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Does Education Reform Make Recruiting More Difficult?

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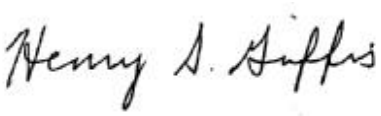

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Executive summary

In recent years, the number of people age 19 or younger who earn General Education Development (GED) certificates rather than high school diplomas has increased appreciably. At the same time, states have substantially increased requirements for high school graduation. The two primary paths for tightening graduation requirements are implementing exit exams and increasing the Carnegie-unit requirements. Exit exams are standardized tests that students must pass (in addition to completing course work) to receive diplomas; Carnegie-unit requirements specify the number and type of courses that students must pass to graduate.

Both of these changes have the potential to make recruiting more difficult for DoD. Those who graduate with GEDs rather than traditional high school diplomas enter the Services with a Tier 2 credential. The total proportion of accessions with Tier 2 or 3 credentials is limited by DoD and the Services. In addition, those who lack Tier 1 credentials are not eligible for some fields/bonuses and must score higher on the Armed Forces Qualification Test (AFQT) than traditional high school graduates. For these reasons, an increase in the proportion of young people with GEDs essentially reduces the pool of potential recruits with preferred credentials.

In this research, we use data from the 2000 Census to examine how changes in GED recipiency, the use of high school exit exams, and increasing Carnegie requirements affect the size and quality of the pool of potential enlisted applicants of the Navy and the Marine Corps. We next examine how these changes in education requirements affect the proportion who enter the Services with "alternate credentials" (no high school diploma). Finally, we look at how education policies affect the quality and performance of those who are accepted for enlistment.

Our results indicate that education policies do affect outcomes of potential recruits. Moreover, several of the policies examined have nuanced effects; for example, exit exams decrease the probability that a person will complete high school but increase college attainment for high school graduates and increase labor force attachment for all people. Also, we find that the proportion earning GEDs (rather than high school diplomas) does depend on GED policies (such as age restrictions) and on high school graduation requirements.

When we examine our samples of Navy and Marine Corps accessions, we find a story that is less clear-cut. In both the Navy and the Marine Corps, we see no change in the proportion with alternate credentials that can be linked to changes in education policy; in fact, the proportion with alternate credentials in the Marine Corps changed little over our sample period (1993 to today). In the Navy, however, we see a sharp increase in the proportion holding one of the two alternate credentials considered Tier 1: adult education certificates or one semester of college without a high school degree. The growth in accessions holding these credentials cannot be tied directly to any changes in education policy; rather, it seems to have occurred during particularly difficult recruiting years.

When we look at various measures of accession quality, we find again a nuanced story. Graduation and GED requirements do seem to affect recruit quality—sometimes positively, sometimes negatively. For example, exit exams raise AFQT scores of some accessions; stringent Carnegie requirements lower AFQT scores of all recruits (Sailors and Marines). A strong, consistent finding is that in states with exit exams more accessions require waivers for "serious" matters (which we define as legal matters more serious than a misdemeanor, up to and including a felony).

Although we test several different models, we find virtually no effect of graduation policies on attrition. This may be because our sample period encompassed a time of falling overall attrition and overall waiver levels, at least in the case of the Navy.

The near future is sure to bring more prevalent exit exams; five states plan to enact exit exams over the next 3 years so that by 2008 half of all states (including 70 percent of all students) will require the exams.

It is likely that Carnegie-unit requirements will continue to increase as well. Given these realities, our findings suggest the following four recommendations:

1. It would be very useful for the Services to know more about the potential size and quality of the recruiting pool of people with the following alternate Tier 1 credentials—adult education or some college (in lieu of a high school diploma). At present, no national database allows tracking this group; even differentiating between high school graduates and GED-holders is difficult with currently available data.
2. We believe the increase in the proportion of Navy accessions with alternate Tier 1 credentials is cause for concern. In particular, we find the concentration of these recruits in certain states problematic. We recommend careful tracking of these groups.
3. As high school graduation standards continue to increase, it may be possible through more thorough screening to improve the quality of those accessions holding alternate credentials (especially Tier 2 or 3 credentials). Doing so, however, will require the Services to change the way they recruit those with Tier 2 or 3 credentials; as long as these people are recruited on a walk-in basis, quality is unlikely to improve.
4. We are concerned about the increase in accessions requiring serious waivers in states with increasing graduation standards. As graduation standards become more prevalent, we recommend a re-analysis of the relationship between serious waivers and attrition.

We expect that, as states' graduation requirements continue to increase in the next few years, the effects will continue to be mixed; some aspects of these changes could be harmful to recruiting, while others could be neutral or even positive.

Introduction[1]

Over the last decade, there has been a substantial increase in the number and proportion of young people (age 19 or younger) who earn General Education Development (GED) certificates rather than high school diplomas. In 1993, 157,000 such young people earned GEDs; by 2000, the number had increased by roughly 40 percent to more than 217,000 [1, 2].

Although many people who receive GEDs consider themselves high school graduates,[2] substantial research indicates that a GED is *not* the equivalent of a traditional high school diploma. In fact, those who hold GEDs work less, earn less per hour, and have higher job turnover than otherwise similar high school graduates [3]. Moreover, this increase in GED holders is not readily apparent from glancing at statistics on U.S. educational attainment; it is the norm to track the number who completed high school through graduation *or an equivalent certificate* versus dropouts but not to distinguish between traditional high school diplomas and alternate credentials.[3]

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1. Thanks to Dave Gregory and Cathy Hiatt for preparing our initial military data samples. We are grateful to Aline Quester for thoughtful comments, to Dinah Sunday for editing, and to Pat Blackmore for preparing the document for dissemination. Thanks also to Kathy Christie of the Education Commission of the States for providing detailed notes on past high school graduation requirements in a cheerful, timely manner.

2. This viewpoint is encouraged by the GED Testing Service, the group that develops, oversees, and collects information on the GED tests. See, for example [2, pp. 3-4].

3. Both the Current Population Survey (CPS) and the Census collect information in this manner. See [4] for a discussion of changes in educational attainment over time, with a particular emphasis on the increase in those holding GEDs. Alternate credentials include, but are not limited to, credentials awarded for completing the GED, a correspondence school program, a vocational/occupational program, or an adult education program.

The growth in GED recipiency has important implications for military recruiting. For purposes of enlistment, credentials are divided into levels or tiers. The tier system is based on historical attrition rates; those with alternate credentials (or no credential) usually exhibit first-term attrition rates that are roughly double those of high school graduates. Given the high cost of replacing enlisted Servicemembers who do not fulfill their obligation (i.e., who "attrite"), the Services attempt to recruit those who are most likely to complete their obligation. Education credentials are assigned to tiers as follows:

- *Tier 1:* Traditional high school diploma graduates, as well as those who have completed adult education programs and those with college credits[4]
- *Tier 2:* Those who hold GED certificates, occupational/vocational program certificates, certificates of high school completion/attendance, and correspondence school certificates
- *Tier 3:* Those with no recognized credential.

Because DoD does not view the GED as a substitute for a high school diploma, the growth in GED recipiency decreases the pool of potential Tier 1 recruits.

Research suggests that the decrease in high school completion rates and the increase in GED recipiency are tied both to states' GED policies and to recent increases in graduation standards (e.g., see [5], [6], [4]). As a consequence of substantial reform in the American education system, students who complete high school today encounter more standardized tests, and take more courses, than students 20 years ago. At the high school level, many states have introduced and upgraded the difficulty of standardized exit exams; students must complete all coursework *and* pass the tests to graduate. During the same time period, states and school districts have increased the number of high school courses required for graduation. While the mandated increases have been small on average, districts may require or encourage more coursework than the state-mandated minimum.

4. Beginning in FY99, a 5-year pilot program allowed the Services to recognize home-school diplomas, as well as joint completion of the National Guard Youth Challenge program and a GED, as Tier 1 credentials.

Consistent with this, the number of courses *completed* by the average graduate has increased quite sharply during this period. The average high school graduate in 1982 had earned 21.6 Carnegie units; by 1990 the figure rose to 23.5 and by 2000 the average graduate had earned 26.1 units [7, table 137]. One Carnegie unit is usually awarded for each course completed, so this increase means that students completed substantially more coursework in 2000 than in 1982. Also, the increases have come largely within "academic" subjects—that is, math rather than vocational education [7, table 137].

Students who remain in school and complete all coursework but do not pass standardized tests required for graduation receive a certificate of attendance or completion rather than a traditional high school diploma. As indicated earlier, this certificate is considered Tier 2 by DoD. To minimize attrition, the Services sharply limit the enlistment of people with Tier 2/3 credentials. Also, those holding Tier 2/3 credentials must attain a higher score on the Armed Forces Qualification Test (AFQT) than those holding Tier 1 credentials.[5] Therefore, while more stringent graduation requirements may raise the overall quality of high school *graduates*, such requirements may also decrease the pool of potential recruits with Tier 1 credentials. Thus, increased use of standardized testing and higher graduation standards, coupled with increased GED recipiency, have the potential to make recruiting more difficult for the Navy and the Marine Corps.

In this research, we examine how changes in the civilian education world—especially the increase in GED recipiency, the increased use of high school exit exams, and the increased Carnegie requirements—affect the size and quality of the pool of potential enlisted applicants of the Navy and the Marine Corps. We also examine how changes in education requirements affect the performance of those who are accepted for enlistment.

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5. AFQT scores are computed by combining the scores on the following subtests of the Armed Services Vocational Aptitude Battery (ASVAB): (1) Arithmetic Reasoning, (2) Word Knowledge, (3) Paragraph Comprehension, and (4) Mathematics Knowledge. With few exceptions, Tier 2/3 enlistments must attain a minimum AFQT score of 50; the minimum for Tier 1 recruits is 32 in the Marine Corps and 35 in the Navy (the Navy's minimum score threshold was 31 before 2003).

Background

The General Education Development credential

History of the exam, number of test-takers

The GED has become an important credential for those who do not complete a traditional high school course of study. (The GED is the most common alternate credential among enlisted Servicemembers, as well as among all Americans.) The GED program began during World War II as a route to certification for the many returning veterans who had not completed high school before enlisting. Such certification allowed those veterans who had the necessary skills to take advantage of the GI Bill and enter college without first returning to high school. In the next few years, states began to allow non veterans to take the test; by 1959, civilian test-takers outnumbered veteran test-takers. During the late 1960s, GED preparation programs began to receive substantial government funds, and the number taking the GED exam grew rapidly.[6]

The exam consists of five subject tests (two of which are broken into two parts); completing all tests takes about 7.5 hours. The subject tests include Language Arts (Writing), Social Studies, Science, Language Arts (Reading), and Mathematics. The seven subtests are graded separately. Test-takers are allowed to retake any individual tests that they fail, as often as they like.

