment and Control Group

DiD Estimate
-0.42% (0.71)

DiD Estimate
0.02% (0.67)

DiD Estimate
0.36% (1.72)

DiD Estimate
0.27% (0.74)

■ Control Group Pre-97   ■ Treatment Group Pre-97   ▨ Control Group Post-97   ☐ Treatment Group Post-97

Note: The dropout rate is defined as the ratio of students enrolled in a given grade(s) in year t and the number of students enrolled in the previous grade(s) in year t-1, where t = 1994-2000. All estimates are weighted by the 15-17 year old population in the given state. The plot above shows the average dropout rate rate for the period pre-1997 (i.e. 1994-1996) and post-1997 (i.e. 1998-2000). Huber-White robust standard errors in parentheses (clustered within state). Treatment states are those states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. Control states are those that already had high enough standards by 1997. These include: AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. States with fewer than two observations per period are dropped for 'all races' category. States with fewer than two observations per period for any of the dropout rate measures by race are dropped for by race categories. Control states dropped from 'all races' regressions due to missing and negative dropout rates include: NJ. Control states dropped from regression by race due to missing and negative dropout rates include: AR, ID, KY, MO, ND, NJ, NY, SD, UT, WA, WV. No treatment states are dropped from any regressions. Since there are more missings in the dropout rates by race, the 'all races' category is not directly comparable to the categories by race. Source: Common Core of Data (CCD).

Figure 9. Average Pre- and Post-1997 12th Grade Dropout Rate for Treatment and Control Group

Note: The dropout rate is defined as the ratio of students enrolled in a given grade(s) in year t and the number of students enrolled in the previous grade(s) in year t-1, where t = 1994-2000. All estimates are weighted by the 15-17 year old population in the given state. The plot above shows the average dropout rate rate for the period pre-1997 (i.e. 1994-1996) and post-1997 (i.e. 1998-2000). Huber-White robust standard errors in parentheses (clustered within state). Treatment states are those states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. Control states are those that already had high enough standards by 1997. These include: AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. States with fewer than two observations per period are dropped for 'all races' category. States with fewer than two observations per period for any of the dropout rate measures by race are dropped for by race categories. Control states dropped from 'all races' regressions due to missing and negative dropout rates include: NJ. Control states dropped from regression by race due to missing and negative dropout rates include: AR, ID, KY, MO, ND, NJ, NY, SD, UT, WA, WV. No treatment states are dropped from any regressions. Since there are more missings in the dropout rates by race, the 'all races' category is not directly comparable to the categories by race. Source: Common Core of Data (CCD).

