

## 6

## *Do High School Exit Exams Influence Educational Attainment or Labor Market Performance?*

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The federal government has recently taken a central role in promulgating standards-based education reform through the No Child Left Behind (NCLB) Act of 2001. In particular, NCLB has introduced explicit requirements for student testing, as well as consequences for schools that fail to make “adequate yearly progress” toward specific achievement goals. The implementation of this landmark legislation continues to unfold at the state level as the 2013–14 deadline for raising all students to academic proficiency approaches.<sup>1</sup> A question of particular interest about these ongoing standards-based reforms is whether they will be able to close the achievement gaps that contribute to the persistence of poverty and economic inequality.

While NCLB focuses exclusively on *schools* as a unit of accountability, many states have responded to the legislation by implementing programs to hold *students* accountable. Of course, this is not a new phenomenon. The so-called first wave of education reform began approximately thirty years ago as several states began to introduce standardized tests that students were required to pass to graduate. Around the same time, states began to introduce

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1. Lynn Olson, “Room to Maneuver,” *Education Week* 25, no. 15, December 15, 2005, pp. S1–S5.

requirements that students pass an explicit number of core academic courses to graduate.

NCLB appears to have accelerated this trend. By 2000 eighteen states had passed a high school exit exam, most of which were implemented in the 1980s. Since the passage of NCLB, two states (Arkansas and Massachusetts) have implemented exit exams, and three states (Louisiana, Tennessee, and Virginia) have made existing exams substantially more rigorous. Seven other states plan to introduce such requirements within the next seven years.<sup>2</sup> Nearly all states now have explicit requirements for how many core academic courses high school graduates must complete.

Despite their widespread acceptance, these student-focused reforms have been the subject of little rigorous empirical scrutiny. The literature that is available provides contradictory evidence on the fundamental consequences of these state initiatives. In this study, we present new empirical evidence on how these state reforms—in particular, exit exams—influenced educational attainment and early labor market experiences. This study makes three broad contributions to the extant literature. One involves the analysis of more recent datasets (that is, data from the 2000 Census and the Common Core of Data [CCD] from the National Center for Education Statistics [NCES]) and state policy changes. A second contribution is the use of research designs that are robust to potential confounding factors and that allow us to synthesize our findings with the prior literature. Third, we directly examine how the effects of these policies may have varied by race, gender, and ethnicity and assess what these findings suggest about the effects of first-wave reforms on children in poverty.

We find evidence that these student-focused standards-based reforms have exacerbated inequality. Our analysis of data of the 2000 Census indicates that exit exams led to particularly large increases in the dropout rates of Black students. Similarly, our analysis of Minnesota’s recent exit exam, based on the NCES’ Common Core of Data, indicates that this state’s graduation requirement increased the dropout rates in school districts with relatively large concentrations of minority students as well as in urban and high-poverty school districts while reducing the dropout rates in suburban and low-poverty school districts.

At the same time, we find some evidence that these policies may have benefited certain groups. For example, our analysis of data from the 2000 Census indicates that exit exams improved some longer-term outcomes (for example, college matriculation, labor-market outcomes) for Hispanic females

2. Sullivan and others (2005).

and Blacks. Similarly, the positive effects of exit exams in Minnesota's suburban and more affluent school districts suggest the potentially beneficial incentive effects of these types of policies.

This study is organized as follows. The second section provides background on the first-wave reforms and discusses the prior literature. The third section presents new evaluation results based on data from the 2000 Census. The fourth section presents complementary evidence based on dropout data from the Common Core of Data. The chapter concludes with a discussion of what these results suggest about the effects of ongoing standards-based reforms.

### "First-Wave" Education Reforms

In the 1970s, there was a growing perception that the quality of public schools was in decline and that the high school diploma, in particular, was no longer a meaningful credential that vouched for a student's skills and motivation.<sup>3</sup> These concerns were often voiced most prominently by local business leaders concerned with the quality of the entering workforce. Nearly every state responded to these concerns by instituting testing programs designed to assess students' basic skills.<sup>4</sup>

#### *Conceptual Framework*

The intent of most of these new testing programs was to identify low-performing students and provide them with sources of remediation. However, a number of states also began to require that students pass a performance threshold to graduate.<sup>5</sup> These exit exams (EEs), particularly in their earliest incarnations, typically required that students demonstrate math and reading skills at only an eighth or ninth grade level. Furthermore, students often began taking these exams as early as eighth or ninth grade and were typically given multiple retesting opportunities so that they could graduate. Nonetheless, the failure rates on these exams often proved politically unacceptable, and states would sometimes lower their cut scores or adjust their exemptions in response.<sup>6</sup>

In addition to these test-based standards, states also began introducing a particular type of "process" standard during this period that required high

school graduates to complete an explicit number of courses, particularly in core academic areas. These reforms accelerated after *A Nation at Risk* decried "cafeteria-style" curricula and recommended that the adoption of a "New Basics" curriculum that included four years of English and three years of social studies, science, and mathematics.<sup>7</sup> Only a few states adopted the "New Basics" requirements, but virtually every state introduced or increased its course graduation requirements (CGRs) over the last three decades.

The public discourse that accompanied the adoption of these policies focused on encouraging the academic effort of students and reinvigorating the high school diploma as a meaningful education credential. However, these reforms could conceivably influence student outcomes in several distinct and sometimes contradictory ways. For example, the most obvious potential consequence of exit exams is to elicit increased academic effort from students. The potential education benefits of exit exams could also extend beyond the marginal student from whom they might encourage additional effort. In particular, one study discusses how the higher and external standards implied by exit exams might limit the "nerd harassment" and peer pressure that encourages high-ability students to shirk educational effort.<sup>8</sup>

However, the introduction of exit exams could also have unintended, pejorative consequences for the effort and achievement of particular students. For example, the existence of a testing requirement could reduce the academic engagement of very low-performing students who see little chance of passing the exam. It has also been suggested that standards like exit exams could reduce performance among high-achieving students by prominently signaling relatively low public expectations.<sup>9</sup> In fact, the authors of *A Nation at Risk* voiced this concern, suggesting that minimum competency tests would become maximum standards and lower the expectations for high-ability students.

Another conjectured benefit of exit exams is that their high-stakes consequences will promote student achievement by improving the performance of schools and teachers. For example, the literature on "effective schools" has identified several characteristics associated with successful schools. These critical traits include clearly defined objectives, a common mission, continuous monitoring of student performance, and appropriate remediation for under-

3. See, for example, Popham (1981).

4. Pipho (1978).

5. States typically delayed the enactment of these exit exams to provide students with adequate notice, to allow for the development of the tests and curricular changes, and in response to court challenges (see table A6-1).

6. See, for example, Catterall (1989).

7. National Commission on Excellence in Education (1983).

8. Bishop (1999).

9. See, for example, Phillips and Chin (2001).

achieving students.<sup>10</sup> This literature suggests that the introduction of exit exams could make schools more effective by establishing clear objectives and providing student-specific assessments. Exit exams may also encourage (and facilitate) the targeting of remediation efforts to the neediest students in a manner that reduces minority achievement gaps.

However, exit exams could also harm the performances of the school and teachers. For example, high-stakes exit exams could lead teachers to focus their instruction on a limited set of skills or use more didactic teaching methods (both of which might be described as "teaching to the test") that are less effective at fostering intellectual engagement and higher-order critical skills.<sup>11</sup> Indeed, there is strong evidence that high-stakes educational accountability policies lead to strategic placement of low-achieving students into special education or bilingual programs to avoid testing.<sup>12</sup> Of course, provisions of NCLB that require nearly all students to take the exams are intended to mitigate this concern. However, there is even evidence that accountability may lead teachers and administrators to manipulate student exam scores to falsely improve student performance.<sup>13</sup>

As noted above, one of the key motivations for the first-wave education reforms was to ensure that a high school diploma was a signal that a student had mastered important skills. This suggests that the other potentially important consequences of exit exams involve their effects on employer perceptions. More specifically, exit exams may have changed the signal (of achievement and hard work) that a high school diploma provides by changing the composition of workers with different education levels. Proponents generally argue that stricter graduation requirements will increase the benefit of a high school diploma because employers will know that high school graduates have mastered certain skills. What is less often realized, however, is that the introduction of stricter graduation requirements may also enhance the signal conveyed by *not* completing high school. Consider the simplest case in which the new standards have no incentive effects and merely reduce the fraction of those able to obtain a diploma. In this case, the average ability level of the graduates will increase because the lowest-achieving students who received diplomas under the old standard no longer receive diplomas under the new standard. However, the average ability level among dropouts will also increase because the students who were pushed into the dropout group under

the new standard are higher achieving than those who were already in the dropout group under the old standard. The sorting induced by the new requirements will therefore improve the labor market outcomes for both dropouts and graduates.<sup>14</sup>

### *Prior Literature*

The prior discussion indicates that the likely effects of the first-wave standards on student outcomes should be viewed as an open, empirical question. However, despite the prominence of standards-based reforms, these long-standing state-level experiments have actually been the subject of relatively little empirical scrutiny. The evidence that does exist is generally mixed and unsatisfactory. This is largely due to two issues: the lack of consistent and reliable data on outcomes such as achievement or educational attainment and the difficulty of differentiating between effects due to the exit exams and effects due to other related policies or conditions in the state at the time. In this subsection, we review several recent studies, highlighting the two difficulties described above.<sup>15</sup>

Several studies conducted cross-sectional analyses of educational attainment and labor market performance using nationally representative datasets such as High School and Beyond (HS&B) and the National Educational Longitudinal Survey of 1988 (NELS:88). One cross-sectional analysis of NELS:88 found that exit exams only increased dropout probabilities for low-ability students.<sup>16</sup> Another study found similar results with the NELS:88: namely, course graduation requirements reduced the probability of seniors graduating from high school, and state exit exams increased dropout rates for students with below-average grades but increased the number of GEDs (general equivalency diplomas) and the average time spent in high school.<sup>17</sup> A third study presented evidence that course graduation requirements, but not state exit exams, increased dropout rates.<sup>18</sup> That analysis is based both on data that have one observation for each state in each year as well as data that have observations on individuals from HS&B and NELS:88, although the exit exam effect is based exclusively on cross-sectional comparisons and does not separately examine lower-achieving students. However, a more recent study, which used a later wave of data from NELS:88, found that high school

10. Purkey and Smith (1983); Purkey and Smith (1985); Stringfield and Teddlie (1988).

11. Murnane and Levy (2001); Airasian (1987); Koretz and Barron (1998); Jacob (2005).

12. Jacob (2005); Figlio and Getzler (2002); Cullen and Reback (2006).

13. Jacob and Levitt (2003).

14. Betts and Costrell (2001).

15. For a survey of earlier research, see Jacob (2001).

16. Jacob (2001).

17. Bishop and Mane (2001).

18. Lillard and DeCicca (2001).

examination requirements were not associated with increased chances of leaving school without a diploma or a GED, even among low socioeconomic status and low-achieving students.<sup>19</sup>

A significant limitation of these studies is that they had a limited ability to control for state-specific factors that may be correlated with student outcomes as well as with the adoption of exit exams or course graduation requirements. For example, one might be concerned that states adopted stricter graduation requirements in response to a decline in student performance, in which case the effects of exit exams or course graduation requirements would likely be biased toward finding negative policy effects. Although the studies cited above attempted to control for state-specific factors such as employment rates, per pupil expenditures, and other things that might influence student outcomes, one might still be concerned about the type of trend described above or some other unobservable state factor. Moreover, analyses based on NELS:88 cannot provide information on cohorts other than on those expected to graduate in 1992.