The GED is designed and distributed by the GED Testing Service (GEDTS), part of the American Council on Education (ACE). The GEDTS has changed the test over time to reflect changes in the American educational curriculum. The first change—more emphasis on conceptual items and less on factual recall—came in 1978 [10]. In

6. For more background on the GED, see [8] or [9].

1988, the tests were again updated to include a writing sample (previous tests were all multiple choice), as well as an increased emphasis on critical thinking [10].

ACE has always set a (minimum) passing standard, but states have the right to set a higher standard and the responsibility for setting other requirements (such as the minimum age at which a person may take the test). Over time, many states raised their passing standards above those set by ACE; in fact, 45 states had raised their standard above the ACE's national standard by 1995. In 1997, ACE raised the passing standard to the level already required by many states. Because so many states had already raised the standard, the new standards had little effect on many test-takers [8]. However, the change did mean that, while there was substantial variation in the passing levels across states until 1997, there has been little variation since 1997.

Finally, in 2002, the tests were again restructured. This change put more emphasis on "information processing" (the new questions frequently ask test-takers to read a chart or a graph). Test-takers are allowed to use a calculator on one of the math sections, and the English Language Arts test is now reflective of the National Assessment of Educational Progress (NAEP) framework [10]. The number of test-takers, as well as the number who passed the exam, increased sharply between 2000 and 2001 and then decreased dramatically during 2002. This is most likely because scores from the pre-2002 version could not be combined with those from the new version; therefore, those who had passed some sections of the old exam were urged to complete their testing before the new exams went into effect in 2002. (Consistent with this, the percentage of new GED-holders age 16 to 19 was lower during 2001 than during prior or later years.) ACE and state GED administrators mounted a campaign to inform all those who had passed only some sections of the test about the changes. The campaign was judged successful by ACE [2]. The most recent numbers (from 2003) indicate that the number of test-takers increased over 2002, but the total remains well below the 2001 numbers and somewhat below annual numbers from the last decade. However, nearly half of those passing the tests in 2002-2003 were 19 or younger, and it seems likely that the number of young test-takers will continue to increase over the next few years. Despite the

restructuring of the exam, passing rates for the last 2 years have been similar to those of previous years.[7]

Although the format of the tests has changed substantially, a close look at sample questions reveals several patterns. First, the tests require relatively little in the way of factual or recall knowledge. For example, many of the questions on the Social Studies and Science tests require simply that the test-taker be able to pull facts or information out of a written paragraph, figure, or chart; in essence, they are tests of reading comprehension. On the math sections, pertinent formulas are provided, and the test-taker must simply select the correct formula and apply it to the problem. (For sample questions, see [12].)

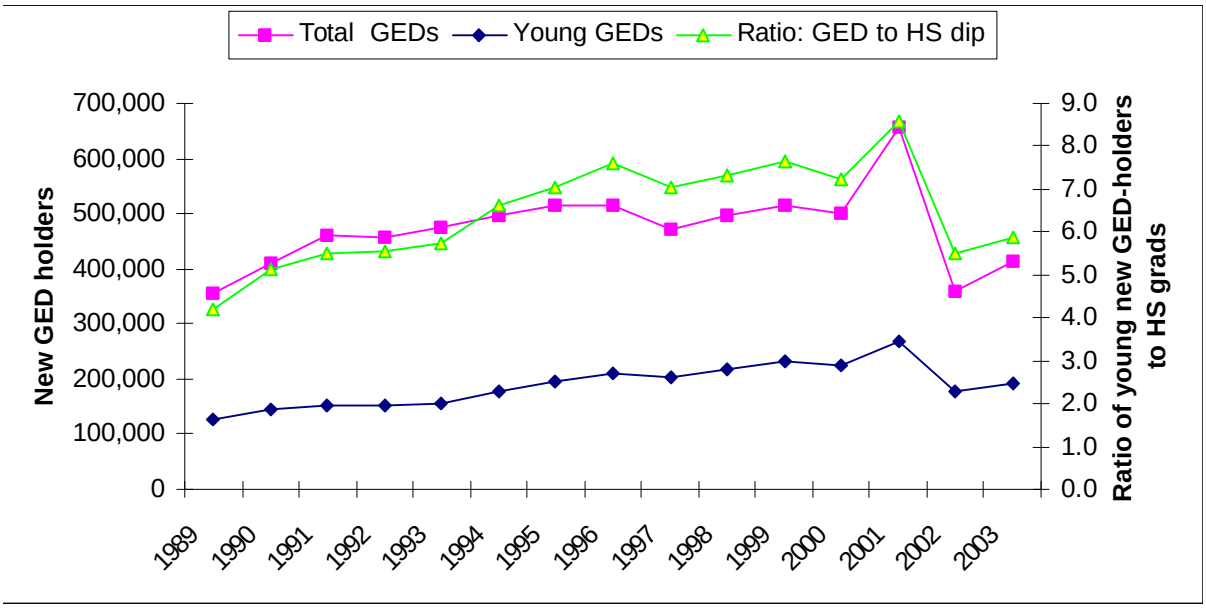
Figure 1 shows the total number of new GED-holders for each year over a 10-year period and the number who are age 19 or younger.[8] The number of new GED-holders rose dramatically over this 10-year period; the sharp drop-off during 2002 after the most recent revision of the GED tests is also evident from the figure. By the mid-1990s, one person earned a GED for every six who earned a high school diploma [9]. A casual glance at this figure could lead one to believe that nearly 15 percent of high school students earned GEDs rather than high school diplomas, but this is not the case. Some who take the GED

7. This is not surprising because the passing scores are set by ACE after giving the GED exam to a group of graduating high school seniors. ACE sets each passing score at the 40th percentile among graduating seniors (i.e., 60 percent of them would pass each exam). Overall pass rates are fairly high; of those who completed all five test in 2003, 73 percent passed all five [11, p. 37]. Because of this norming, it is also possible to gauge differences in relative performance across the tests. For example, the median score of those taking the GED is 460 on the Mathematics test and 480 on the Language Arts (Writing) test; 94 percent of those taking the Language Arts (Writing) test pass, while nearly 20 percent of test-takers fail the Mathematics test [11, p. 37].

8. We define new GED-holders as those who passed the test within the calendar year. Some researchers argue that the number of test-takers is a better indicator of the demand for the test; however, because we are primarily concerned with those who could enlist in the military, we look at those who actually receive the credential.

have been out of school for many years. In 2000, for example, 22 percent of those taking the tests and 20 percent of those issued a credential were at least 30 years of age [2].

Figure 1. Number of new GED-holders and ratio of new young GED-holders to high school graduates[a]



a. Source: Authors' calculations using [1], [2], [11], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], and [7, table 102]. Total number of high school graduates estimated from number of public school graduates.

An increase in the number of GED-holders increased among those 35 years of age or older is unlikely to affect military recruiting. (Indeed, ACE publications place heavy emphasis on their role in serving "adults" and those who left school some time before taking the exam; for example, see [14].) However, increases in GED recipiency rates among young people are a cause for concern. Therefore, we calculate and plot the ratio of new young GED-holders to high school graduates in figure 1; this number provides a measure of how changes in credentials affect the potential recruiting pool.

As figure 1 shows, the total number of new GED-holders did increase over the period, but so did the number of young new GED-holders (those who were 19 or younger). The *ratio* of young new GED-holders to high school graduates also rose sharply during the 1990s (this ratio is plotted on the right-hand axis of the figure). Figure 1 indicates that the overall probability that a young person with a credential will have a GED (as opposed to a high school diploma) increased markedly during the 1990s and has increased again after a sharp decrease in 2001.

Research on the GED and GED test-takers

Much of the research on those who hold GEDs has concentrated on three important questions:

- How do educational and labor market outcomes of GED recipients compare with those of high school graduates?
- Does earning a GED improve educational and labor market outcomes for high school dropouts?
- Does the presence of the GED (or specific state-level policies concerning the GED) increase the probability that a student will drop out of high school?

There is general agreement that GED recipients have poorer educational and labor market outcomes than high school graduates. The definitive research remains that of [3], who found that GED recipients earned less, were less likely to be employed, earned less while employed, and had higher job turnover than high school graduates.

A number of studies indicate that GED-holders also have poorer outcomes than high school diploma graduates in postsecondary education. A Wisconsin study found that GED-holders have lower grades and a higher chance of dropping out of college / university than high school diploma graduates [25]. Reference [3] found similar results for a national sample. These findings hold despite the fact that GED-holders seem to have cognitive abilities that are relatively close to high school graduates, especially the group of high school graduates who do not attend college [8, 26].

Many researchers have asked a different question: Given that a student decides to leave school, does acquiring a GED help the person either to acquire more education or to attain higher earnings? To this question, the answer is a qualified "yes." Reference [27], for example, finds that dropouts who earn a GED are more likely to attend college, and to get training, than other dropouts. However, the probability that a GED-holder will attend college is relatively low. In a review of the literature, [9] cites several other studies consistent with this finding. Reference [9] summarizes the research as finding that GED benefits (as measured by wage increases) accrue gradually over time rather than immediately, and that the largest wage gains go to those who have relatively weak cognitive skills.

However, researchers also note important differences, on average, between GED recipients and other dropouts. As noted by [9] and [8], GED-holders are relatively advantaged; they have more years of schooling, higher standardized test scores, and more advantaged backgrounds than other dropouts. The findings in [28] suggest that male GED-holders have cognitive abilities similar to those of high school graduates who do *not* attend college. In fact, these researchers find that the wage differences between male high school graduates and GED-holders are *not* related to cognitive ability but instead are related to different non-cognitive factors (behaviors). Similarly, [26] notes that male GED-holders actually have higher levels of such negative behaviors as fighting in school, as well as shoplifting and various other illegal actions, than other male dropouts; these authors suggest that the GED essentially selects those dropouts who possess relatively high cognitive skills but who also have relatively high levels of behavioral problems. In a similar manner, [8] notes that GED-holders (men in particular) seem to have problems of persistence—first in high school, but also in the military, postsecondary education, and the labor market.

Finally, research suggests that state-level policies concerning the GED program induce some students to drop out of high school [9], [4], [29], [6]. The size of the effect is not clear, partly because over the last 10 to 15 years states (and ACE) changed GED policies while states also changed a number of other education policies. For example, [5] notes that required Carnegie units increased over the same period,

and [9] posits that the relatively large effects linked to state-level policies (such as small changes in the GED fee) found by [5, 4] are consistent with omitted variable bias; the most likely cause is the difficulty of controlling for other state-level education policies.