Figure 10. Percentage of HS Students Eighteen or Older by Grade and Race, CPS October 1994-2000
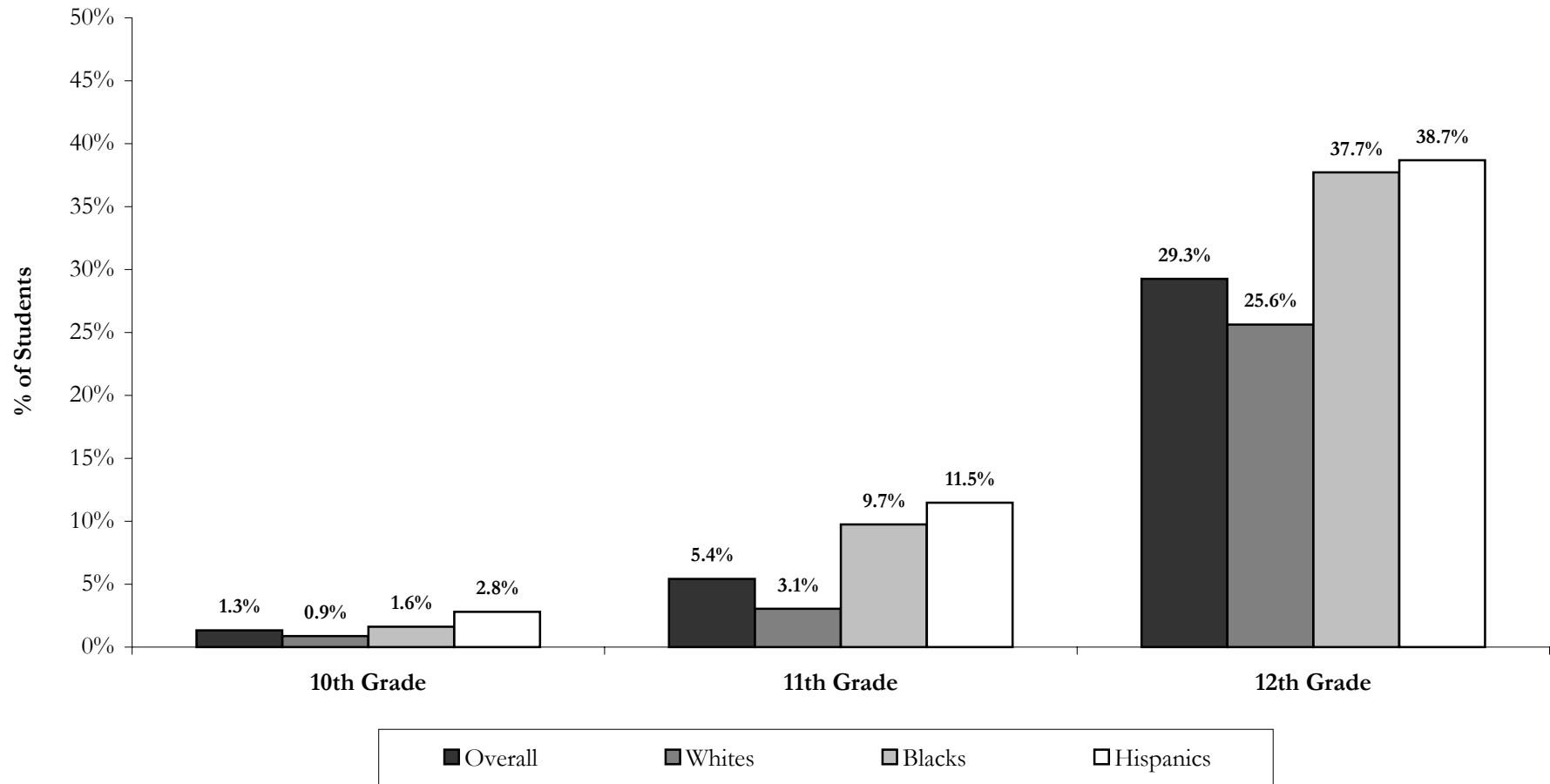
Authors' calculations from CPS October 1994-2000 data. The sample is restricted to those who report being enrolled in high school between the ages of 12 and 20.