Another recent study used data from the 1990 Census Public Use Microdata Sample (PUMS) to address several of these concerns.<sup>20</sup> The PUMS used in the study was a 5 percent sample from the Census that includes a variety of information on individuals including age, race, gender, "state of birth" (which serves as a proxy for the state in which one attended secondary school), highest grade completed, employment, and earnings. Using age and state of birth, this study determined whether individuals would have been subject to course graduation requirements or exit exams as adolescents. It then employed a difference-in-difference strategy that involved comparing the outcomes of individuals within the same state who experienced different policies because of their age and the timing of when the policies were introduced. By controlling for fixed effects for state of birth, this approach controls for any time-invariant state characteristics that might be correlated with policy adoption and student outcomes. This study concluded that exit exams reduced the probability of completing high school, but only for Black males. However, the study also found that exit exams created passive labor market rewards for Black males in the form of increased employment in their twenties, an outcome consistent with the hypothesis that these testing regimes changed the signals associated with dropping out and graduating.<sup>21</sup>

19. Warren and Edwards (2005).

20. Dee (2003).

21. Dee (2003) considers part-time as well as full-time employment and in some specifications includes controls for whether the respondent was enrolled in school (presumably college)

Finally, several recent studies have utilized state-level data on enrollment and completion rates to examine this issue. Some found that exit exams increased dropout rates, while others found no effects on completion rates.<sup>22</sup> Two other studies suggested that this recent work had several serious methodological shortcomings: for example, information about exit exams is often inaccurate, the state-level measures of completion rates have important flaws, and many of these studies fail to account for unobserved heterogeneity across states.<sup>23</sup>

One of these recent studies addressed these issues of measurement and specification.<sup>24</sup> More specifically, the authors utilized state-level panel data on high school completion rates from 1975 to 2002 and examined three dependent variables:

—A status dropout measure that treats high school diplomas and GEDs as equivalent: this measure is derived from data from the Current Population Survey (CPS) on sixteen- to nineteen-year-olds who are not enrolled in school and do not have a diploma or GED

—A measure of high school completion that uses data from the Common Core of Data: this measure is defined as the ratio of the number of high school completers (which is available for each state and year over many years) to the number of ninth graders enrolled three academic years earlier, after adjusting for interstate migration

—The percent of sixteen- to nineteen-year-olds in a state who take the GED

They found that exit exams were associated with lower completion rates and higher rates of people taking the GED exam and that these relationships were stronger in states with more difficult exams, higher poverty levels, and more racial and ethnic minorities.

The authors noted that state-level high school dropout rates from the CPS have substantial limitations, but they chose to report results on this measure

at the time of the interview. At the time of the interview, all respondents would have been at least twenty years of age. Moreover, the author found that exit exams had no impact on the likelihood that Black males would enroll in college. Together, these facts suggested that the employment effects were not driven by the fact that high school dropouts were more likely to be employed than enrolled students. While these results are consistent with a scenario in which the implementation of an exit exam changes the composition of dropouts and graduates, the findings are also consistent with a scenario in which the implementation of the exam changed the actual skills acquired by students (dropouts as well as graduates). However, Dee also found that exit exams were associated with reductions in students taking core academic courses.

22. Amrein and Berliner (2002); Carnoy and Loeb (2002); Greene and Winters (2004); Warren and Jenkins (2005); Marchant and Paulson (2005).

23. Warren, Jenkins, and Kulick (2005); Warren (2005).

24. Warren, Jenkins, and Kulick (2005).

so that they could compare their results with prior research. The authors' preferred measure was their estimated high school completion rate. A related analysis suggested that this measure was not biased by interstate migration, grade retention, or changes in the size of incoming high school cohorts.<sup>25</sup> However, the authors noted that this measure is modestly biased by international migration and student retention in the eighth grade. From the perspective of evaluating the effects of exit exams, the first study had two more substantive shortcomings. One was that the aggregate state-year completion rates made it more difficult to examine the important question of how the effects of exit exams may have varied by race, gender, and ethnicity. Second, this study did not address the issue of whether exit exams have had their conjectured effects on subsequent labor market outcomes.

Another study applied a distinctly novel research design to the dropout question.<sup>26</sup> The author examined the impact of the exit exam in Texas utilizing a regression discontinuity design in which he compared students who barely pass and barely fail the test. He found two particularly interesting results. First, there was no evidence of a discouragement effect. That is, students who barely failed the exam in tenth or eleventh grade were no more likely to drop out than were students who barely passed the exam in these grades. Second, the exam did ultimately reduce the likelihood of graduation. Students who barely failed the final exam had significantly lower chances of holding either a diploma or a GED and were less likely to attend postsecondary schooling compared with those who barely passed. The author estimated that roughly 1 percent of Texas students do not graduate because they cannot pass the test, which implies a relative effect of roughly 5 percent (relative to the mean dropout rate).<sup>27</sup>

The most recent studies of high school exit exams provide mixed evidence on the basic question of whether they increased the likelihood of dropping out of high school. This study contributes to this literature in several distinct ways:

—We use the most recently available data, which allow us to assess whether the more recent (and generally more rigorous) exit exams uniquely influenced educational attainment.

—Unlike several of the prior studies, we also focus on the important question of whether these reforms had unique effects by race, gender, or ethnicity.

25. Warren (2005).

26. Martorell (2004).

27. The relative effect is calculated by dividing the absolute effect (1 percentage point) by the average dropout rate (20 percent), which yields  $1 \div 20 = 0.05$  or 5 percent.

—Our study examines the effects of exit exams on subsequent labor market outcomes, not just on educational attainment.

### Evidence from the 2000 Census

In this section, we present new evidence on the impact of exit exams and course graduation requirements using data from the 2000 Census Public Use Microdata Sample (2000 PUMS). The PUMS data offer several other advantages relative to the CPS and CCD data used in the analyses described above. First, the large number of respondents in the PUMS allows one to precisely identify very small policy effects, and a better ability to detect race-specific responses to educational policies. Second, the background information on race and gender allows one to examine the impact of educational policies across important demographic subpopulations. Third, the self-reported data on educational attainment avoid some of the problems associated with the imputed high school completion measures in prior research.<sup>28</sup> Also, because PUMS respondents report educational attainment as of 1999, for most birth cohorts the data will allow an individual who takes longer than four years to finish high school to be counted as completing. Finally, the PUMS provides information on other interesting and important outcomes such as college attendance, employment, and earnings.

However, the PUMS has several important limitations. First, because of interstate mobility, state of birth is an imperfect proxy for the state in which a child attended secondary school. This measurement error will tend to attenuate the effects of the state-level education policy variables such as exit exams and course graduation requirements. Second, respondents may systematically misreport educational attainment or employment. On the one hand, if this misreporting is (conditionally) random with respect to relevant characteristics, it will simply increase the residual variation in our models and thus decrease the precision of our estimates. On the other hand, if an individual's tendency to misreport his or her educational attainment is correlated with the existence of an exit exam and course graduation requirements, the misreporting may introduce bias into our estimates. A third and related problem is that the PUMS questionnaire does not distinguish between conventional high school graduates and GED completers. In light of the possibility that exit exams encourage students to drop out but also attain a GED, this Census coding convention implies that our results will

28. See, for example, Warren, Jenkins, and Kulick (2005).

understate the true policy-induced reductions in the likelihood of graduating from high school.

#### Data

The 2000 PUMS consists of approximately 14 million respondents (5 percent of the population) who completed the long-form questionnaire to the decennial Census (U.S. Bureau of the Census 2003).<sup>29</sup> The PUMS includes a host of information on respondents, including age, race, gender, state of birth, current state of residence, educational attainment, and labor market performance. One particularly useful feature of the PUMS is that, because it contains individuals from multiple birth cohorts within each state, one can exploit within-state variation in exit exams and course graduation requirements instead of the cross-state variation to estimate the effects of these policies.

Our extract from the PUMS data consists of the 2,925,005 White (non-Hispanic), Hispanic, and Black respondents who were aged eighteen between 1980 and 1998 and who were born in one of forty-nine states.<sup>30</sup> Two of the outcome variables defined for each respondent identify educational attainment, a binary indicator for high school graduation and another for college entrance.<sup>31</sup> We limited the sample to those who were at least eighteen by 1998 because of the biases that could be generated by state-specific trends in the "incomplete spells" of high school completion and college entrance among cohorts that were younger at the time of the Census interview.<sup>32</sup> The other dependent variables reflect the labor market experiences of each PUMS respondent. One is a binary indicator for employment participation, which is defined for all respondents.<sup>33</sup> The other is the natural log of average weekly wages, which is defined only for 2,429,250 respondents. This wage variable

29. U.S. Census Bureau (2000).

30. See Ruggles and others (2004). Respondents born in Nebraska were omitted since that state does not use Carnegie units in defining its graduation standards. The inclusion of Nebraska does not change the results for exit exams. We identified the year in which each respondent was eighteen by their age on enumeration day (April 1, 2000). Respondents from the District of Columbia or those born abroad were also excluded.

31. College entrants are those whose highest reported educational attainment was "Some college, no degree" or higher. It should be noted that this sample, of course, includes students who attended private schools. However, their inclusion is arguably appropriate since it is possible that students may switch schools to avoid the consequences of stricter standards.

32. Angrist and Evans (1999).

33. Those who report that they are not in the labor force are defined as unemployed to avoid omitting discouraged workers. However, the exclusion of these respondents does not substantively alter the subsequent results.

is the ratio of pretax wage and salary income reported for the previous calendar year to the corresponding number of weeks worked.