Performance of GED-holders in the military

Substantial evidence shows that, across the four Services and over long time periods, those who enlist with GEDs are much less likely to complete their obligation than those who enlist with high school diplomas (e.g., see [30], [31], [32], [33], [34], [35]). On average, holders of alternate credentials leave the Services prematurely nearly twice as often as high school diploma graduates.[9] Aptitude does not explain these differences; reference [31] points out that even GED-holders whose AFQT scores place them in the top 7 percent in terms of cognitive ability are still much more likely to attrite than high school graduates whose AFQT scores place them between the 10th and the 30th percentile.

The strong relationship between education credentials and attrition is most likely due to noncognitive factors. Those who complete high school have served "seat time" and have demonstrated perseverance and a tolerance for rules, as well as cooperation with instructors and peers; these qualities are likely important in a highly structured organization such as the military (e.g., see [36]). Reference [35] demonstrated that enlisted GED-holders are more likely than enlisted dropouts to hold waivers and to hold "serious" legal waivers (defined as a waiver for a serious misdemeanor or a felony). Reference [33] also found that roughly 13 percent of enlisted GED-holders (as opposed to 3 percent of high school graduates) reported being

9. On average, about one-third of all first-term enlistees leave the Services prematurely (i.e., they "attrite"). While the percentages vary somewhat across Services and time periods, as demonstrated in [31], 29.2 percent of high school graduates and 49.1 percent of GED-holders attrited within 36 months of enlistment during the FY88–96 period, and the numbers as far back as FY79 were similar. Using a random sample of enlistees from FY99 to FY00, [35] found that 28.7 percent of high school graduates and 47.6 percent of GED-holders attrited by 36 months.

expelled from school, and those who were expelled had higher attrition rates than others.

These findings on GED-holders in the military accord well with much of the research on civilian GED-holders (see previous subsection). It is likely that GED scores and AFQT scores are correlated, so the higher AFQT cutoff faced by GED enlistees should ensure that those Servicemembers with GEDs have average levels of cognitive ability that are higher than those of many high school graduates. This suggests that GED enlistees are capable of completing training. However, military researchers have long recognized the distinction between credentials and cognitive ability; while the AFQT score is an indication that the person is capable of completing the training, the education credential is considered a valuable indicator of the likelihood of completing one's obligation. Thus, the high attrition rate of GED-holders is consistent with the finding of [28] that the wage differences between high school graduates and GED-holders are related not to cognitive ability but to noncognitive or behavioral differences. GED-holders in the military have outcomes similar to GED-holders in the civilian labor force (i.e., high job turnover), suggesting that the military values the same things as civilian employers. Also, [37] notes that GED math test scores are not related to standard measures of socialization, so high-scoring GED-holders may have noncognitive skills similar to lower-scoring GED-holders. Taken together, these findings imply that GED-holders in the military attrite at high levels because of behavioral problems rather than lack of ability to complete the required training.

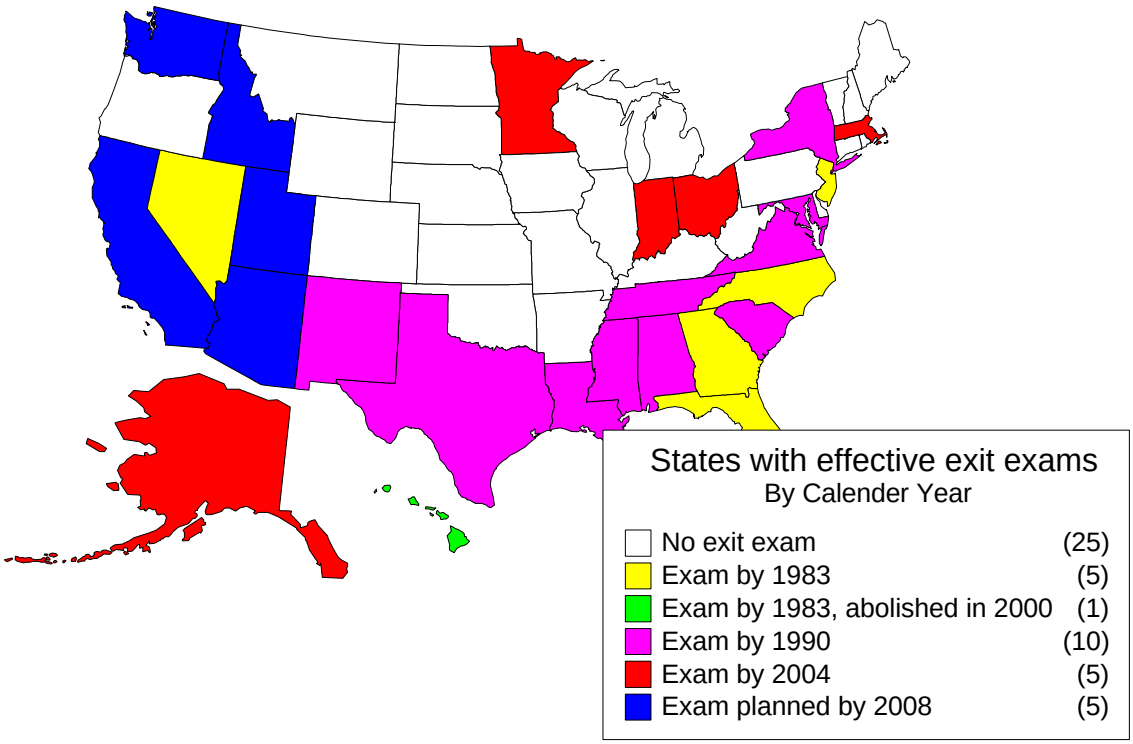
Other education reforms

Increases in standardized testing

The 1983 report, "A Nation at Risk," characterized American high schools as lax and sparked a wave of reforms aimed at improving educational quality [38]. The educational reforms that followed this influential report included increased scrutiny of teachers' professional credentials as well as more, and more stringent, high school graduation requirements. For example, the report made specific recommendations about the number and type of courses that should be

required for high school completion (we discuss these requirements in the next section). Another reform sparked by this report was a sharp increase in the number of states requiring students to pass a standardized test (in addition to completing coursework) to graduate. Before 1983, only 5 states required such tests; figure 2 shows that, by 1990, that number had increased to 16.

Figure 2. State graduation exam requirements over time[a]



a. See appendix A for a complete list of sources.

The 2002 No Child Left Behind Act (NCLB) ushered in a renewed interest in testing, at both primary and secondary levels. It is likely that NCLB requirements will be expanded at the high school grades over the next 2 years. In line with this, the number of states requiring a test for graduation increased slightly between 1990 and 2004; by

2008, 5 more states will require such tests (see figure 2). In 1990, about 40 percent of all students faced a graduation test requirement. Several populous states have enacted or plan to enact tests. By 2004, 50 percent of students were affected; by 2008, 70 percent of public school students will live in states requiring graduation tests. Therefore, this reform will soon affect the large majority of students.

The standard high school graduation exam is first administered in the tenth grade, and most states give students multiple opportunities to take the exam. The difficulty level of the exams tends to increase over time. For example, Alabama's initial high school exit exam, required of the class of 1985, tested basic skills at the sixth-grade level. By 1993, Alabama high school graduates were required to pass an exam that tested students at the eighth- and ninth-grade levels. Beginning with the class of 2001, Alabama high school students must pass an exit exam that tests eleventh-grade material [39]. Over time, fewer states report that their exit exams test a minimum level of competency, and states are increasing the number of subject tests that students are required to pass [40]. However, looking at the more recent exit exams of six states, [39] found that the math exit tests were at an eighth-grade level when compared with international grade criteria.

Despite the historically low difficulty level of some high school exit exams, significant numbers of students do not pass. Of the Texas high school test-taking cohorts of 1991 through 1994, [41] reports that 87 percent eventually passed or were exempt from the exit exam. The 2002 and 2003 first attempt pass rate for eight states with math exit exams ranged from 36 percent for Nevada students to 91 percent for Georgia students [40].

In general, students who complete all required test work but fail to pass the exit exam receive an alternative diploma, usually a certificate of attendance or completion. Such alternative diplomas are a Tier 2 credential. Thus, exit exams may decrease the pool of potential Navy and Marine Corps Tier 1 recruits. In addition, if exit exams influence the decision to drop out of high school, exit exams could be associated with an increase in the number of GED recipients. Of course, exit exams also could raise the quality of high school graduates.

The research on whether exit exams influence students' propensity to drop out is mixed. Some studies find no association between exit exams and high school completion rates [42]. Other researchers have found that dropout behavior *is* influenced by the presence of exit exams—in particular, that exit exams have negative effects, at least in the cases of low-achieving students and more difficult exit exams. Reference [43] finds that low-achieving students in states with exit exams are 25 percent more likely to drop out than comparable students in states without exams. Comparing the difficulty of exams across states, [44] finds that the high school completion rates were 1.2 percent lower in states with "minimum competency" exams and 3.2 percent lower for states with "more difficult" exams when compared with states without exit exams. Reference [45] finds a negative effect on high school completion for black men. Using student level data on Texas high school students, [41] estimates that just over 1 percent of all students drop out of high school solely because of the graduation exam. At the same time, there are some indications that exit exams have positive effects on achievement and labor market outcomes of those who do complete high school [42, 45, 46].