Figure 11. Graduation Rate Before and After Implementing the GED Program, California vs. All other States
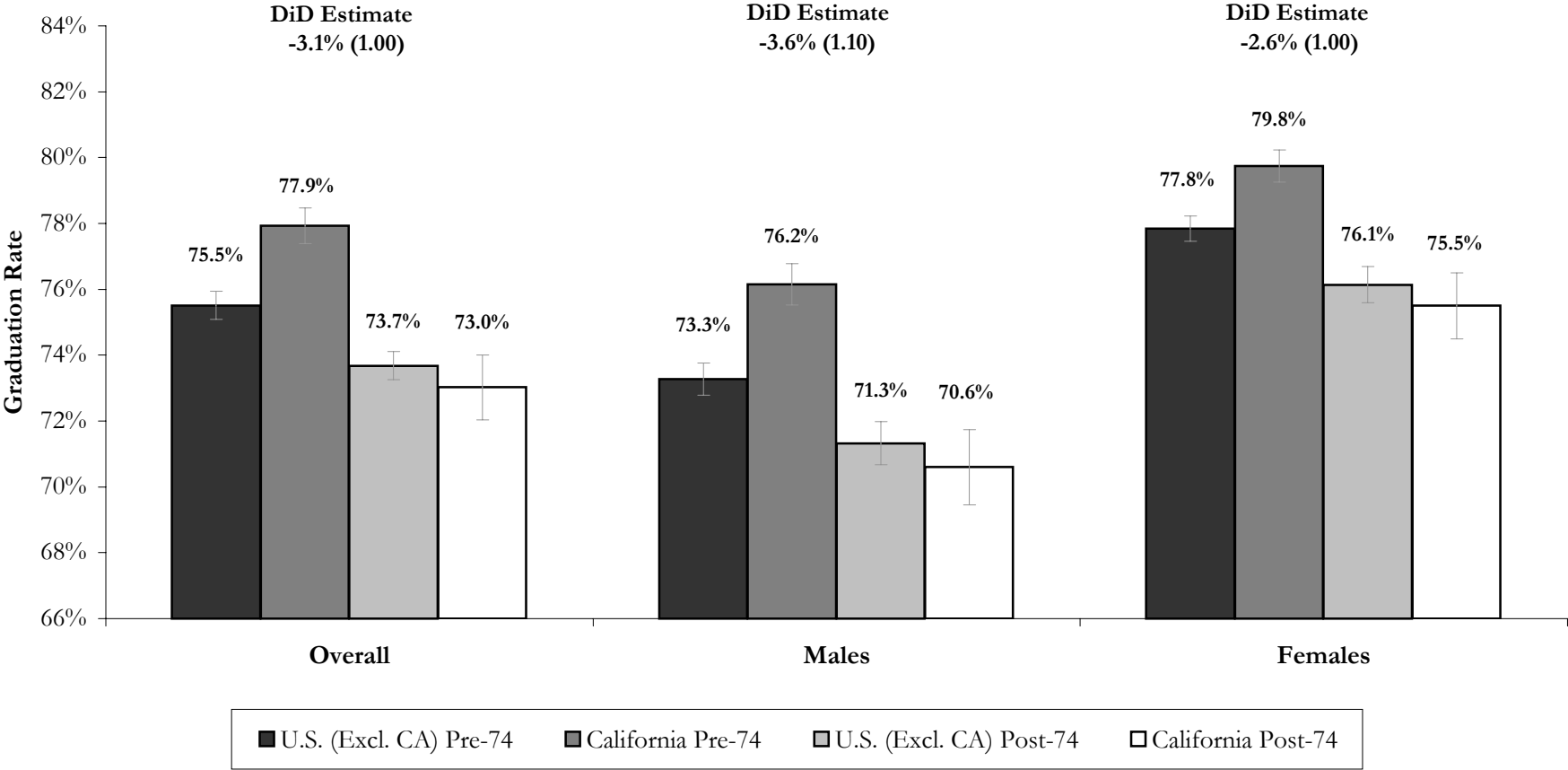
Notes: Authors' calculations based on NCES data. The graduation rate is the number of regular public and private high school diplomas issued over the 14 year old population four years previous. Population totals for the U.S. were obtained from the U.S. Census Bureau. California population estimates were obtained from the California Demographic Research Unit. Huber-White standard errors in parentheses. State 15 year old population are used as weights. Pre-period is defined as 1971-1973 and Post-period as 1975-1977.