Using the respondents' birth years and states of birth, we determine whether each individual was subject to an exit exam and course graduation requirements. Specifically, we assign to each respondent the policies regarding exit exams and course graduation requirement that applied to the high school graduating class in his or her state of birth when the respondent was eighteen years old. For example, a twenty-seven-year-old respondent born in Virginia would have been eighteen years old in 1991 and thus was assigned the policies in place for the graduating class of 1991 in Virginia. Table 6A-1 presents data on exit exams by state and year. Here, "year" refers to a graduating class rather than a calendar year. For example, when we say that "Virginia had an exit exam in 2000," we mean that the high school graduating class of 2000 in Virginia was subject to the exam.

Similar to at least one other recent study, this study distinguishes between more and less difficult exit exams based on the difficulty of the material included in the exam.<sup>34</sup> Specifically, if any component of a state exit exam assessed material that was first presented during the high school years (that is, in ninth grader or later), the exit exam is referred to as a more difficult exam. Information on the grade level of the material assessed in an exit exam was gathered from a variety of sources, including official reports published by state departments of education as well as newspaper accounts of the exit exam.<sup>35</sup> Note that this definition has several shortcomings. Because districts may introduce material at different grade levels, it is difficult to determine whether this measure is comparable across states. In addition, states can alter the difficulty of an exam by adjusting the required passing score, so that it is possible that an exam containing "less difficult" material may actually be more difficult to pass relative to an exam covering more difficult material.

The second dummy identifies whether the state had high, academically focused course graduation requirements (CGRs) in effect for that graduating class. "High" CGRs are defined here as a required high school curriculum that includes at least 3 Carnegie units in English, 2 in social studies, 1 in sci-

34. Warren, Jenkins, and Kulick (2005).

35. It is worth noting that our investigation revealed several potential mistakes in the classification adopted by Warren, Jenkins, and Kulick (2005). For example, the authors indicated that the Florida exam became "more difficult" in 1993, whereas our research indicates that this did not occur until the introduction of the Florida Comprehensive Assessment Test (FCAT) in 1996. Similarly, they indicated that Louisiana's exit exam was "more difficult" since its inception in 1991, while our research indicates that it did not reach this level of difficulty until the introduction of a new exam in 2003.



ence, and 1 in mathematics.<sup>36</sup> "Very high" CGRs are defined here as a curriculum that requires the following: 4 Carnegie units in English, 3 in social studies, 2 in math, and 2 in science.

Table 6-1 presents summary statistics for our sample. Roughly 87 percent of respondents graduated from high school, and 57 percent attended at least some college. About 14 percent of the sample is Black, and 3 percent is Hispanic.<sup>37</sup> More than 75 percent of respondents were employed at the time of the survey. Approximately 32 percent of state-year observations have an exit exam, but only 5 percent have a more difficult exit exam. Rigorous course graduation requirements are more common, with 75 percent of state-year observations requiring at least 3 units of English, 2 units of social studies, and 1 unit of math and science and 25 percent requiring 4, 3, 2, and 2 or more (respectively).

### *Empirical Strategy*

The goal of our analysis is to estimate the causal impact of exit exams and course graduation requirements on educational attainment and labor market outcomes. Our primary concern is that unobserved factors may be correlated with both the introduction of these policies and our outcome measures, which could lead our estimates to understate or overstate the true "causal" impact of the educational policies. Since these reforms were state policies that were enacted in particular years, we are most concerned about unobserved state- or time-specific factors, perhaps including things such as economic conditions or other educational policies. To mitigate this concern, we estimate what are often referred to as state-year panel data models. By focusing exclusively on changes that take place *within* states over time, this approach removes the possible biases due to unobserved time-invariant state-level determinants of educational attainment and labor market performance. We are effectively comparing the differences among cohorts in the "treatment" states before and after the introduction of new standards to the contemporaneous cross-cohort changes in the "control" states.

The basic specification used for regression models based on these data is:

$$(1) \quad Y_{ist} = \beta X_{ist} + \gamma Z_{st} + \mu_s + \alpha_t + \varepsilon_{ist}$$

36. Some studies represent state CGR policies by the total number of Carnegie units required. However, this measure may more accurately reflect the focus of reform efforts (for example, a major emphasis of *A Nation at Risk* was to increase the number of courses that students take in core academic areas).

37. The proportion of Hispanics is lower than the national average since we exclude all respondents who were foreign-born.

where  $Y_{ist}$  is the dependent variable for respondent  $i$  in state of birth  $s$  and birth cohort  $t$ , and the matrix  $X$  includes observed, individual-level traits. In most models, the individual covariates simply include binary indicators for race and gender. In the models for labor market outcomes, we also estimate models that control for measures of educational attainment (that is, separate dummy variables for high school graduates, those with some college, and those with bachelor degrees) and a dummy variable for whether the respondent attended school within the last year.<sup>38</sup> We discuss the estimates from the reduced form as well as the more complete models in the next section. The terms  $\mu_s$  and  $\alpha_t$  represent fixed effects specific to each state of birth and year of birth. The term  $\varepsilon_{ist}$  is a mean-zero random error. We report Huber-White heteroscedastic-consistent standard errors, which allow for arbitrary correlation of errors within each state of birth.<sup>39</sup> For specifications with dichotomous outcome variables, we estimate probit models; for other specifications, we estimate OLS (ordinary least squares) models.

The matrix  $Z$  includes determinants that were specific to the birth cohorts within each state. These determinants include the two independent variables of interest: dummy variables that reflect the state EE and CGRs policies in place for each birth cohort at age eighteen. These and other state-year controls were matched to the respondents by their state of birth and year of birth. As noted earlier, the measurement error introduced by relying on state of birth will lead to attenuation bias in these state-level variables, suggesting that the reported estimates can be interpreted as lower bounds on the true effects.<sup>40</sup>

As suggested earlier, the identification strategy embedded in this model makes a potentially important contribution to our understanding of the consequences of exit exams and course graduation requirements because it removes the possible biases due to unobserved time-invariant state-level determinants of educational attainment and labor market performance. The inclusion of state fixed effects means that we are effectively comparing the differences among cohorts in the "treatment" states before and after the introduction of new standards to the contemporaneous cross-cohort changes in the "control" states.

We present some evidence on the empirical relevance of relying on within-state versus cross-state comparisons by comparing the results of models that

38. The school attendance variable is meant to control for the fact that those respondents still in school over the last year would have had limited labor market experiences. This specification is similar to those used by Bishop and Mane (2001).

39. Bertrand, Duflo, and Mullainathan (2004).

40. We found that the results were similar in models that matched respondents to the state-year variables by their state of residence five years before the Census.

Table 6-1. *Descriptive Statistics for the PUMS Analysis*

Source (definition)		Full sample				Less difficult exit exam		More difficult exit exam	
		Min	Max	Mean	SD	Mean	SD	Mean	SD
<i>Dependent variables</i>									
High school graduate	2000 PUMS (completed high school—may or may not have obtained further education)	0	1	0.873	0.333	0.859	0.348	0.826	0.379
Attended college	2000 PUMS (enrolled in college—may or may not have obtained further education)	0	1	0.573	0.495	0.568	0.495	0.508	0.500
Employed	2000 PUMS (those not in the labor force are included as unemployed)	0	1	0.755	0.430	0.740	0.439	0.676	0.468
Average weekly earnings <sup>a</sup>	2000 PUMS (total annual salary income divided by number of weeks worked)	0.077	325,000	615	1,178	617	1,205	380	807
Ln(average weekly earnings)	2000 PUMS	-2.565	12.692	6.080	0.802	6.082	0.795	5.624	0.745
<i>Main independent variables</i>									
Less difficult exit exam (EE)	Various sources (in effect for the high school graduating class in the respondent's state of birth in the year that the respondent was seventeen years old; covers material below ninth grade level)	0	1	0.317	0.465	1.000	0.000	0.000	0.000
More difficult EE	Various sources (covers material at ninth grade level or higher)	0	1	0.053	0.224	0.000	0.000	1.000	0.000
Moderately rigorous course graduation requirements (CGRs)	Various sources (at least 3 Carnegie units in English, 2 in social studies, 1 in math, 1 in science)	0	1	0.746	0.436	0.444	0.497	0.516	0.500
Very rigorous CGRs	Various sources (at least 4 in English, 3 in social studies, 2 in math, 2 in science)	0	1	0.234	0.423	0.456	0.498	0.484	0.500
<i>Individual covariates</i>									
Female	2000 PUMS	0	1	0.506	0.500	0.509	0.500	0.501	0.500
Black	2000 PUMS	0	1	0.135	0.342	0.212	0.409	0.168	0.374
<i>State-level time-varying covariates</i>									
Hispanic	2000 PUMS	0	1	0.033	0.178	0.027	0.161	0.068	0.252
Enrolled in school	2000 PUMS	0	1	0.152	0.359	0.152	0.359	0.327	0.469
High school graduate	2000 PUMS (completed high school but did not obtain any further education)	0	1	0.300	0.458	0.291	0.454	0.318	0.466
Some college	2000 PUMS (completed high school and enrolled in college or obtained an AA degree)	0	1	0.354	0.478	0.337	0.473	0.415	0.493
BA	2000 PUMS (obtained a BA degree or higher)	0	1	0.219	0.414	0.231	0.422	0.093	0.290
Poverty rate	Statistical Abstract of the United States (in respondent's state of birth when the respondent was seventeen years old)	0.024	0.180	0.068	0.021	0.150	0.036	0.148	0.030
Unemployment rate	Statistical Abstract of the United States (in respondent's state of birth when the respondent was seventeen years old)	8.814	13.050	11.647	0.832	0.064	0.015	0.058	0.009
Ln(number of eighteen-year-olds in the state)	Census (in respondent's state of birth when the respondent was eighteen years old)	0.029	0.272	0.139	0.036	11.754	0.702	12.148	0.401
Average in-state tuition at lowest-level state college (dollars)	State of Washington Higher Education Coordinating Board (in respondent's state of birth when the respondent was seventeen years old)	0.000	2,698	727	362	802	352	813	336
K-12 student-teacher ratio	Digest of Educational Statistics (in respondent's state of birth when the respondent was seventeen years old)	1.900	27.400	17.965	2.496	17.082	1.727	16.133	1.182
Average K-12 teacher salary (2000 dollars)	Digest of Educational Statistics (in respondent's state of birth when the respondent was seventeen years old)	11,448	50,647	27,242	8,757	28,305	8,020	34,309	5,320
State issued school report cards for K-12	Various sources (policy in respondent's state of birth when the respondent was twelve years old)	0	1	0.015	0.121	0.019	0.137	0.035	0.184
Number of executions	Various sources	0	37	0.845	3.219	0.859	0.348	0.826	0.379

Source: 2000 PUMS.