Increases in Carnegie units

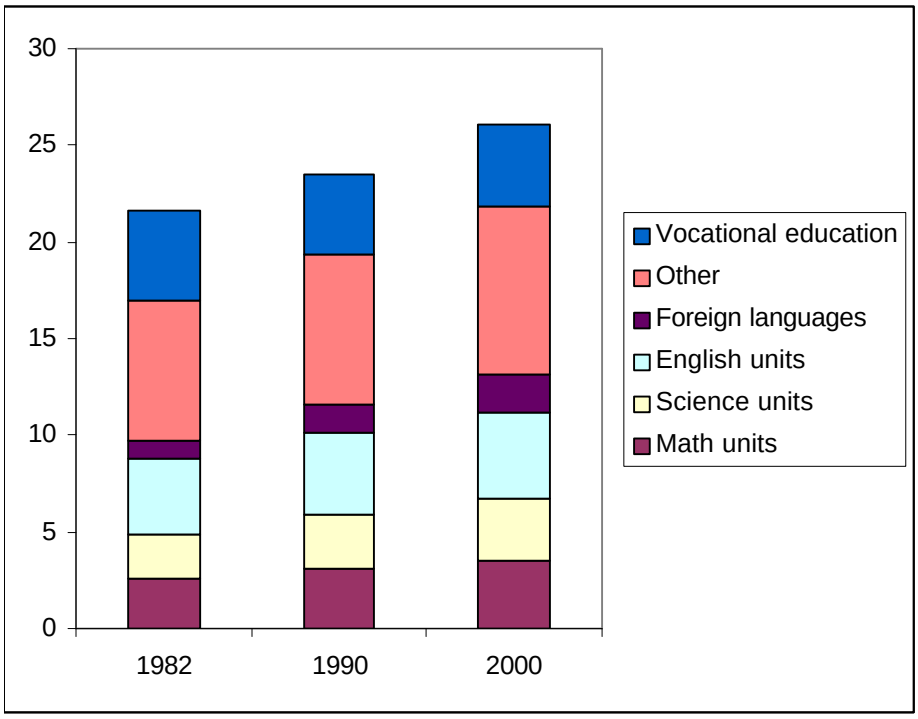
Figure 3 shows how both the number and the type of Carnegie units earned by high school graduates have changed over time.[10] The increases have come largely within "academic" subjects (i.e., math as opposed to vocational education).[11] Specifically, the average high school graduate today leaves school having taken 1 more math course (most likely a course requiring Algebra), one-half more English course, 1 more science course, and 1 more foreign language course than the typical graduate in 1980.[12] The number of vocational courses fell slightly over the period; the total number of credits increased by about 4.5 [7, table 137]. Such increased course requirement should help to prepare students for exit exams and are likely to

10. Figure 3 traces the number of units actually earned—not those required for graduation. This increase is a reflection of increased requirements.

11. Vocational credits include those in general vocational courses as well as those in business, marketing, health, and technical courses.

increase the AFQT score of the typical high school graduate. However, college attendance has also increased during this period, so it is less clear how these changes are likely to affect the quality of military recruits. Finally, research indicates that increasing standards may prove discouraging to some students; [5] finds that increasing course requirements causes some students to drop out of high school.

Figure 3. Carnegie units earned by high school graduates, over time[a]



a. Source: [7, table 137]. "Vocational" courses include business, health, and technical courses, as well as general vocational courses.

12. Within subjects, the shift has also been toward more difficult courses; for example, the number of courses requiring Algebra increased from 1.74 to 2.25 over the period, while the number requiring no Algebra fell from 0.90 to 0.61 {7, table 137].

Methodology and data

To study how changes in the civilian education world have affected the quality and quantity of Navy and Marine Corps recruits, we use Census data to look at how changes in public education affect all young adults. We also focus on the increased use of exit exams and Carnegie-unit (CU) requirements, as well as on changing GED policies. Using Census data, we examine how the likelihood that a person will complete high school, attend college, and work (or search for work) differs based on education requirements. We also ask whether otherwise similar people earn more or less based on the education policies in effect during their schooling. Because these policies affect all potential recruits, we refer to them as the "recruiting climate." As a link between changes in the civilian world and how such changes affect the military world, we look at how the number of recruits with various alternate credentials changed as education policies changed.

The second part of this section (Data) focuses on the military world—specifically on the Navy and the Marine Corps. We link enlistees to policies that were in place when they attended high school and test the theory that education policies affect the "quality" of recruits. We cannot measure quality directly, but we observe a number of outcomes that give us an indication of how enlistees perform in the military. We refer to these outcomes as "military success."

Methodology

We discuss our methodology in some detail here and provide detailed information on regressions in the results section and appendix A.

The recruiting climate

We use Census data to see how changes in states' education policies affect *all* students (as opposed to how these policies affect only those students who eventually become military recruits).

Education certification

We first examine how GED policies, exit exams, and CU reforms have influenced the characteristics of potential and actual Navy/Marine Corps recruits. We are particularly interested in whether these policy changes have influenced the probability of being Tier 1 eligible and in their effect on the overall quality/preparation of young people.

Using our civilian (Census) data set, we can differentiate between people who drop out of high school and those who complete high school; unfortunately, we cannot distinguish between those who earn GEDs and those who earn high school degrees. Because the Census includes no standardized test scores, we cannot determine which people meet AFQT cutoffs. As a proxy for Tier 1 eligibility and a measure of general educational attainment, we examine the probability of completing high school (defined as graduating or earning a GED). We also look at the probability of attending college. Finally, we consider how education reforms affect both the likelihood that the person works at all and the amount each person earns. (We follow the methodology of [45] closely for much of this section, but we use data from the 2000 rather than the 1990 Census.)

For each outcome of interest, we estimate a logit model:[13]

$$Pr(Y_{ist} = 1) = F(\beta X_{ist} + \pi G_{st} + \psi E_{st} + \Phi C_{st} + \varpi STATE_{st} + \mu_s + \eta_t)$$

13. A logit model is appropriate since each outcome is discrete (either it occurred or it did not). The model's structural form is: ,

$$p = \frac{1}{1 + e^{-\beta x}}$$

where p is the probability that an outcome (e.g., earn a high school diploma) occurred and x includes our independent variables. The marginal effects are not linear, so we provide marginal effects of key variables in the results section. To model wages, we use a simple log-linear specification.

where:

- Y = one of the outcomes of potential recruits
- X = individual-level characteristics, such as gender and AFQT
- G = state-level GED policies
- E = a dummy variable that signifies whether a state, in any given year, had a test as a requirement for high school graduation
- C = a measure of Carnegie units required for graduation by each state in each year
- $STATE$ = a vector of state-level characteristics likely to influence educational attainment, such as per-pupil expenditures at public elementary and secondary schools and the unemployment rate

Except where noted, all of our models include state fixed effects to account for time invariant state-specific characteristics. In addition, we include year fixed effects to account for non-state-specific changes over time. For example, year fixed effects would account for changes over time in military recruiting policies that may influence the decision to earn a high school degree. Our state and year fixed effects are represented by μ and η, respectively.

Pool of GED-holders

We would like to know how changes in education policies influence the probability that a person will earn a GED or leave school completely rather than graduate. Substantial research exists on this question (see [45], [46], and [5]). However, most research focuses on one education policy (i.e., GED requirements or exit exam requirements) but does *not* control for other policies; also, most research uses data from earlier periods. For these reasons, we estimate a simple state-level model using data on the total number of GED credentials earned as well as existence of graduation exam and Carnegie-unit requirements to determine whether changes in education policy influenced the proportion of youths earning a GED. Specifically, we estimate a linear regression model of the form:

$$PROP_{st} = \lambda G_{st} + \partial C_{st} + \Lambda E_{st} + \xi STATE_{st} + \mu_s + \eta_t + \varepsilon_{st}$$

Our outcome of interest, PROP, is GEDs awarded to those age 19 or younger divided by total number of graduates from public high schools (we also test an alternate outcome, the ratio of GEDs awarded to those 19 or younger to the 15- to 19-year-old youth population and find similar results).[14] We estimate this model using 612 observations since our PROP variable varies only by year and state and we have complete data only for 1989 through 2000. G, C, E, and STATE represent the same variables as indicated above. Finally, we include state and year fixed effects, μ and η, respectively.

Military success

Descriptive statistics: holders of alternate credentials in the military

First, we explore whether civilian education reforms have had any influence on the credentials of enlisted Sailors and Marines. The enlistment process is an interaction between the Services and American youth; therefore, education reforms may have a large effect on the population that enlists, or they may have little or no effect. For example, an education policy that raises the quality of the top 10 percent of high school graduates (the high achievers) is likely to have very little discernible effect on the enlisted Sailors or Marines because the vast majority attends college immediately after leaving high school. Likewise, a policy that improves the quality of the bottom 10 percent of high school students may have little or no effect on the population of enlisted Sailors or Marines because many of these students would not qualify for enlistment. Therefore, we first look to

14. The number of public high school graduates does not capture the total number of graduates as somewhat fewer than 10 percent of students graduate from private high schools each year. However, private schools are not bound by end-of-year exams or Carnegie-unit requirements; therefore, our ratio of GEDs to high school diplomas is appropriate in this case.

see how the number and quality of enlisted Sailors and Marines with alternate credentials has changed over our sample period. Then, we use regression results to see whether such changes can be tied to state education policies. Specific measures of quality include:

- *AFQT scores:* AFQT scores are indicative of a recruit's ability to complete training successfully[15]
- *Waivers:* Waivers can be assigned for many different reasons, and Navy and Marine Corps assignment policies vary; we use an indicator of a "serious" waiver (for an act more serious than a minor misdemeanor, up to and including a felony).

Military outcomes of interest

We measure the relationship between education policies, education credentials, and the following indicators of military success:

- *Fleet success:* 12-month attrition, 36-month attrition.

Our models in this section are very similar to those discussed in the earlier section on civilian outcomes; we note exceptions in the text.

Data

Civilian data—the 2000 Census[16]

The Census is a cross-sectional dataset; it includes observations on all people at a specific point in time. We want to see how state-level education policies affect various outcomes for young adults. To do this, we merge data from the 2000 Census with state-level policy data (further discussion of our state-level data on education policies follows). Because we are concerned with students who have recently completed high school, we select only those age 20 to 28 as of April of 2000. We do not include younger students because to do so would likely conflate two of our outcome measures: high school completion

15. We use nationally normed percentile scores that are comparable across our sample period.

16. We use the Census 5% Public Use Micro-Sample (PUMS).

and postsecondary enrollment. By 20 years of age, most students have completed high school and the majority of those who will enroll in postsecondary institutions have done so.

Our primary dataset includes all who were born in 1 of the 50 states, or the District of Columbia, and who lived in the United States both at the time of the 2000 Census and 5 years before. (We delete those who lived in foreign countries, as well as those who lived in U.S. territories, in 1995 because the state-level education policy variables are likely to be unreflective of their educational experience.)[17] Table 1 shows some basic descriptive statistics from our main sample.

Table 1. Descriptive statistics—(weighted) sample from 2000 Census[a]

Variable	Mean	Standard dev	Minimum	Maximum
Age	23.9	2.63	20	28
Male	0.50	0.50	0	1
White	0.76	0.43	0	1
Black	0.15	0.35	0	1
Asian/PI	0.015	0.12	0	1
Am Ind/AN	0.011	0.11	0	1
Other	0.066	0.25	0	1
Hispanic	0.094	0.29	0	1
Completed high school	0.865	0.34	0	1
Attended college	0.582	0.49	0	1
In labor force	0.709	0.45	0	1
Average weekly earnings (~=0)[b]	$530.75	$1,100.01	$0.09	$369,453
Moved since birth	0.314	0.46	0	1

a. We use the 5% Public Use Micro-Sample (PUMS) of the 2000 Census. Our sample includes 1,305,668 observations, which weight to represent 27,704,732 people.

b. Some individuals reported implausibly high or low earnings; when we excluded those whose hourly earnings placed them in the top or bottom 1% of our sample, our results were unchanged. Without these individuals, the minimum weekly earning was $1.53 while the maximum was $8371.00.