Table A-1. Summary Statistics of Variables Used in the Anlaysis

	Treatment Group States				Control Group States			
	Pre-1997 (N=15)		Post-1997 (N=15)		Pre-1997 (N=57)		Post-1997 (N=57)	
	Mean	N	Mean	N	Mean	N	Mean	N
10th-12th Grade Dropout Rate								
Overall	.105 (.019)	15	.090 (.021)	15	.100 (.033)	57	.098 (.032)	57
Whites	.079 (.019)	15	.070 (.019)	15	.086 (.029)	27	.082 (.030)	27
Blacks	.140 (.012)	15	.124 (.018)	15	.158 (.041)	27	.152 (.044)	27
Hispanics	.142 (.020)	15	.109 (.019)	15	.158 (.018)	27	.143 (.014)	27
10th-11th Grade Dropout Rate								
Overall	.112 (.022)	15	.105 (.023)	15	.105 (.041)	57	.102 (.043)	57
Whites	.089 (.024)	15	.085 (.023)	15	.086 (.037)	27	.082 (.042)	26
Blacks	.140 (.019)	15	.134 (.015)	15	.170 (.042)	27	.160 (.051)	27
Hispanics	.152 (.025)	14	.133 (.020)	15	.165 (.025)	27	.143 (.021)	27
12th Grade Dropout Rate								
Overall	.088 (.016)	15	.052 (.025)	15	.095 (.034)	56	.088 (.035)	56
Whites	.057 (.016)	15	.036 (.018)	15	.086 (.034)	26	.079 (.032)	26
Blacks	.139 (.019)	14	.099 (.035)	15	.124 (.058)	27	.129 (.039)	26
Hipsanics	.114 (.019)	15	.049 (.024)	15	.138 (.033)	26	.143 (.036)	26
GED Testing Rate								
Ages 16-19	0.031 (.007)	15	0.027 (.005)	14	0.020 (.007)	57	0.021 (.008)	57
Ages 16-17	0.026 (.006)	15	0.025 (.005)	14	0.014 (.009)	57	0.015 (.009)	57
Ages 18-19	.036 (.009)	15	.029 (.007)	14	.026 (.007)	57	.027 (.009)	57
Time Varying Covariates								
Minimum dropout age	16.78 (.425)	15	17.00 (.347)	15	16.92 (.991)	57	16.92 (.993)	57
Minimum GED testing age	17.65 (.569)	15	17.73 (.564)	15	17.71 (1.031)	57	17.88 (.937)	57
Log per capita income	9.91 (.087)	15	10.12 (.114)	15	10.07 (.133)	57	10.27 (.143)	57
Local unemployment rate	.062 (.010)	15	.047 (.007)	15	.062 (.014)	57	.046 (.009)	57