Min = minimum value; Max = maximum value; SD = standard deviation.

a. There are a very small number of cases where the average weekly wage is less than \$10 and, as in the case of the minimum, less than \$1. These are clearly data entry errors, but because there are so few such cases, they were kept in the data.



do and do not include the state fixed effects. As a further ad hoc check on the validity of this specification, in some models we include an additional predictor variable—namely, the number of state executions that took place in a respondent's state of birth when the respondent was eighteen years of age as a predictor.<sup>41</sup> Insofar as one believes that state executions should not have had a large and statistically significant effect on educational attainment, for example, the finding of such effects would suggest the presence of specification error. One virtue of using state executions for this type of "falsification exercise" is that there was considerable variation over this period both within states and across states in the number of state executions.

In the preferred specifications, which include state fixed effects, the possible sources of omitted variable biases are the unobserved determinants of *Y* that are also related to the timing of new standards within states. The matrix *Z* addresses this concern by including other regression controls that vary by state and year. For example, new state standards were sometimes part of omnibus education bills that included other policy changes such as increased spending. To control for the possible effects of school spending, some models include, as an independent state-level variable, per pupil expenditures in K-12 public schools when the respondents were sixteen- to seventeen-years-old. For example, respondents who were eighteen in 1980 were matched to the school expenditures in their state during the 1978-79 school year. Another state-year control in most models is the state unemployment rate when the respondent was seventeen years old. This variable is expected to have a positive effect on educational attainment since it reduces the opportunity costs associated with remaining in school.<sup>42</sup>

A recent study presented evidence that the natural variation in the size of the population of a particular birth cohort could also influence educational attainment.<sup>43</sup> At the college level, this could occur if temporary increases in cohort size were not fully matched by an increased supply of enrollment space at local colleges and universities. At the secondary level, increased cohort size may reduce the benefits of remaining in school by lowering school quality.<sup>44</sup> Therefore, we also include a measure of cohort size based on the natural log of the U.S. Census Bureau's estimate of eighteen-year-olds in the respondent's state of birth at age eighteen. We also include a measure of

41. See, for example, Dee (2003).

42. Duncan (1965).

43. Card and Lemieux (2001).

44. Card and Lemieux (2001) found that cohort size was associated with significant increases in pupil-teacher ratios.

the real costs of postsecondary tuition based on the in-state rate at "lower-level" state colleges and universities when the respondent was seventeen-years-old.<sup>45</sup> As a control for within-state changes in socioeconomic conditions, we also matched each respondent to the poverty rate in their state when they were seventeen years old. Finally, we include one additional measure of a related policy concerning educational accountability in the state at the time the respondent was eighteen years of age: a binary variable indicating whether the state issued report cards for individual schools.

### Results

Table 6-2 shows the marginal effects evaluated at the mean derived from probit models predicting the likelihood of graduating from high school. Column 1 presents what might be described as the baseline specification, which includes individual demographics (that is, indicators for Black and female) along with state and year fixed effects. There is no significant relationship between the likelihood of dropping out and the existence of either an exit exam or course graduation requirements. In column 2, we see that adding controls for time-varying state variables does not change the results. The standard errors on the EE and CGRs variables imply that our analysis has the power to detect effects of roughly  $\pm 0.4$  percentage point, which translates into roughly 3 percent if one uses an average dropout rate of 12.7 percent as a baseline.

The specification shown in column 3 includes separate indicators for more and less difficult exit exams and course graduation requirements but does not find effects that are significant at conventional levels. It is also possible that the impact of exit exams and course graduation requirements evolves over time, as students, parents, and teachers become more familiar with the new requirements. In results not shown here, we test for an interaction between the existence of a less difficult exit exam and the number of years it has been required, but we do not find any significant results.<sup>46</sup>

Column 4 serves as a specification check. In this specification, we include the number of state-year executions in the model as a predictor. Since we do not think that the number of executions could have any causal impact on the contemporaneous high school completion rate, if this variable is a significant

45. See Card and Lemieux (2001) and Kane (1994). Complete data on community college tuition were not available for several states. For these states (New Hampshire, South Dakota, California, and South Carolina), we used state college tuition.

46. The more difficult exit exams have not been in place long enough to obtain reliable estimates on the time trend for these exams.

Table 6-2. *Probit Estimates of the Effect of High School Graduation Requirements on High School Completion<sup>a</sup>*

Independent variable	(1)	(2)	(3)	(4)	(5)
Any exit exam	-0.001 (0.003)	-0.002 (0.002)	...	...	...
Less difficult exit exam	...	...	-0.002 (0.002)	-0.002 (0.002)	-0.005** (0.001)
More difficult exit exam	...	...	-0.005 (0.003)	-0.006* (0.003)	-0.007** (0.003)
Any course graduation requirements	-0.001 (0.003)	-0.002 (0.002)	...	...	...
Moderately difficult course graduation requirements	...	...	-0.002 (.002)	-0.002 (.002)	-0.002 (.002)
Very difficult course graduation requirements	...	...	0.001 (0.002)	0.001 (0.002)	0.000 (0.002)
Number of years following introduction of exit exams	...	...	...	...	...
Number of state executions when the individual was 18	...	...	...	0.0003** (0.0001)	0.0001 (0.0002)
Mean of the dependent variable	0.873	0.873	0.873	0.873	0.873
State-year controls	no	yes	yes	yes	yes
Division-specific cubic time trends	no	no	no	no	yes
Number of observations	2,925,005	2,925,005	2,925,005	2,925,005	2,925,005

Source: 2000 PUMS.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

... Not applicable.

a. The dependent variable is "high school completion." The unit of observation is the individual. The marginal effect evaluated at the mean is shown in each cell. Standard errors shown in parentheses are adjusted to account for clustering of errors within the state of birth.

The sample includes individuals aged twenty to thirty-eight on census day. Residents from Nebraska and the District of Columbia are excluded. Only individuals indicating race as White, Black, or Hispanic are included.

*More difficult exit exams* are those in which the tested material is at the ninth grade level or higher. *Rigorous course graduation requirements* are defined as those which require students to earn at least 3 Carnegie units in English, 2 in social studies, 1 in math, and 1 in science. *Very rigorous course graduation requirements* are defined as those which require at least 4 units in English, 3 in social studies, 2 in math, and 2 in science.

All models include individual demographic controls (binary indicators for female and Black) and fixed effects for state of birth and year of birth. State-year controls include the unemployment rate, the natural log of the number of eighteen-year-olds, the poverty rate, the average teacher salary, the average student-teacher ratio, and an indicator for whether the state issued report cards for K-12 schools.

predictor, then we might be concerned that we have omitted an important time-varying state characteristic that influences educational outcomes and might bias our estimates. Indeed, we find that the number of state executions is positively associated with the high school graduation rate, which raises concerns about our previous specification.

In an effort to more completely account for time-varying state characteristics that might confound our analysis, in column 5 we include a series of division-specific time trends. Specifically, we interact linear, squared, and cubed terms for the number of years since 1979 with nine indicators for each of the different census divisions (that is, New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific) for a total of 27 additional covariates (that is, three-year variables  $\times$  nine census divisions). These covariates control for any factors that may have been changing over time in different parts of the country, including such things such as economic conditions we do not pick up with the unemployment rate, social norms or public policies that pertain to educational attainment, or other factors. In column 5, we see that once we control for these time trends, the coefficient on state executions drops dramatically and is no longer significant.

Turning to the estimates of the education policy variables in column 5, we see that both more and less difficult exams are negatively associated with the likelihood that a student completes high school. Specifically, the easier exit exams are associated with a 0.5 percentage point reduction in the likelihood of completion which, given a baseline dropout rate of 12.7 percent, translates into a 4 percent increase in the probability of dropping out. More difficult exit exams are associated with a 0.7 percentage point or 5.5 percent increase in the probability of dropping out. In contrast, neither the moderate nor the very rigorous CGRs appear to be associated with changes in high school completion.

Table 6-3 shows the results for high school completion separately by race and gender. The specification includes division-specific time trends and thus is comparable with column 5 in table 6-2, with the exception that the models are estimated separately by race and gender, which allows all of the coefficients to vary across groups (that is, a completely unrestricted model).<sup>47</sup> As discussed above, one would expect more rigorous graduation requirements to have a larger negative impact on lower-achieving students, for which we use

47. The one difference between the model in column 5 of table 6-2 and the models in table 6-3 is that the former includes an indicator for state executions while the latter do not.

Table 6-3. *Probit Estimates of the Effect of High School Graduation Requirements on High School Completion, by Race and Gender*<sup>a</sup>

Independent variable	All (1)	White male (2)	Black male (3)	Hispanic male (4)	White female (5)	Black female (6)	Hispanic female (7)
Less difficult exit exam	-0.005** (0.001)	-0.005** (0.002)	-0.013** (0.005)	0.032 (0.021)	-0.0002 (0.0017)	-0.006 (0.004)	0.0003 (0.0188)
More difficult exit exam	-0.006** (0.003)	-0.006* (0.003)	-0.018** (0.008)	0.023 (0.032)	-0.002 (0.003)	-0.021** (0.008)	0.032 (0.019)
Moderately difficult course graduation requirements	-0.002 (0.002)	0.0003 (0.0020)	-0.003 (0.005)	0.007 (0.016)	-0.003* (0.002)	-0.003 (0.005)	0.005 (0.014)
Very difficult course graduation requirements	-0.0002 (0.0025)	0.005** (0.003)	-0.007 (0.006)	0.008 (0.016)	-0.004* (0.002)	-0.001 (0.006)	0.008 (0.018)
Mean of the dependent variable	0.873	0.878	0.752	0.701	0.908	0.817	0.755
Number of observations	2,925,005	1,212,102	184,909	47,044	1,221,388	210,997	48,543

Source: 2000 PUMS.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

a. The dependent variable is "high school completion." The unit of observation is the individual. The marginal effect evaluated at the mean is shown in each cell. Standard errors shown in parentheses are adjusted to account for clustering of errors within state of birth.

The sample includes individuals aged twenty to thirty-eight on census day. Residents from Nebraska and the District of Columbia are excluded. Only individuals indicating race as White, Black, or Hispanic are included.

*More difficult exit exams* are those in which the tested material is at the ninth grade level or higher. *Rigorous course graduation requirements* are defined as those which require students to earn at least 3 Carnegie units in English, 2 in social studies, 1 in math, and 1 in science. *Very rigorous course graduation requirements* are defined as those which require at least 4 units in English, 3 in social studies, 2 in math, and 2 in science.