17. See appendix A for more details on the formation of our sample, as well as the alternate samples we test.

Military data

Navy data

Our primary Navy data source is observations drawn from CNA's data-files. In particular, our sample includes non-prior-service accessions who entered the Navy between October 1992 and September 2004 (FY90–04) and who were no more than 21 years of age at accession. In most cases, the information comes from the PRIDE-based (Personalized Recruiting for Immediate and Delayed Entry) Enlisted Street-to-Fleet (ESTF) database. (In some cases, we instead drew information from CNA's Enlisted Master Files (EMR); these exceptions are noted in appendix A.)

Next, we use the enlistees' age at enlistment and the date of enlistment to match the person to state- and year-specific data on civilian education policy and economic conditions. Also, we keep track of all who enlisted in the Navy no later than January 2003, so we have 12-month attrition on each person. After selecting the data in this manner, we have 508,263 observations. Basic descriptive statistics on the dataset appear in table 2.

Table 2. Descriptive statistics, Navy sample

Variable	Mean	Standard dev	Minimum	Maximum
High school graduate	0.88	0.32	0	1
GED-holder	0.033	0.18	0	1
Dropout	0.024	0.15	0	1
Certificate-holder	0.0025	0.050	0	1
Any alternate credential	0.115	0.32	0	1
Male	0.83	0.38	0	1
Age	18.8	1.1	17	21
AFQT score	59.2	18.4	31	99
Any waiver	0.24	0.43	0	1
Serious waiver	0.09	0.29	0	1
12-month attrition	0.197	0.40	0	1
24-month attrition	0.281	0.45	0	1
36-month attrition	0.346	0.48	0	1

Marine Corps data

Our Marine Corps data consist of observations drawn from a parallel source, CNA's Marine Corps Street-to-Fleet File. The data on promotions come from the Marine Corps HMF quarterly snapshot files. As above, we selected data on all non-prior-service enlistees who entered the Marine Corps between FY90 and FY04, and we deleted observations with missing home-of-record or other key variables, as well as those who were over 21 at accession. In each case, we coded the variables so that they are consistent with the Navy data (see notes above and in appendix A). By selecting the data in this manner, we have 353,894 observations; table 3 shows basic descriptive statistics.

Table 3. Descriptive statistics, USMC sample

Variable	Mean	Standard dev	Minimum	Maximum
High school graduate	0.939	0.24	0	1
GED-holder	0.022	0.15	0	1
Dropout	0.0025	0.05	0	1
Certificate-holder	0.0097	0.98	0	1
Any alternate credential	0.059	0.24	0	1
Male	0.934	0.25	0	1
Age	18.6	1.00	17	21
AFQT score	58.6	17.8	21	99
Any waiver	0.317	0.47	0	1
Serious waiver	0.091	0.29	0	1
12-month attrition	0.127	0.33	0	1
24-month attrition	0.168	0.37	0	1
36-month attrition	0.208	0.41	0	1

State-level data

Our civilian data were formed by combining information from a number of different sources. In most cases, these data consist of state-year observations, so there is one observation for each state for each year between 1990 and 2003. We describe each separate data source briefly below. We discuss specific details of data selection and coding in appendix A.

GED data

For each state during each year, the GED data include indicators of the number of GED credentials awarded, the number awarded to those 19 or younger, the number of GED testing centers, the minimum age requirement, and the scores required for passing the test. This information is detailed in yearly publications produced by the General Education Development Testing Service [e.g., 21].

Carnegie-unit data

Our data on Carnegie units are derived from several sources. Our measure is the average number of Carnegie units (courses) required for graduation by each state in each year. In our regressions, we include variables indicating whether a state meets one of two standards: a "high" Carnegie-unit standard suggested by [45] or a "stringent" standard suggested in [38].[18]

Data on exam requirement to graduate high school

Our state- and year-level data on exit exams are derived from a number of sources. For states that have ever had an exit exam, we list the year the exam began and the data source in appendix A.

Other data

Along with the Service- and education-specific measures discussed earlier, we include several other state- and year-specific measures. For example, we include measures of economic well-being, such as the percentage living in poverty, the unemployment rate, and the average weekly wage of young workers.

We also include a measure of the per-pupil expenditures at public elementary and secondary schools. Finally, we include a measure of the size of the youth population in each state and year. It is an estimate of the total number age 15 to 19 inclusive for each state in each year. See appendix A for more specific details about sources and calculations.

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18. The "high" Carnegie-unit standard requires at least 3 CUs of English, 2 of Social Studies, and at least 1 each of Math and Science; the "stringent" standard requires at least 4 courses in English and at least 3 each of Math, Science, and Social Studies.

Results

Recruiting climate

Number facing key education policies

In this research, we focus on several key education policies: exit exams, Carnegie requirements, and GED requirements. Here, we first document how widespread these policies actually are. We begin by calculating how many people in our Census sample lived in states with each key policy in effect. Next, we make the same calculation, but for Navy and Marine Corps enlistees. It is possible that, due to recruiting patterns, different civilian opportunities, etc., enlistees are relatively likely, or relatively unlikely, to come from states with these policies. Figure 4 tabulates the proportion of civilians (using our Census sample), Navy enlistees, and Marine Corps enlistees who lived in states with each policy in effect during high school.[19]

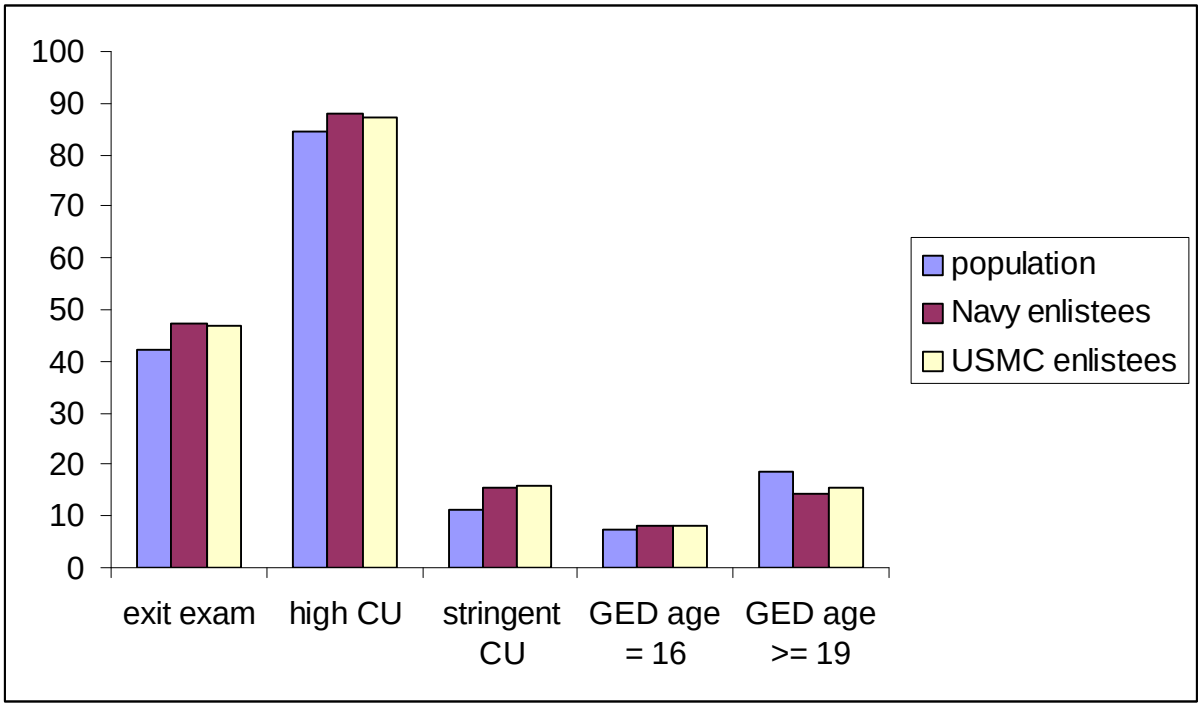
As shown in figure 4, most students face high CU requirements, but very few face stringent requirements. Most also live in states with a moderate GED age requirement (between 16 and 19); somewhat fewer than half had to pass an exit exam. Figure 4 also indicates that, in general, Servicemembers were slightly more likely than the population as a whole to face CU requirements and exit exams, but Servicemembers were more likely to face lower GED age requirements than the youth population.[20] Much of this difference occurs because of regional recruiting patterns. Those from southeastern states join the

19. To be specific, we tabulate the proportion for whom the policy was in effect during the year they were age 17.

20. The differences, while often small in size, are statistically significant. We note that most of the sample lived in states with GED age requirements of 17 or 18. During our sample period, no states had age requirements less than 16; one state had an age requirement of 18.5.

Services at relatively high rates, and southeastern states are quite likely to have exit exams, CU requirements, and low GED age restrictions. These differences, however, are relatively small; it is fair to say that, like the youth population, Servicemembers often come from states with exit exams and high CU requirements, as well as from states with moderate GED age requirements.

Figure 4. Prevalence of education policies[a]



a. High CU requirement: 3 units (courses) of English, 2 of Social Studies, 1 each of Math and Science. Stringent CU requirement: 4 units of English and 3 each of Math, Science, and Social Studies.

Education and labor market outcomes

We used our Census sample to test the effects of Carnegie-unit requirements, exit exams, and GED policies on several outcomes: high school completion, college attendance, employment, and earnings. Our results indicate that the outcomes of more stringent education policies are nuanced. Strengthening some policies may raise

educational attainment but have no effect on wages; strengthening others may actually lower attainment but increase wages. In each case, we present results from our preferred specification, and we footnote results from alternate specifications. We discuss each outcome in turn.[21] We use figures to present the marginal effects—the estimated size of the effect of changing a policy. In each case, we do *not* present results that are not statistically significant.[22] We include complete regression results in appendix B, tables 5 through 7.

High school completion

We show the marginal effects of policy changes in figure 5. Enacting "high" Carnegie-unit (CU) requirements generally had a negative effect on educational attainment. Our estimates indicate that otherwise identical students who had to achieve high CU requirements were about 2.3 percentage points less likely to complete high school with either a diploma or a GED. This is a change of 2.6 percent. Like high CU requirements, stringent CU requirements increase the probability that a student will drop out of high school, although the effect is smaller than for the (less stringent) high CU requirements. Finally, the presence of a graduation exam lowers the probability that a student will complete high school (with either a diploma or a GED) by about 0.5 percentage point. Raising the GED age requirement had a small, positive effect on high school completion.