Note: Standard deviations in parentheses. The dropout rate is defined as the ratio of students enrolled in a given grade(s) in year t and the number of students enrolled in the previous grade(s) in year t-1, where t = 1994-2000. Enrollment data by grade are from the Common Core of Data (CCD). Minimum age required to drop out of school are from the Digest of Education Statistics (several years). Minimum age required to take the GED are from the yearly reports published by the GED Testing Service: "Who Took the GED?" (several years). Local unemployment rates are computed using monthly data from the Bureau of Labor Statistics. Log of per capita income are computed using data from the Census Bureau. All calculations are weighted by the 15-17 year old population in each state.
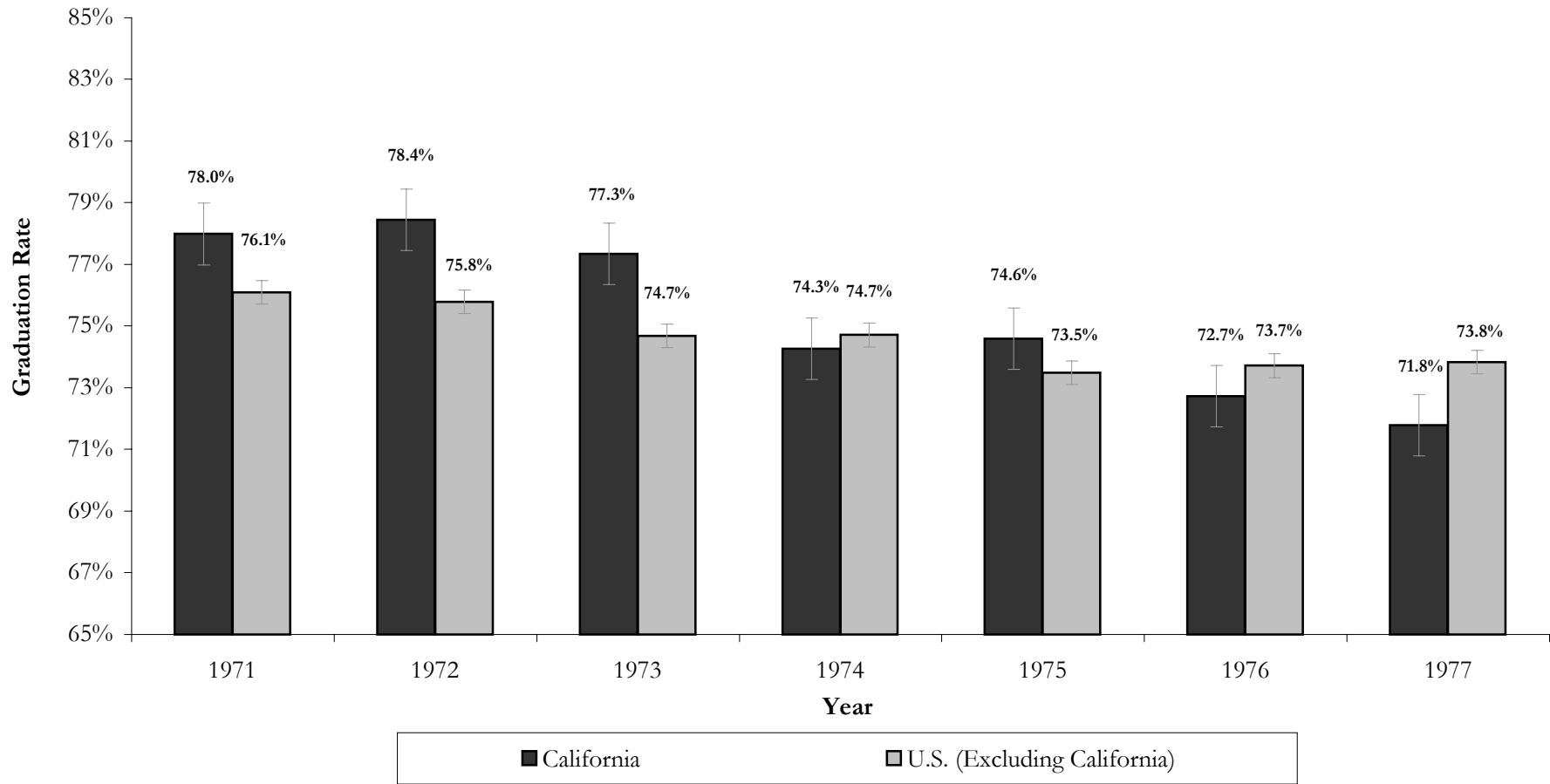
Table A-2. Summary of Robustness Checks