All models include individual demographic controls (binary indicators for female and Black); fixed effects for state of birth and year of birth; a cubic division-specific time trend; and the following state-year controls: the unemployment rate, the natural log of the number of eighteen-year-olds, the poverty rate, the average teacher salary, the average student-teacher ratio, and an indicator for whether the state issued report cards for K-12 schools.

race and ethnicity as a proxy. Consistent with this hypothesis, we find that exit exams reduce the likelihood of high school completion for Black students by twice as much as they do for White students. More and less difficult exit exams are associated with a 1.3 and 1.8 percentage point reduction, respectively, in the likelihood of high school completion among Black males, which translates into relative dropout effects of roughly 5.2 and 7.3 percent, respectively. Among Black females, easier exit exams do not appear to have significant effects, but more difficult exams are associated with a 2.1 percentage point (11 percent) reduction in the likelihood of completing high school. Interestingly, exit exams do not appear to affect high school completion rates for White females, though they sharply reduce the completion rates among White males. Overall, the existence of course graduation requirements is not associated with changes in high school completion rates, although they do seem to reduce the probability of high school completion for White females.

The results for Hispanics are somewhat more puzzling. Our point estimates suggest that exit exams *increase* the likelihood of high school completion among Hispanics. While the estimates are not significant at conventional levels, the point estimates are large in magnitude and thus may warrant further exploration in subsequent research. We tested the extent to which the somewhat anomalous Hispanic results are due to particular states. It appears that the positive effect of exit exams for Hispanic males is due largely to New York State. If one eliminates New York, the point estimates for more and less rigorous exit exams are both quite close to zero and are not close to statistical significance.<sup>48</sup> The results for Hispanic females do not appear to be due to any single state. One possible explanation for the difference in estimated effects among Black and Hispanic students is that Hispanic students may have been eligible for language-related exemptions and testing accommodations, although this seems less likely given the fact that our sample is limited to native-born Hispanics.<sup>49</sup> It is also possible that schools with predominantly Hispanic populations were more effective in responding to the policies.

As discussed above, the expected effect of exit exams and course graduation requirements on college attendance is unclear. On the one hand, if some of the students who were prevented from graduating from high school because of the requirements would have attended college, we would expect the policies to reduce attendance. On the other hand, if the requirements led other students to be better prepared for college (or to believe that they were

48. The point estimates (and standard errors) for more and less rigorous exit exams are 0.007 (0.015) and -0.002 (0.026), respectively (data not shown).

49. Sullivan and others (2005, chapter 6).

better prepared for college), then one would expect the policies to increase postsecondary enrollment. In practice, it seems likely that one would expect to find a negative relationship at the very bottom of the ability distribution but perhaps find a somewhat positive relationship at somewhat higher points on the ability distribution. In general, however, it seems unlikely that we would expect to find any effect among moderate- or high-ability students, for whom the requirements were probably not a binding constraint. In results not shown here, we find that exit exams do not have a significant influence on college attendance. One notable exception is for Hispanic females who faced a more difficult exit exam. These students were considerably more likely to enroll in college than were their counterparts who did not face a difficult exit exam.

The evidence presented thus far is largely consistent with the concerns sometimes raised by critics of standards-based reforms—namely, higher requirements may reduce educational attainment among disadvantaged groups. Moreover, the findings shown in tables 6-2 and 6-3 are consistent with our earlier work.<sup>50</sup> As noted earlier, however, a full evaluation of these policies should consider the impact of more rigorous graduation standards on labor market performance. An examination of the labor market effects is also interesting insofar as business leaders frequently express concern with the quality of their workforce, and they were often instrumental in the adoption of the exit exams and course graduation requirements. Indeed, higher standards may benefit students by inducing greater effort in high school, which is later rewarded in the labor market. They may also influence the relative returns of a high school degree by changing the signal associated with the diploma, although, as discussed above, it is not clear whether this will improve the earnings of high school graduates relative to dropouts, since student sorting alone would suggest that higher standards would raise the ability level of both graduates and dropouts.

Table 6-4 presents results for reduced-form models predicting employment. The covariates are identical to those in the earlier models. Models that control for educational attainment and whether the respondent is currently in school yield comparable results. Overall, the results seem to suggest that neither exit exams nor course graduation requirements had any substantial impact on employment. There is some evidence that exit exams may be associated with slight reductions in employment for Blacks and increases for White females, although these results are quite small in magnitude and only

Table 6-4. *Probit Estimates of the Effect of High School Graduation Requirements on Employment, by Race and Gender<sup>a</sup>*

Independent variable	All (1)	White male (2)	Black male (3)	Hispanic male (4)	White female (5)	Black female (6)	Hispanic female (7)
Less difficult exit exam	0.0005 (0.0024)	-0.001 (0.003)	-0.009* (0.005)	-0.019 (0.020)	0.009* (0.005)	-0.001 (0.005)	0.006 (0.010)
More difficult exit exam	0.003 (0.004)	-0.002 (0.004)	0.004 (0.009)	-0.028 (0.030)	0.009* (0.005)	-0.009 (0.007)	0.031* (0.018)
Moderately difficult course graduation requirements	-0.0002 (0.0017)	0.0005 (0.0025)	-0.001 (0.006)	-0.023 (0.017)	0.003 (0.004)	-0.010 (0.006)	0.043** (0.012)
Very difficult course graduation requirements	-0.002 (0.002)	0.002 (0.003)	-0.0002 (0.0063)	-0.006 (0.020)	-0.004 (0.004)	-0.008 (0.007)	0.050** (0.017)
Mean of the dependent variable	0.755	0.840	0.600	0.713	0.721	0.643	0.627
Number of observations <sup>b</sup>	2,925,005	1,212,102	184,909	47,053	1,221,388	211,007	48,453

Source: 2000 PUMS.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

a. The dependent variable is "employed." The unit of observation is the individual. The marginal effect evaluated at the mean is shown in each cell. Standard errors shown in parentheses are adjusted to account for clustering of errors within state of birth.

The sample includes individuals aged twenty to thirty-eight on census day. Residents from Nebraska and the District of Columbia are excluded. Only individuals indicating race as White, Black, or Hispanic are included.

*More difficult exit exams* are those in which the tested material is at the ninth grade level or higher. *Rigorous course graduation requirements* are defined as those which require students to earn at least 3 Carnegie units in English, 2 in social studies, 1 in math, and 1 in science. *Very rigorous course graduation requirements* are defined as those which require at least 4 units in English, 3 in social studies, 2 in math, and 2 in science.

All models include individual demographic controls (binary indicators for female and Black); fixed effects for state of birth and year of birth; a cubic division-specific time trend; and the following state-year controls: the unemployment rate, the natural log of the number of eighteen-year-olds, the poverty rate, the average teacher salary, the average student-teacher ratio, and an indicator for whether the state issued report cards for K-12 schools.

b. In some cases, the sample sizes differ slightly from those shown in table 6-3 because the Probit estimation procedure drops observation cells with no variation in the outcome, and the results from this procedure can differ across outcomes.

marginally significant. Once again, there is a somewhat puzzling improvement for native-born Hispanic females. Employment rates increase by 0.9 percentage point (1.2 percent given a baseline of 72.1 percent) for these students when they face exit exams and course graduation requirements.

Table 6-5 presents results for earnings. Note that only respondents who reported earnings greater than zero are included in these specifications. While the estimates are quite noisy, a few tentative patterns emerge. The introduction of course graduation requirements is not significantly related to earnings. However, exit exams (particularly the more difficult ones) tended to reduce the subsequent earnings of White and Hispanic students while increasing those of Black students. The wage gains of Black students are somewhat surprising in light of their reduced educational attainment and the evidence of wage losses among non-Black students. This heterogeneous pattern of results cannot be easily reconciled as a signaling phenomenon and instead suggests that there were unique incentive effects of exit exams by race and ethnicity, at least at the center of the wage distribution.

To summarize, our results indicate that exit exams led to statistically significant reductions in high school completion, which were concentrated among Black students and White males. In terms of labor market outcomes, our results indicate that exit exams may have increased the subsequent earnings of Black students while reducing those of White students. Finally, our results highlight a surprising and puzzling positive effect of stricter graduation requirements, particularly exit exams, on the outcomes of native-born Hispanic females. For example, our estimates indicate that exit exams improved the college matriculation and employment of native-born Hispanic females.

### Evidence from the Common Core of Data (CCD)

The evaluation results based on the 2000 Census indicate that exit exams, particularly the most difficult ones, reduced the probability of completing high school among White males and Black students. However, there are a number of reasons to be concerned that these estimates may understate the true effects of exit exams on the probability of completing high school. For example, the use of state of birth to match PUMS respondents to their state exit exam requirement could introduce measurement error. To the extent this measurement error promotes attenuation bias, the true effect of exit exams on educational attainment would be understated.

A second issue that would also lead our results to understate the true effect of exit exams on the probability of completing high school is that the PUMS

Table 6-5. *OLS Estimates of the Effect of High School Graduation Requirements on Earnings, by Race and Gender<sup>a</sup>*

Independent variable	All (1)	White male (2)	Black male (3)	Hispanic male (4)	White female (5)	Black female (6)	Hispanic female (7)
Less difficult exit exam	-0.005 (0.005)	-0.014* (0.008)	0.012 (0.008)	-0.040 (0.034)	-0.009 (0.006)	0.005 (0.007)	-0.004 (0.021)
More difficult exit exam	-0.012 (0.009)	-0.027* (0.016)	0.022* (0.011)	-0.071* (0.039)	-0.022** (0.011)	0.028* (0.015)	-0.005 (0.038)
Moderately difficult course graduation requirements	-0.001 (0.005)	-0.006 (0.007)	-0.002 (0.009)	-0.011 (0.023)	0.004 (0.006)	0.007 (0.008)	0.001 (0.028)
Very difficult course graduation requirements	0.003 (0.007)	0.003 (0.009)	-0.012 (0.010)	0.011 (0.041)	0.004 (0.007)	-0.004 (0.009)	0.021 (0.032)
Mean of the dependent variable	6.080	6.289	6.023	6.057	5.910	5.847	5.804
Number of observations	2,429,250	1,073,357	139,183	39,109	974,508	166,250	36,843
R-squared	0.1945	0.2063	0.1185	0.1361	0.1188	0.1063	0.0992

Source: 2000 PUMS.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

a. The dependent variable is "ln(average weekly wages)." The unit of observation is the individual. Standard errors shown in parentheses are adjusted to account for clustering of errors within state of birth.