College attendance

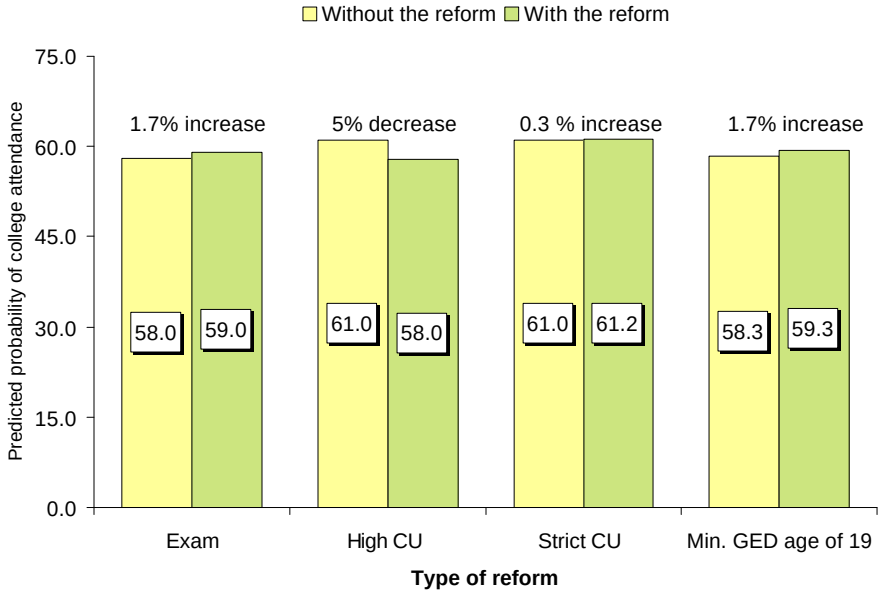
Students in states with high CU requirements were roughly 3.0 percentage points less likely to attend college than students in states without this requirement (see figure 6). In contrast, enacting stringent

21. All of the results in this section were virtually unchanged when we excluded Nebraska, the state with absolutely no CU requirements, and when we excluded people on active military duty, the disabled, and those who spoke English less than "very well."

22. We define "statistically significant" as significant at the 5-percent level (unless otherwise noted). This indicates that the probability of the result occurring by chance was no more than 5 percent; in most cases, the probability is far less. For t-statistics, see the complete regression results in appendix B, tables 5 through 7.

Figure 5. Effect of education policies on high school completion, young adults

Figure 6. Effect of education policies on college attendance, young adults

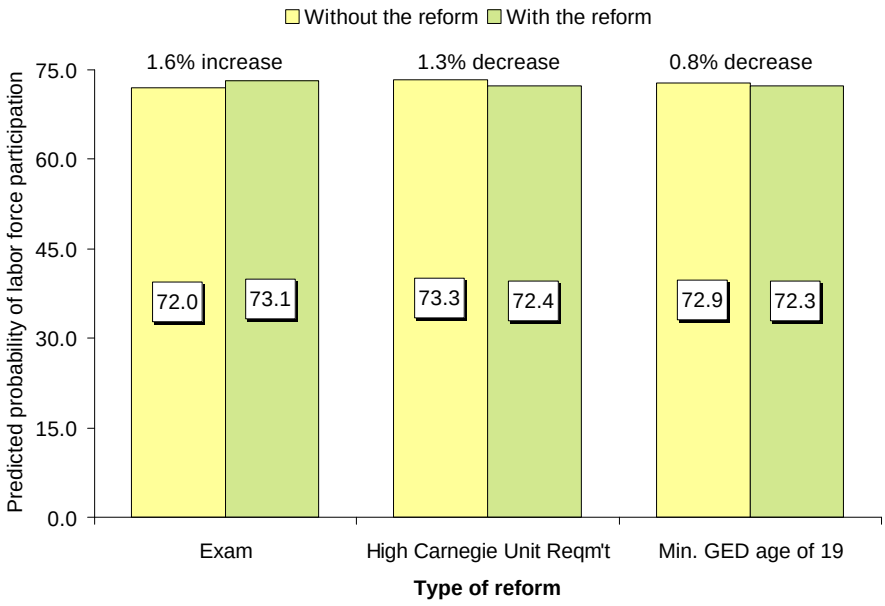


requirements slightly increase the probability of attending college. The presence of exit exams increased the probability that a person will attend college by about 1 percentage point; finally, raising the GED minimum age also increased the probability of college attendance by about 1 percentage point.

Labor force participation

Most policies had only small effects on the probability that a person worked for pay (or searched for work) during the previous year. Enacting high CU requirements, for example, had a negative effect; stringent requirements had a small and insignificant effect (see figure 7). Exit exams had a positive effect on the probability that a person will be employed (about 1 percentage point). Raising the minimum GED age to 19 actually decreased the probability that a person worked.

Figure 7. Effect of education policies on labor force participation, young adults



Average earnings

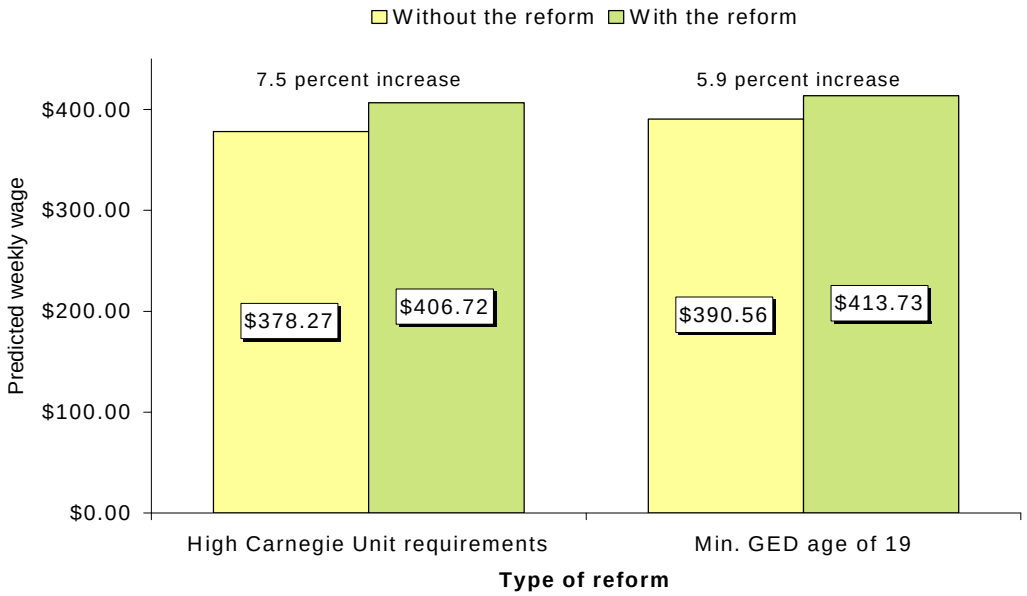
Regressions explaining weekly wages indicate that for those employed, being educated in a state with high CU requirements is associated with higher earnings. As figure 8 shows, enacting high CU requirements are associated with a substantial boost in earnings—in the 7-percent range, which works out to a difference of more than $28 per week for the average worker in our sample. In terms of wages, stringent CU requirements have no significant effect. Finally, graduation exams have very little effect on weekly earnings.[23] Raising the minimum GED age from 16 to 19 increased wages by about $23 per week.

Summary

Based on these findings, it is fair to say that several of the education policies we consider have both positive and negative impacts. Graduation exams are an important education policy because they are widely used today and their use will increase in the near future. These exams seem to have a sorting effect-- while their presence increases the probability that some people will leave school, they also increase the probability that a high school graduate will attend college, and they increase the probability that a person will work for pay or search for work (as opposed to leaving the labor force). Thus, exit exams seem to hurt students who have a high probability of dropping out of high school, but also have some positive effects. In general, our results are consistent with those of [41, 43, and 45], among others.

23. The coefficient is insignificant in our preferred specification, as well as in the equations that delete those with very high and very low earnings, and in the hourly specification. However, it is positive and significant in both of the alternate datasets, on the order of 1 percent. Also note that, in the specification excluding active-duty military, those with a disability, and those who do not speak English well, the results differed: for this sample, graduation exams had a positive effect, raising wages approximately 7 percent, but high CU requirements had a negative effect (about 8 percent). This is consistent with a sorting effect and suggests that results may differ between the military and civilian populations.

Figure 8. Effect of education policies on earnings, young adults



Carnegie-unit requirements also seem to have both negative and positive effects. Both high and stringent requirements are associated with lower levels of high school completion; high CU requirements also lower college attendance, and labor force participation. For those who do have jobs, however, high CU requirements are associated with substantially higher wages. Our results are consistent with the finding of [45] that CU requirements actually serve to *lower* student effort, but they may well increase effort or productivity in the labor market.

In contrast with other policies discussed in this section, the effects of raising the GED minimum age are more straightforward. First, the minimum age requirement had a small positive effect on high school completion. This may seem surprising since we count GED-holders as completing high school in our data. It indicates that lower age requirements draw students out of high school; some of these students presumably complete GEDs but others certainly do not. The same increase in the age requirement also has a positive effect on the probability of college attendance, as well as on wage levels (but a

small negative effect on labor force participation).[24] Thus, raising the GED minimum age has generally positive effects on all students.

As indicated above, we also defined two alternate Census samples in which we assigned people to a home state in a slightly different manner, as well as a more restrictive dataset excluding those with a disability, those in the military, and those who do not speak English well. When we examine the regressions using our alternate samples, we find that, in general, the results do not differ from the preferred specification in a substantive manner (see appendix A for more discussion of our alternate samples).

In many cases, our results agree with those of [45], who performed a similar analysis using data from the 1990 Census. Like [45], we find a negative effect of CU requirements on high school completion, although our effect is somewhat larger than his. While [45] finds positive effects of both CU requirements and exams on employment (but not wages), we find effects on wages but a negative effect on employment. In both cases, however, the story is mixed—especially in the case of CU requirements (which [45] finds in a separate analysis actually *decrease* some students' level of effort). Differences between our results and those of [45] may stem from today's more difficult exit exams, or from our inclusion of GED variables in our regressions.