	10th-12th Grade Dropout Rate				10th-11th Grade Dropout Rate				12th Grade Dropout Rate			
	All Races	**Whites**	**Blacks**	**Hispanics**	**All Races**	**Whites**	**Blacks**	**Hispanics**	**All Races**	**Whites**	**Blacks**	**Hispanics**
Score changer states as control group	-1.53%	-1.08%	-1.90%	-2.67%	-0.23%	-0.39%	0.25%	-1.09%	-4.83%	-2.11%	-6.10%	-6.66%
	(.440)	(.400)	(1.010)	(1.050)	(.350)	(.340)	(1.430)	(1.550)	(1.140)	(1.150)	(4.720)	(1.380)
Southern states only	-1.45%	-0.42%	-2.16%	-3.08%	-0.95%	-0.53%	-1.59%	-1.89%	-2.17%	0.07%	-3.30%	-5.82%
	(.210)	(.140)	(.460)	(1.050)	(.260)	(.450)	(.900)	(1.420)	(1.010)	(1.230)	(2.240)	(.960)
Excluding states that changed minimum age required to drop out	-1.30%	-0.42%	-1.25%	-2.58%	-0.56%	0.01%	0.13%	-1.25%	-2.93%	-1.28%	-4.76%	-5.98%
	(.370)	(.160)	(.970)	(.400)	(.540)	(.470)	(1.620)	(.520)	(.650)	(.910)	(1.730)	(.480)
Excluding states that changed either school leaving or GED age requirements	-1.51%	-0.38%	-1.28%	-2.74%	-0.78%	0.16%	0.16%	-1.53%	-3.21%	-1.45%	-4.88%	-5.75%
	(.450)	(.100)	(1.080)	(.470)	(.680)	(.450)	(1.760)	(.600)	(.630)	(1.140)	(1.880)	(.590)
GLS	-1.27%	-0.42%	-1.60%	-2.65%	-0.77%	0.05%	-0.71%	-1.55%	-2.70%	-1.18%	-3.86%	-6.44%
	(.210)	(.150)	(.430)	(.460)	(.210)	(.170)	(.610)	(.550)	(.490)	(.410)	(1.070)	(.650)
GLS using within panel AR-1 autocorrelation structure	-1.37%	-0.51%	-1.56%	-2.49%	-0.90%	-0.05%	-0.89%	-1.15%	-2.83%	-1.70%	-4.04%	-6.45%
	(.170)	(.120)	(.340)	(.360)	(.190)	(.150)	(.580)	(.470)	(.380)	(.330)	(.990)	(.580)
Restricting Control Group to California and Florida (High Immigrant States)	…	…	…	-1.60%	…	…	…	0.53%	…	…	…	-7.25%
	…	…	…	(.372)	…	…	…	(.677)	…	…	…	(.590)

Note: Huber-White robust standard errors are in parentheses (clustered by state). The full regression specifications are presented in the web appendix. Unless otherwise stated the model is estimated using OLS. State 15-17 year old populations (by race for relevant regressions) are used as weights. The estimate reported above is the interaction between the treatment state dummy and the post period dummy, where the treatment state dummy is equal to 1 for treatment states and the post period dummy is equal to 1 for the years 1998-2000, otherwise both dummies are equal to 0. States with fewer than two observations per period are dropped for "all races" regressions. States with fewer than two observations per period for any of the dropout rate measures by race are dropped for by race regressions. Treatment states are those states that were required to eliminate the and/or score option. These include: LA, MS, NE, NM, TX. Unless otherwise stated control states are those that were not required to raise their GED minimum score requirement. These include:
AR, CA, CO, DE, DC, FL, ID, KY, MD, MO, NJ, NY, ND, OK, OR, SD, UT, WA, WV, WI. From these states the following had to be dropped from the "by race" regressions due to missing and negative dropout rates: AR, ID, KY, MO, ND, NJ, NY, SD, UT, WA, WV. The state of NJ is also dropped from the "all races" regressions. Score changer states are those states that were required to raise their minimum score requirement from 35 to 40 in 1997. These include: AK, AL, AZ, CT, GA, HI, IA, IL, IN, KS, MA, ME, MI, MN, MT, NC, NH, NV, OH, PA, RI, SC, TN, VA, VT, WY. From these states the following are dropped due to missing and negative dropout rates:
AL, AZ, IA, ME, MN, MT, NH, SC, TN, VT, WY. No treatment states are dropped from any of the regressions. States that changed the minimum age required to drop out include: DC (from original control group), MS and NM (both from treatment group). States that changed either school leaving or GED age requirements include: AR, DC, KY, MO, OK, OR, SD, UT, WI (from original control group) and MS, NE and NM (from treatment group).

Figure A-1. Graduation Rate Before and After Implementing the GED Program, California vs. All other States

Notes: Authors' calculations based on NCES data. The graduation rate is the number of regular public and private high school diplomas issued over the 14 year old population four years previous. Population totals for the U.S. were obtained from the U.S. Census Bureau. California population estimates were obtained from the California Demographic Research Unit.