The sample includes individuals aged twenty to thirty-eight on census day. Residents from Nebraska and the District of Columbia are excluded. Only individuals indicating race as White, Black, or Hispanic and who reported earnings greater than zero are included.

*More difficult exit exams* are those in which the tested material is at the ninth grade level or higher. *Rigorous course graduation requirements* are defined as those which require students to earn at least 3 Carnegie units in English, 2 in social studies, 1 in math, and 1 in science. *Very rigorous course graduation requirements* are defined as those which require at least 4 units in English, 3 in social studies, 2 in math, and 2 in science.

All models include individual demographic controls (binary indicators for female and Black); fixed effects for state of birth and year of birth; a cubic division-specific time trend; and the following state-year controls: the unemployment rate, the natural log of the number of eighteen-year-olds, the poverty rate, the average teacher salary, the average student-teacher ratio, and an indicator for whether the state issued report cards for K-12 schools.

survey did not distinguish high school completers from GED completers.<sup>51</sup> A third issue is that, because the PUMS data provide "status" data on educational attainment (that is, the total share meeting a definition at a given point in time), they do not identify precisely when exit exams may have increased the probability of dropping out. In other words, this evidence does not identify whether most students dropped out after failing their initial attempts (that is, early in high school) or persisted with retests through twelfth grade. The design of improved remediation for the dropout risk ostensibly created by exit exams could benefit from evidence of such grade-by-grade risks. A fourth and more general concern is that the empirical evidence based on an alternative identification strategy would provide useful evidence on the robustness of the Census results.

This section addresses several of these concerns by presenting different evidence on whether (and when) exit exams increased the probability of dropping out of high school. This analysis is based on unique, *district-level* dropout data that the National Center for Education Statistics began collecting in the early 1990s through the Common Core of Data.<sup>52</sup> Generally, the NCES has only reported these data from states that used dropout definitions that conformed to their standard, which is described below.<sup>53</sup> Fortunately, over the last fifteen years, the number of states that have chosen to conform to their definition has increased. However, because of the limited overlap between states that have consistently reported these dropout data and states that introduced exit exams during this period, we focus on the experiences within one particular state, Minnesota.

#### *Graduation Requirements in Minnesota*

In the early 1990s, the Minnesota legislature and the state board of education expressed their intention to develop "results-oriented" high school graduation requirements for the state's public school students. As in many other states, the motivation for these requirements came from business and community leaders concerned that students did not have the basic skills necessary for productive employment and responsible citizenship. The subsequent

51. There is evidence that exit exams increased rates of GED completion (for example, Warren, Jenkins, and Kulick 2005).

52. Prior analyses based on NCES data have relied on state-level reports of the number of high school diplomas granted and measures of the relevant enrollment base, often with attempted adjustments for the effects of grade retention and migration; see, for example, Greene and Winters (2004), Warren, Jenkins, and Kulick (2005).

53. In more recent years, the CCD also reports dropout data from states that use a similar definition of a dropout except for their calendar conventions.

graduation rules required that students pass "Basic Skills Tests" (BSTs) in math, reading, and writing to graduate. Passing scores on the math and reading tests were first required of the graduating class of 2000 (that is, of graduates who were ninth graders during the 1996–97 school year). The requirement that public high school graduates achieve a passing score on the writing test was delayed until the graduating class of 2001.<sup>54</sup>

Another prominent component of Minnesota's new high school graduation requirements was that students demonstrate higher-order understanding through complex and highly controversial performance-based assessments known as the "Profile of Learning." These standards became effective somewhat later (beginning with students entering ninth grade during the 1998–99 school year). While there is some evidence that the unpopular Profile influenced classroom practice, its implementation was highly uneven.<sup>55</sup> After several years of legislative wrangling, the state effectively transferred control over these standards to local school districts.<sup>56</sup> Then, shortly after our study period (in 2003), the Profile was abolished entirely. Unsurprisingly, we found that the Profile had no distinct effects on dropout rates separate from those of the BSTs requirement. Nonetheless, a caveat about our reduced-form results is appropriate because the timing of these policy changes overlapped considerably.<sup>57</sup>

For all the reasons discussed earlier, whether Minnesota's BSTs requirement actually increased or decreased dropout rates is clearly an open empirical question. When Minnesota's 80,000 eighth graders first took the BSTs in the spring of 1996, the pass rates seemed surprisingly low to many observers; only 63 percent passed the reading test, and 76 percent passed the math test. And these initial passing rates were substantially lower among minority and low-income students.<sup>58</sup>

However, the ultimate effect of the BST requirements on dropout rates could be attenuated by a number of factors. For example, relative to other

54. Beginning with the class of 2001, the cut score required to pass the BST also increased from 70 percent of questions answered correctly to 75 (see Allie Shah, "More 12th Graders Fail Skills Tests; New Writing Test, Stricter Scoring Affect Results," *Minneapolis Star Tribune*, June 1, 2001, page 1A).

55. Avery, Beach, and Coler (2003).

56. See Avery, Beach, and Coler (2003) for details.

57. However, it should be noted that the grade-specific heterogeneity in our BST results is clearly consistent with exit exam effects but less plausibly related to the Profile.

58. Maureen M. Smith and Duchesne Paul Drew, "Skills-Test Failure Rate High for Minority, Poor Students," *Minneapolis Star Tribune*, May 25, 1996, page 1A. It is interesting that the gaps in pass rates among White and minority students are larger in Minnesota than in other states (Gayler and others 2004, p. 37).



states with exit exams, Minnesota provided an unusually high number of retest opportunities (eleven). Like most other states with exit exams, the state also required school districts to develop individualized remediation plans for each student who failed a BST in eighth or ninth grade.<sup>59</sup> The state also provided flexibility and testing accommodations for students with disabilities and for those who were English language learners (ELL). For example, students with an individualized education program (IEP) could have their BSTs cut scores lowered by their local IEP team. And ELL students who had been enrolled for fewer than three years in a school where the primary instructional language was English were exempted from the graduation requirements.<sup>60</sup>

The BSTs in math and in reading were administered in eighth through twelfth grades while the writing test was first taken in tenth grade. The first cohort required to pass the BSTs in math and reading took these exams for the first time as eighth graders in the spring of 1996. The cohort required to pass the BST in writing took this test for the first time as tenth graders in the spring of 1999. The implementation of the BST requirements attracted relatively little public notice, especially relative to the more controversial Profile of Learning standards. One exception occurred in 2000 when scoring errors led to some students being mistakenly told they failed the test, including about fifty seniors who were denied diplomas.<sup>61</sup> There were also two incidents of teachers being accused of stealing copies of the high-stakes exams.<sup>62</sup> It is interesting that during the summer of 2005, which is after our study period, the Minnesota legislature enacted legislation to replace the BSTs with tests that were geared to higher-level grade content and that were aligned to state content standards.<sup>63</sup>

#### *Common Core of Data*

The National Center for Education Statistics (NCES) collaborates annually with state education agencies to organize a variety of data on all public schools and school districts (such as staffing, enrollments, and finances) into the Common Core of Data. The data items collected by the CCD are based on consistent definitions that have been developed by the NCES and state

59. Gayler and others (2004, table 10).

60. The state also translated the math BST into Hmong, Somali, Spanish, and Vietnamese (Sullivan and others 2005, p. 172).

61. Brian Bakst, "Diplomas Denied to Fewer Seniors because of Test Error than Estimated," Associated Press State and Local Wire, August 15, 2000.

62. Associated Press State and Local Wire, "Cass Lake-Bena Teacher Accused of Stealing Copy of State Test," April 2, 2001.

63. Sullivan and others (2005, table 3).

representatives over several decades. Beginning in the early 1990s, the CCD included district-level and grade-level data on dropouts from a growing number of states (including Minnesota) whose reporting practices conformed to the NCES definitions.

The CCD uses an "event" dropout definition. More specifically, a student is designated as a dropout for a particular school year if the student was enrolled at some time during the school year and met several explicit criteria as of October 1 in the next school year. These criteria are that the student in question was not enrolled, had not graduated or completed an approved educational program (for example, the GED), had not transferred, and was not absent because of death or a school-recognized illness or because of suspension. The CCD reports dropout rates that are based on these dropout data and specific to each district and grade. These rates were constructed by dividing the number of NCES-defined event dropouts for each district and grade by its corresponding enrollment base for that school year.<sup>64</sup>

The grade-specific dropout rates in the CCD are not perfect measures. Most notably, it would be preferable to separate GED completers from conventional graduates. Furthermore, a problem with any event measure is that it will not reflect subsequent reenrollment by a student who drops out except through a change in the enrollment base. However, as noted earlier, these data also have several unique benefits. For example, relative to the PUMS data, individuals attending public schools can be matched without measurement error to their high school graduation requirements. Furthermore, because these dropout rates accommodate both grade retention and student mobility, they are not subject to the concerns that have been the focus of studies using state-year high school completion rates based on adjusted enrollment data.<sup>65</sup>

Another unique feature of these grade-specific dropout rates is that they facilitate a somewhat unusual empirical strategy for identifying the effects of Minnesota's high school graduation requirements on educational attainment. That strategy, which is described below, relies on the fact that within each district and year, we observe the dropout rates in grades, some of which are constrained by Minnesota's exit exam policies and some of which are not. The unit of observation for this analysis is the dropout rate for each unique dis-

64. States do not report this enrollment base directly. Instead, the NCES constructs these variables from grade-specific enrollments from schools within the district.

65. See, for example, Warren (2005). The NCES gives states autonomy in verifying a student's transfer status (for example, transcript requests or withdrawal notices with signed parental assurances about reenrollment) but discourages reliance on unsubstantiated reports.

trict-grade-year observation over the nine school years from 1994–95 to 2001–02. We applied several edits to the pooled CCD files to create a dataset suitable for this analysis. For example, we deleted school districts that were regional service agencies or state or federal agencies providing services to special-needs populations as well as districts without students. We also deleted districts that did not serve students in a grade from ninth through twelfth.

We also deleted a small number of observations where the dropout rate was either negative or greater than 100. However, the results presented here are similar when these observations are included with imputed dropout rates of 0 or 100 percent. We also applied an imputation to correct a coding convention used for the Minnesota data for the 1994–95 and 1996–97 school years. Specifically, in most years, roughly a quarter of the district-grade observations for Minnesota had no dropouts. However, for the 1994–95 and 1996–97 school years, only one district-grade observation had a dropout rate of zero. Instead, districts in these years with positive enrollments were coded as missing or not applicable for dropout rates that should have been zero. We have imputed zero to these observations but checked that the results are similar without this imputation and when data from these two school years are omitted.