The results in this section indicate that the education reforms launched over the last 15 years have had mixed effects on the population as a whole; these reforms are likely to have mixed effects for the Services as well. First, as states increase CU requirements and continue to adopt exit exams, it is clear that some students are less likely to complete high school (and thus less likely to qualify with a Tier 1 credential). Those students who were educated in states with stronger requirements, however, are also likely to earn more. While this may imply that the Navy and Marine Corps will need better recruiting

24. States with lower-quality schools tend to have easier requirements for passing GED; in our specification without state-level fixed effects, states with more centers per 1,000 youth and/or lower passing scores had *lower* high school completion. While we would predict that high school completion will increase as states add centers and lower passing criteria, these variables are correlated with overall state education quality.

incentives to attract these students, it also suggests that these people are more productive than they were before the reforms (otherwise, there is little reason for employers to increase their pay). This is a potential plus for the Services.

As discussed earlier, the Census data do not allow us to distinguish between those with GEDs and those with high school diplomas, yet this distinction is vital for the Armed Forces. In the next section, therefore, we use data on the number and age of people who received GED credentials each year to determine how these education policies affect the breakdown of traditional graduates versus GED-holders.

Alternate-credential-holders

Education policies and the number of GED-holders

In this section, we use civilian data to explain the proportion of young people (age 19 or younger) in a given state and year who earn GEDs. Our data indicate that, in any single year, the proportion of all youth who earn GEDs is quite small (on the order of 1 percent). However, we believe that the ratio of young new GED-holders to new high school diploma graduates provides a more accurate measure of the extent to which young people earn GEDs rather than traditional high school diplomas. Across states, this ratio averages roughly 8 (for every 100 high school diplomas issued, 8 GEDs are issued) but varies substantially. In some states, the ratio is less than 2; in others, it is near 20. Our descriptive statistics showed how this ratio has increased over time (refer to figure 1).

Our regression results indicate that the proportion holding GEDs has increased over time, even after correcting for the state-level variables discussed earlier. (Full results appear in appendix B, table 8.) Also, there is substantial variation in the proportion who hold GEDs across states even while holding constant state-level variables. However, some education policy variables do help to explain GED recipiency.

In particular, more young people earn GEDs in states with higher Carnegie-unit requirements. Our results indicate that, in a state with high CU requirements, the ratio of GEDs to diplomas is about 8.3; in contrast, it is roughly 6.7 in states with lesser requirements. In

contrast, our regression results suggest that increasing requirements substantially from the high level to the stringent level has a small and insignificant effect on the proportion of GEDs.

Passing requirements for the GED also affect the proportion who earn the credential. As an example, we consider two (hypothetical) states: the first has relatively lax passing requirements; the average score required on the seven subtests is 40, while the minimum score is 35. Like some states, we allow this lax state to have an either/or passing requirement: people must either score an average of 40 on the seven subtests or a minimum of 35 on each test. We contrast these requirements with those of a stricter state—one that requires both an average score of 45 *and* a minimum score of 45. Our regression results indicate that if the two states are identical in other measurable ways, the state with the strict passing standard will have a GED ratio of 8.0, while the lax state will have a ratio of 10.2. Thus, passing standards appear to be quite important in determining how many young people earn GED credentials. In contrast, the number of GED testing centers seems to make less difference; in fact, the number of centers per thousands of youth has a negative (but statistically insignificant) effect on the proportion who earn GEDs. Finally, there is little evidence that changing the minimum age requirement from 16 to 18 or 19 affects the proportion earning GEDs. (Most states have minimum age requirements of 17 or 18.)[25] However, requiring that students pass an exam to graduate has an insignificant effect on the proportion who earn GEDs.[26]

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25. Our estimates imply that, if all states increased their minimum age requirements to 21 years, the GED ratio would fall by nearly 80 percent. We urge caution in using this marginal effect because the same estimates imply that other ages between 16 and 21 make little difference. Also, we suspect that the state's policy for exempting students from the minimum age requirement (which is usually carried out on a case-by-case basis) is important—but very difficult to quantify.

26. Consistent with our Census results, these regression results predict that exit exams increase the proportion with GEDs, but the coefficient is not statistically significant so we cannot reject the possibility that the true effect is zero. Our results in this section use a far smaller sample than those in the previous section. In general, larger sample sizes increase the precision of estimates and make statistical significance more likely.

Taken as a group, our Census results suggest that the most common education reforms are likely to decrease the size of the potential (Tier 1) recruiting pool. We cannot estimate, however, how large the effects on the Navy and Marine Corps are likely to be. Turning to our military data, we look at how education reforms have affected the proportion holding alternate credentials and then at how education reforms have affected the performance of Navy and Marine Corps recruits over this same period.

Alternate-credential-holders in the Navy

First, we measure the number and proportion of recruits with alternate credentials in the Navy during our sample period. We define an alternate credential as any credential *other than* a traditional high school diploma. Thus, GEDs are alternate credentials, as are home school diplomas and adult education certificates; we also include those with no credential ("dropouts") in this definition. We note that some alternate credentials are considered Tier 1, while others are considered Tier 2 or 3.

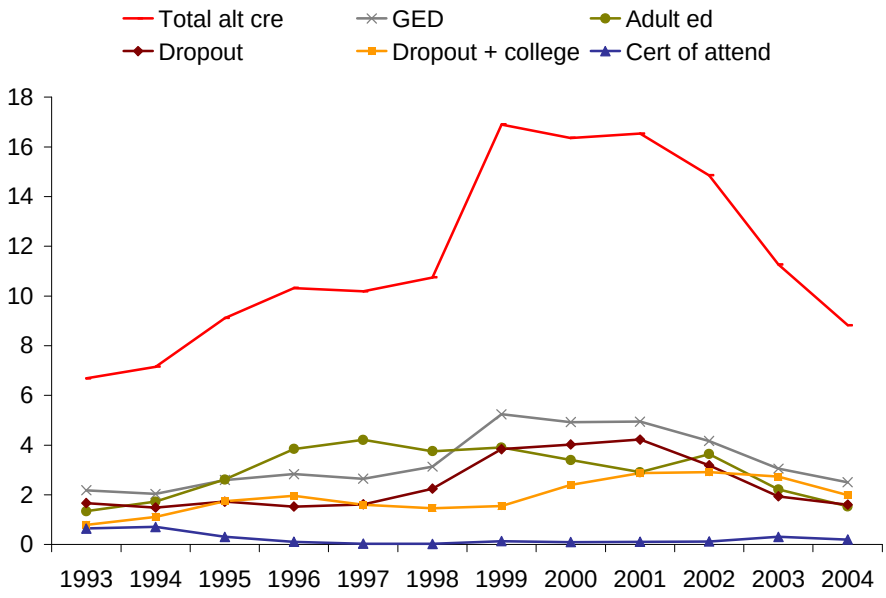
As shown in figure 9, the proportion of new enlistees with alternate credentials generally increased over the sample period, peaking in 1999. (We graph the *proportion* of alternate-credential-holders, though a graph of the *number* holding each credential is very similar in appearance.) Figure 9 also reveals that, although there was an increase in the proportion of enlistees with GEDs, the much sharper increase occurred for those holding two other alternate credentials:

- Those who attended adult education programs
- Those who dropped out of high school but then earned some credits at a college (most often a 2-year college).[27]

Unlike a GED, these two credentials are considered Tier 1 for enlistment purposes, so the number of enlistees with these credentials are not limited in any practical purposes.

27. There was a notable concentration of Navy enlistees with these alternate credentials in a few states; see appendix A for more details.

Figure 9. Proportion of Navy accessions with alternate credentials over time



In some years, more than 15 percent of Navy enlistees held one of the alternate credentials described here. But despite the increased use of exit exams, the proportion of recruits with certificates of attendance / completion did *not* increase over our sample period. There are at least two potential reasons for this. First, certificates of attendance / completion closely resemble high school diplomas; therefore, it is possible that many who enter with such certificates are mistakenly considered graduates (consistent with the findings of [33]). Second, because certificates are considered Tier 2 credentials, it is possible that certificate-holders complete an adult education program or attain some college credits before enlistment. Of course, it is also possible that certificate-holders are discouraged from enlistment because they do not hold a Tier 1 credential.

Next, we use regression analysis to explore how changes in education policy, as well as other factors, are related to any changes in the proportion of alternate-credential-holders. Our regressions use state-level data over time. We find that neither graduation exams nor CU requirements explain the growth of alternate-credential-holders in

the Navy, and GED policy variables have little effect.[28] The ratio of young GEDs to the youth population explains some of the growth in alternate-credential-holders; this variable even explains some of the growth in those holding adult education degrees (perhaps because of occasional overlap between the programs). In summary, the proportion of alternate-credential-holders entering the Navy increased over this time period, but the increase was unrelated to education policy changes or to changes in many other variables. However, the increase was related to what might be termed the "recruiting climate." In particular, FY99 and FY00 were difficult recruiting years for several Services. As indicated by the year fixed effects in table 9 of appendix B, the proportion of alternate credential-holders was sharply higher during those 2 years than during earlier years. (Complete regression results are in appendix B, table 9.)

Alternate-credential-holders in the Marine Corps

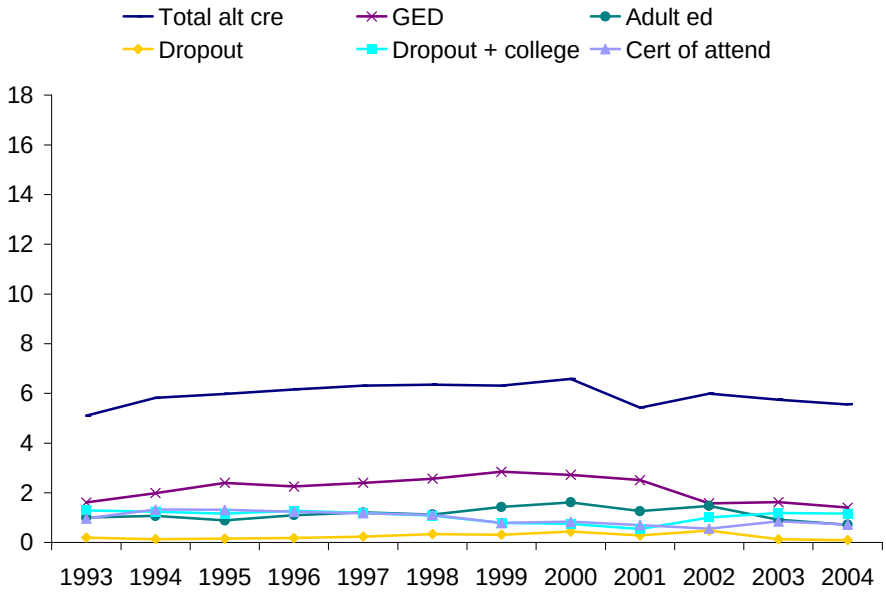
Next, we show the number and proportion of alternate-credential-holders in the Marine Corps over this period. Figure 10 shows that the story is different for the Marines. The proportion of new Marines holding GEDs did *not* increase in the sharp manner evident among Navy accessions. The number of new accessions holding other alternate credentials did not increase over the period either, and the proportion holding any of the alternate credentials shown here never reached 7 percent.