As noted earlier, an issue of particular interest is whether exit exams have unique effects among high-poverty students or those who are racial or ethnic minorities. To address these issues, we matched the Minnesota school districts to 1995 data on the percentage of children in poverty within the district and to 1993–94 data aggregated from the school-level CCD files on the racial and ethnic composition of the district's students. The grade-level dropout data in the CCD are actually defined by race, ethnicity, and gender during this period. However, we use district-level data on minority composition because the relevant enrollment bases for the CCD's race and ethnicity-specific dropout data were not collected. Specifically, the school-level CCD only started collecting grade-specific enrollments by race, ethnicity, and gender in the 1998–99 school year. Our final, analytical sample omits the observations that could not be matched to these poverty and demographic data. An examination of these observations indicated that they largely consisted of administrative school districts that had been incorrectly flagged in the CCD and school districts, largely charter schools, which had been created during the sample period.<sup>66</sup> The final dataset consists of an unbalanced panel of 10,502 grade-level dropout rates for the approximately 350 districts observed in each of nine academic years.

66. Our results are quite similar in specifications that include these observations.

### Specifications

Our approach to evaluating the effects of Minnesota's BST requirements on dropout rates exploits the variation generated by the fact that the exit exam was first required of the graduating class of 2000. State exit exams were often first tied to a specific graduating class while the cohort was in eighth or ninth grade to avoid the perceived unfairness and possible court challenges associated with subjecting those already in high school to a requirement they could not have anticipated. This sort of phased introduction creates potentially useful variation in policy exposure both across grades and within grades over time. For example, the first high school cohort subject to the new exit exam requirements was in ninth grade during the 1996–97 school year. However, the cohorts in tenth through twelfth grades during that year did not have to pass the BSTs but did share the determinants of dropout rates common to their district and year. In the subsequent school year, the grades constrained by the BST requirements expanded to include both ninth and tenth graders and by the 1999–2000 school year the students in all four grades. The figures in bold in table 6-6 identify the grade-year observations subject to the BST requirements during the school years for which we have CCD dropout data.

The variation in BST exposure ( $X_{gdt}$ ) across grades and within grades over time implies that the effect of this policy ( $\beta$ ) on dropout rates ( $y_{gdt}$ ) can be identified conditional on fixed effects unique to each grade ( $\mu_g$ ), district ( $\alpha_d$ ), and year ( $\lambda_t$ ):

$$(2) \quad y_{gdt} = \beta X_{gdt} + \mu_g + \alpha_d + \lambda_t + \varepsilon_{gdt}$$

Furthermore, because the policy change of interest varies by grade and year in all observed districts, equation 2 can be extended to condition on fixed effects unique to each district-grade combination ( $\mu_{gd}$ ) and to each district-year combination ( $\alpha_{dt}$ ):

$$(3) \quad y_{gdt} = \beta X_{gdt} + \mu_{gd} + \alpha_{dt} + \varepsilon_{gdt}$$

The standard errors reported for these specifications are clustered at the grade-district level. Clustering at this cross-sectional level leads to the more conservative (that is, larger) standard errors and is consistent with concerns about the possible influence of serial correlation.<sup>67</sup>

67. See Bertrand, Duflo, and Mullainathan (2004). Specifically, we found that these standard errors were larger than those that were uncorrected and those calculated using the conven-

Table 6-6. *Mean Dropout Rates in Minnesota School Districts, by Grade and School Year<sup>a</sup>*

School year	Grade 9	Grade 10	Grade 11	Grade 12
1993-94	1.15	2.41	3.37	3.44
1994-95	1.14	2.71	3.26	4.07
1995-96	1.27	2.70	3.78	4.21
1996-97	1.29	2.71	3.73	3.89
1997-98	<b>1.16</b>	<b>2.58</b>	3.92	4.48
1998-99	<b>0.90</b>	2.29	<b>3.00</b>	3.68
1999-2000	<b>0.91</b>	1.95	3.18	3.94
2000-01	<b>0.80</b>	1.94	2.67	3.97
2001-02	<b>0.73</b>	1.75	2.99	4.06

Source: The annual Common Core of Data (CCD) universe surveys from 1993-94 to 2001-02.

a. The unit of observation is the grade (9-12) within a school district in a given school year ( $N = 10,502$ ). The bold numbers identify grade-year combinations, which were required to pass Minnesota's Basic Skills Tests (BSTs).

The conditional means in table 6-6 illustrate how the dropout rates in Minnesota's public high schools varied across grades and over time while the BST requirements were implemented. Casual difference-in-differences comparisons based on these means can illustrate the basic logic of this identification strategy. For example, the dropout rate for tenth graders fell by 0.13 percentage point (that is, 5 percent) in the 1997-98 school year, which was when tenth graders were first subject to the BST requirements. Over that same time period, but in the higher grades not subject to the requirements (eleventh and twelfth grades), the dropout rates *increased* by at least 0.18 percentage point. These simple comparisons suggest that the BST requirements reduced the tenth grade dropout rate in Minnesota.

OLS estimates based on equations 2 and 3 generalize such basic comparisons.<sup>68</sup> However, they also provide a framework for identifying whether the effects of BST requirements varied by grade. For example, as noted earlier, if these exit exams had a strong discouragement effect, we might expect to find

tional White procedure. We also found basically similar results in weighted least squares (WLS) specifications when the enrollment base was the weight. However, the WLS estimates did indicate that the twelfth grade dropout rate is larger than that based on ordinary least squares (OLS). We suspect that this reflects the heterogeneous effects of Minnesota's exit exam by district traits (for example, larger dropout effects in larger urban districts), an issue we examine directly in our analysis.

68. We report OLS estimates based on a linear probability model. Because a large share of observations have no dropouts, procedures like a grouped logit are not feasible. However, after making a small imputation to observations with no dropouts (see Greene 2005, p. 689), we did

that they led to particularly large increases in the ninth and tenth grade dropout rates. Alternatively, these exit exams could increase the dropout rate more substantially among twelfth graders if students remain in school and persist in attempting to pass the BSTs despite earlier failures. We examine this issue by evaluating the reduced-form effects associated with interactions between a BST dummy variable and grade-specific dummy variables.

The basic panel-data research design outlined here (that is, exploiting the policy variation within grades over time) has not to our knowledge been utilized elsewhere. Therefore, this approach may provide a useful complement to more conventional panel-data evaluations like that presented in section 3. However, like any empirical evaluation, this approach also turns on implicit, maintained assumptions that may not, in fact, be valid.

In particular, this approach implicitly assumes that the common shocks to dropout rates in a particular year have a similar effect across all four grades. However, violations of this assumption could reasonably occur and perhaps bias these results. For example, suppose that during the economic expansion of the late 1990s the dropout rates of twelfth graders (who were generally not subject to exit exams) grew relative to the contemporaneous dropout rates for the earlier grades (which often were subject to exit exams). This pattern would occur if twelfth graders were particularly likely to leave high school as Minnesota's unemployment rate fell during the late 1990s. Similarly, the later increases in Minnesota's unemployment rate (during 1999, 2000, and 2001) could have led to particularly large reductions in the dropout rate of twelfth graders, just as twelfth graders were also being required to pass the BSTs. Under this particular scenario, our reduced-form estimates would have a negative bias because of unrelated year effects unique to a particular grade.

Although it is not possible to address these important concerns definitively, we can examine their empirical relevance through selective adjustments to the groups of grades included in our evaluations. For example, the assumption that there are common grade-year shocks is more likely to be valid when comparing only near grades (for example, just eleventh and twelfth grades). We discuss evidence on whether these sample restrictions influence our results. As an additional approach, we also examine specifications that allow us to condition on grade-year fixed effects by using contemporaneous dropout data from the neighboring states (North Dakota and

find that a grouped logit specification generated results similar to those reported here. Another problem with a grouped logit in this context is that, because the dropout rates tend to be low, and the number of students aggregated in each observation tends to be fairly large, this specification generates suspiciously small standard errors (Greene 2005, p. 689).

Iowa), which were well represented in the CCD dropout data during this period and did not introduce exit exams.<sup>69</sup> The point estimates from these specifications were basically similar to those described below (that is, negative effects in earlier grades and a positive effect in the twelfth grade). However, these point estimates were also more imprecise and their values were somewhat sensitive to which of the two control states was included. More disturbingly, we found that the dropout rates in Minnesota had prereform trends that differed significantly from Iowa and North Dakota, which suggests that the identifying assumptions for these specifications were not valid.

### Results

Table 6-7 presents the basic evaluation results based on the full sample of district-grade-year observations. The initial specifications (columns 1 and 2) condition only on district, year, and grade fixed effects. However, the subsequent models (columns 3 through 8) introduce district-grade and district-year fixed effects. These results indicate that overall the introduction of the BSTs requirement was associated with small and statistically insignificant reductions in the dropout rates. However, these estimates consistently indicate that the assumption of a common BSTs effect across grades obscures heterogeneous effects across grades. More specifically, these estimates indicate that the introduction of an exit exam *reduced* the dropout rate in both tenth and eleventh grades by about 0.3 to 0.4 percentage point (9 to 16 percent) but *increased* the dropout rate in the twelfth grade by a similar amount (approximately 8 percent). These findings suggest that Minnesota's exit exam policy improved student and school performance in the earlier high school grades and did not discourage students from remaining in school. However, these results also indicate that the existence of the BSTs requirement constrained students who could not pass the exams after repeated attempts. A recent study based on longitudinal data from Texas similarly found that exit exams increased the dropout rate through their effect on students sitting for their "last chance" exam.<sup>70</sup>

It is interesting to note that the results in table 6-7 are quite similar across specifications that condition on the fixed effects interactions. And these interactions have considerable explanatory power, increasing the  $R^2$  by approximately 50 percent. In results not shown here, we find comparable results in specifications based only on the dropout rates from more similar

69. This approach would be analogous to a difference-in-difference-in-differences strategy (see, for example, Gruber 1994).

70. Martorell (2004).

Table 6-7. Estimated Effects of Minnesota's Basic Skills Test on Dropout Rates<sup>a</sup>

Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BSTs	-0.136 (0.134)	...	-0.164 (0.129)	...	-0.088 (0.135)	...	-0.115 (0.134)	...
BSTs × grade 9	...	-0.140 (0.155)	...	-0.197 (0.158)	...	-0.119 (0.157)	...	-0.179 (0.165)
BSTs × grade 10	...	-0.419** (0.172)	...	-0.432** (0.156)	...	-0.358** (0.172)	...	-0.364** (0.151)
BSTs × grade 11	...	-0.356* (0.202)	...	-0.372** (0.165)	...	-0.284 (0.211)	...	-0.299* (0.175)
BSTs × grade 12	...	0.332* (0.177)	...	0.306** (0.152)	...	0.361* (0.187)	...	0.331** (0.166)
Statistics								
$R^2$	0.5252	0.5262	0.6827	0.6836	0.6305	0.6314	0.7824	0.7833
District effects	yes	yes	no	no	no	no	no	no
Year effects	yes	yes	yes	yes	no	no	no	no
Grade effects	yes	yes	no	no	yes	yes	no	no
District-grade effects	no	no	yes	yes	no	no	yes	yes
District-year effects	no	no	no	no	yes	yes	yes	yes

Source: The annual Common Core of Data (CCD) universe surveys from 1993-94 to 2001-02.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

... Not applicable.

BSTs = Basic Skills Tests.

a. The unit of observation is the grade (9-12) within a school district in a given school year ( $N = 10,502$ ). Standard errors, adjusted for clustering at the grade-district level, are reported in parentheses.

(that is, closer) grades. These results suggest that year effects unique to particular grades are not a source of confounding biases in these evaluations.

The remaining results, which are based on the data from all four grades, examine how the grade-specific effects of the BSTs requirement varied by a variety of observable district traits. The results in the first panel of table 6-8 are based on dividing the observed school districts into quartiles based on their prereform position in the distribution of the percentage of students who were Black or Hispanic. It should be noted that there are relatively few minority students in Minnesota (roughly 5 percent of students were Black and 2 percent were Hispanic), even in the districts in the top quartile of this distribution. Therefore, these estimates should be understood as identifying the effect for the average student in these districts rather than the effect for a minority student per se.<sup>71</sup> Nonetheless, the results in table 6-8 suggest that the dropout effects of the BSTs requirement differed noticeably across these districts. For example, in the districts with higher concentrations of minorities, the BSTs led to particularly large increases in the twelfth grade dropout rate (0.69 to 0.92 percentage point). However, these results also indicate that the BSTs led to relatively large reductions in the tenth and eleventh grade dropout rates.<sup>72</sup> Also of interest is that the BSTs requirement had small and statistically insignificant effects in the districts with the lowest concentration of minority students.

The results in the next panel are based on dividing districts into quartiles based on their 1995 position in the state distribution of the percentage of children in poverty. The results for high-poverty districts tend to be statistically imprecise. However, the point estimate for the twelfth grade dropout effect is approximately twice as large as that for the full sample. These results indicate that the reductions in tenth and eleventh grade dropout rates were concentrated in the lower-poverty districts. In fact, in the lowest-poverty districts, the BSTs requirement was also associated with reductions in the twelfth grade dropout rate.

The next specification attempts to refine these comparisons by focusing on the observations from districts in the top halves of the state distributions

Table 6-8. *Estimated Effects of Minnesota's Exit Exam on Dropout Rates, by District Traits<sup>a</sup>*

<i>Districts in sample</i>	<i>Estimated effect of BSTs by grade</i>				<i>Sample size</i>
	<i>Grade 9</i>	<i>Grade 10</i>	<i>Grade 11</i>	<i>Grade 12</i>	
Full sample	-0.179 (0.165)	-0.364** (0.151)	-0.299* (0.175)	0.331** (0.166)	10,502
<i>Percentage of minority students</i>					
Top quartile	-0.054 (0.291)	-0.618** (0.266)	-0.194 (0.262)	0.924** (0.277)	2,623
Third quartile	-0.250 (0.283)	-0.272 (0.273)	-0.171 (0.306)	0.689** (0.296)	2,627
Second quartile	-0.499 (0.354)	-0.542* (0.321)	-0.700* (0.412)	-0.329 (0.338)	2,624
Bottom quartile	0.103 (0.383)	-0.015 (0.334)	-0.114 (0.392)	0.066 (0.390)	2,628
<i>Percentage of children in poverty</i>					
Top quartile	0.044 (0.408)	-0.182 (0.357)	0.115 (0.413)	0.699 (0.434)	2,596
Third quartile	0.207 (0.280)	0.163 (0.251)	0.100 (0.277)	0.625** (0.272)	2,626
Second quartile	-0.472* (0.251)	-0.750** (0.242)	-0.195 (0.238)	0.496* (0.298)	2,640
Bottom quartile	-0.489 (0.357)	-0.677** (0.326)	-1.192** (0.417)	-0.478* (0.289)	2,640
Above median in percentage of minority students and children in poverty	0.216 (0.332)	0.179 (0.303)	0.405 (0.339)	1.285** (0.313)	2,132
Urban	0.445 (0.577)	-0.365 (0.757)	-0.314 (0.928)	3.13** (1.07)	316
Suburban	-0.413 (0.294)	-0.840** (0.272)	-0.669** (0.263)	-0.131 (0.239)	2,351
Rural	-0.129 (0.211)	-0.205 (0.189)	-0.177 (0.230)	0.357* (0.212)	7,835

Source: The annual Common Core of Data (CCD) universe surveys from 1993-94 to 2001-02.

\*Significant at the 10 percent level; \*\*significant at the 5 percent level.

BSTs = Basic Skills Tests.

a. The unit of observation is the grade (9-12) within a school district in a given school year ( $N = 10,502$ ). All models condition on district-year and district-grade fixed effects. Standard errors, adjusted for clustering at the grade-district level, are reported in parentheses.

71. Because the PUMS analysis suggested that the effects of exit exams differed for Black and Hispanic students, we also considered more disaggregated measures of minority students. However, the results based on these data were quite similar. Among other things, this could reflect that the Hispanics observed in the CCD files include both native-born and foreign-born students.

72. The distinct effects of exit exams in high-minority districts were similar in models that excluded the Minneapolis and St. Paul districts.

of percentage of minority students and percentage of children in poverty. These results suggest that the BSTs led to increased dropout rates across all four grades with a particularly large and statistically significant effect on the twelfth grade dropout rate. The final set of results in table 6-8 examines the unique effects associated with a district's urbanicity. A striking result is that the BSTs requirement led to a particularly large increase in the twelfth grade dropout rate in urban districts (over 3 percentage points) and to a lesser extent an increase in rural districts. In contrast, the beneficial effects of the BSTs requirements (reductions in tenth and eleventh grade dropout rates) were largely concentrated in suburban school districts.

In sum, the evidence from Minnesota's experience with exit exams is consistent with several of the claims made by both proponents and critics of these policies. For example, these results indicate that the BST requirement was actually associated with reductions in the dropout rates for earlier high school grades. This result is consistent with the hypothesis that Minnesota's exit exam improved student effort and school performance.

Mapping these results into an implied change in the high school graduation rate is not straightforward, in part because these data are based on event dropouts who may later reenroll. However, assuming that event dropouts do not return to school and using the prereform dropout rates as a base, the full sample results (reductions in the dropout rate in ninth through eleventh grades and an increase in twelfth grade) imply that the overall high school graduation rate increased by approximately one-half of a percentage point (an increase of approximately 0.5 percent given an implied graduate rate of 89.2 percent).

However, critics of exit exams would not be surprised to find that these improvements were concentrated in lower-poverty and suburban districts. In contrast, the increased dropout rates were found in urban districts and those with higher shares of minority students and children in poverty. In fact, calculations based on these point estimates indicate that the implied changes in the high school graduation rates for these districts were consistently negative. For example, in urban districts during the 1993-95 period, the implied high school graduation rate was 75.1 percent. The results in table 6-8 imply that this rate fell to 72.7 percent as a result of the BSTs requirement, a decrease of approximately 2.4 percentage points (3.2 percent).

## Conclusions

The notion that high school graduates should meet high academic standards has a universal appeal. The increasing importance of cognitive skills for eco-

nomics success in recent years adds a sense of urgency to standards-based reforms in high school. However, some doubt whether binding standards can effectively improve student or school performance. There are also concerns about whether standards-based reforms may exacerbate economic inequality by harming the students most at risk of academic failure. This study attempts this broader debate by presenting new evidence on the educational and economic consequences of the earliest, standards-based reform—mandatory exit exams for high school students.

Our results, based on data from the 2000 Census, indicate that exit exams led to particularly large increases in the dropout rates of Black students. Similarly, our analysis of Minnesota's recent exit exam, based on the NCES' Common Core of Data, indicates that this graduation requirement increased the dropout rates in school districts with relatively large concentrations of minority students as well as in urban and high-poverty school districts. Furthermore, Minnesota's exit exam also reduced the dropout rates in suburban and low-poverty school districts. Taken at face value, these findings imply that these standards-based reforms have exacerbated both poverty and inequality.

However, a number of factors suggest that the implications for poverty are not quite so straightforward. For example, our analysis of data from the 2000 Census provided some evidence that exit exams improved longer-term outcomes (for example, college matriculation, labor-market outcomes) for Hispanic females and Blacks. These changes could reflect both the signaling and the incentive effects of exit exams. The possible incentive effects of standards-based reform were also suggested by our evidence that exit exams reduced the early high school dropout rates in some of Minnesota's school districts.

These ambiguities suggest a number of possibly fruitful directions for further research. For example, as states continue to both introduce exit exams and simultaneously develop richer, longitudinal data on student achievement, it should become possible to identify how the incentive effects of exit exams may have changed the distribution of cognitive achievement. Second, the evidence that exit exams reduced the dropout rates in some districts (for example, in low-poverty districts) suggests it would be useful to learn more about the mediating factors that may have facilitated these improvements. Third, it would be useful to develop further evidence on whether exit exams generally encourage students to drop out during twelfth grade and to identify the implications of this pattern for both targeted remediation and reform.



Table 6A-1. *High School Exit Exams*<sup>a</sup>

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Alabama	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
Arkansas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Delaware	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Florida	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	0	0	0	0	0
Georgia	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Hawaii	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Indiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Louisiana	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
Maryland	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Massachusetts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Minnesota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Mississippi	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nevada	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
New Jersey	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
New Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North Carolina	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
Ohio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2
South Carolina	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tennessee	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Texas	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Virginia	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2

Source: Data are drawn from a variety of sources, including a comprehensive Lexis-Nexis search of news articles from the relevant states from roughly 1978 to 2005 and from a variety of academic articles.

a. The coding is as follows:

0 = state did not have a high school exit exam for the graduating class in that year

1 = state had a high school exit exam for the graduating class in that year that tested material below the ninth grade level

2 = state had a high school exit exam for the graduating class in that year that tested material on the ninth grade level or above

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