As we did using Navy data, we use regression analysis to explore how education policy changes are related to any changes in the proportion of alternate-credential-holders. Again, we use state-year observations on Marine Corps accessions. Our results are similar to those for Navy recruits. In general, the proportion of Marine recruits holding alternate credentials is *not* related to the education policies examined here. Although there is a slightly higher proportion of Marines with GEDs in states with more young GEDs, there are *not* more Marines

28. We also run regressions separately by alternate credential. There is little difference across these specifications. Exam requirements do not have a significant effect, even on the proportion holding certificates of attendance / completion.

with alternate credentials in total. This suggests that the Marines substitute among enlistees with various alternate credentials, but do not increase the total proportion holding alternate credentials, based on GED policies. The proportion with alternate credentials *is* related to the unemployment rate; as states' unemployment rates increase, the proportion with alternate credentials falls (the result, though statistically significant, is small).[29] Table 12 in appendix b has complete regression results.

Figure 10. Proportion of USMC accessions with alternate credentials over time



Next, we look at the performance of new Sailors and Marines, and test the explanatory power of education reforms, as well as other factors, on these new accessions' performance.

29. We do see more recruits with GEDs, and fewer dropouts, in states with high CU requirements, but again the total proportion of alternate-credential-holders does not change and the effects are quite small.

Military success

Impact of education policy—AFQT

Our Census results indicate that educational policies influence the educational attainment and labor market outcomes of young people. However, so far we see little evidence that these policies affect the number of military recruits with alternate credentials. In this subsection, we test the idea that educational policies may influence the quality of recruits through AFQT scores, incidence of waivers, or attrition.

We use regression analysis to explain the AFQT scores of individual recruits, holding constant personal characteristics, economic factors, and educational policies. (Here and throughout the results section, we use fixed effects models to isolate the outcomes from changes in policies.) Because our Census results indicate that some policies may have different effects on high school graduates and nongraduates, we estimate separate models for these two groups.

Navy

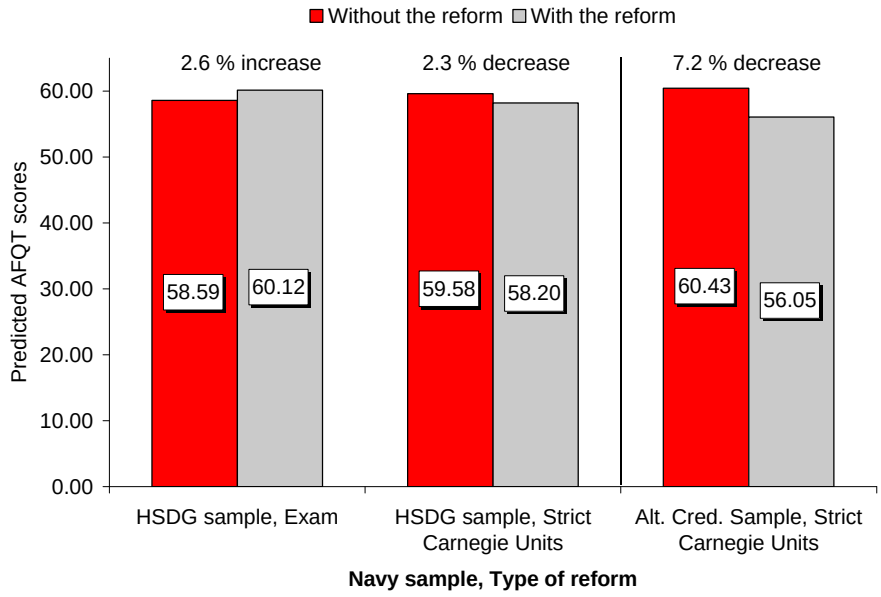
Our results indicate that education policies do have some effect on AFQT scores of Navy recruits. As figure 11 shows, recruits who come from states that enact exit exams have higher AFQT scores than otherwise similar recruits; in contrast, those who come from states that enact stringent CU requirements have lower scores. (Higher AFQT scores from recruits in exam states are due to increases in the scores of HSDGs; scores of those with alternate credentials do not vary based on exam policy.) Finally, we note that increases in per-pupil spending have a small but positive and significant impact on recruits' AFQT scores. (See table 10 in appendix B for complete results.)[30]

As noted above, some states are more likely than others to enact reforms. In fact, exit exams in particular were enacted first in states

30. In our preferred specification, we do not control for education credential because we are interested in how education policies change the average test score of all recruits, regardless of credential (which is also altered by education policies). This is a "reduced form" equation. When we run a similar specification controlling for education credential, however, the effects tend to be somewhat smaller but substantively similar.

with relatively weak education systems. Because of the fixed-effect technique we use, our models hold constant state-level effects of all sorts. In other words, our results indicate that *enacting* an exit exam raises AFQT scores, rather than that recruits from states with exit exams have (and have always had) higher scores.

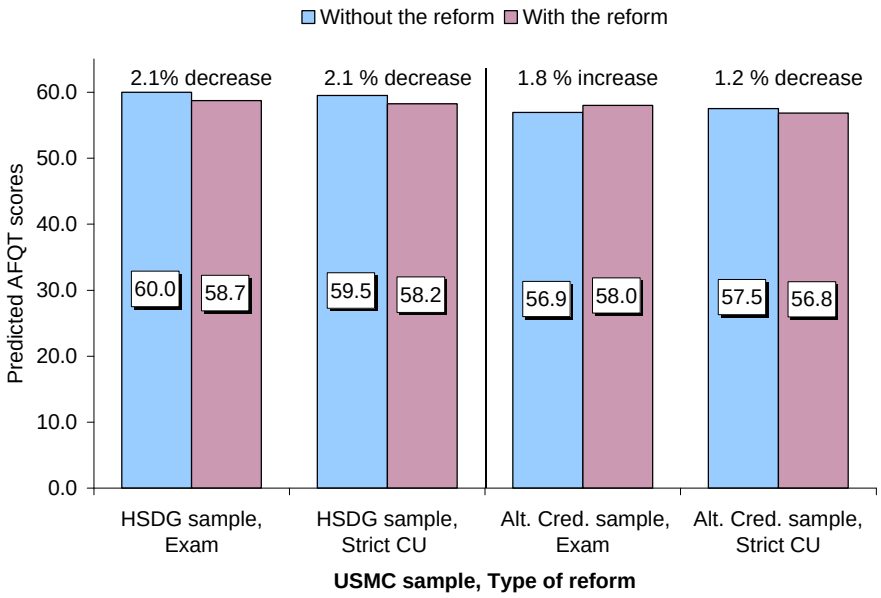
Figure 11. Education policies and AFQT scores, Navy enlistees



Marines

In contrast to our Navy results, Marines with high school diplomas who come from states enacting exit exams have slightly lower AFQT scores than similar Marines from other states, while those with alternate credentials from states enacting exit exams have slightly higher AFQT scores, as shown in figure 12. As in the case of the Navy, we find that enlistees from states with strict CU requirements have lower AFQT scores and that this effect is driven by both high school diploma graduates and alternate-credential-holders. (See table 13 in appendix B for complete results.)

Figure 12. Education policies and serious waivers, Marine enlistees



Though AFQT/ASVAB scores are viewed as a measure of trainability, they are not the only potential measure of quality. Next, we examine a different measure—the incidence of waivers.

Waivers

Recruits receive waivers for many different reasons. Some of these reasons, such as past legal troubles, are likely good indicators of the recruit's probability of adapting to life in the Services. In the case of the Navy, the existence of most waivers has been shown to be a good predictor of attrition.[31] In this subsection, we use regression models to test the extent to which education policies affect the likelihood that a recruit enters the Navy or Marine Corps with a "serious" waiver.[32] We present figures for "serious waiver"; we note briefly how

31. See, for example, [32].

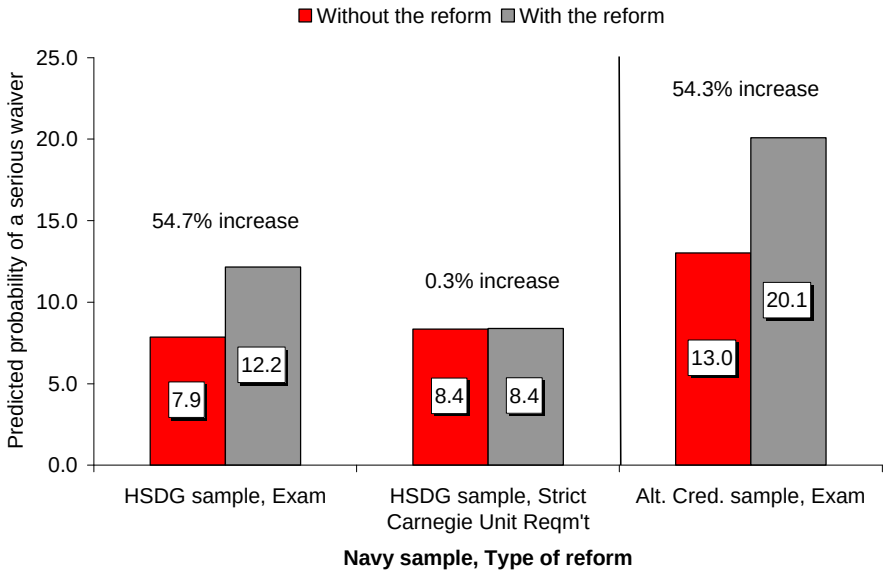
32. We define a "serious" waiver as one due to one of the following: a non-trivial traffic violation, a serious misdemeanor, or a felony.

the results for the "any waiver" model differ. The specification of our model is identical to that used in the section on AFQT scores, except that we omit "waiver" from the list of independent variables; complete regression results appear in appendix B, tables 11 and 14.

Navy

Education policy changes have a smaller effect on the number of serious waivers than on the total number of waivers. In particular, exit exams increase the incidence of serious waivers (and of any waivers). This is true for those with high school diplomas and those with alternate credentials (see figure 13). Most other policies have no significant effect on serious waivers, though stringent CU standards seem to decrease the level of waivers among high school graduates; the effect, however, is very small.[33] GED policies have small, generally insignificant effects on the incidence of waivers.

Figure 13. Education policies and serious waivers, Navy enlistees

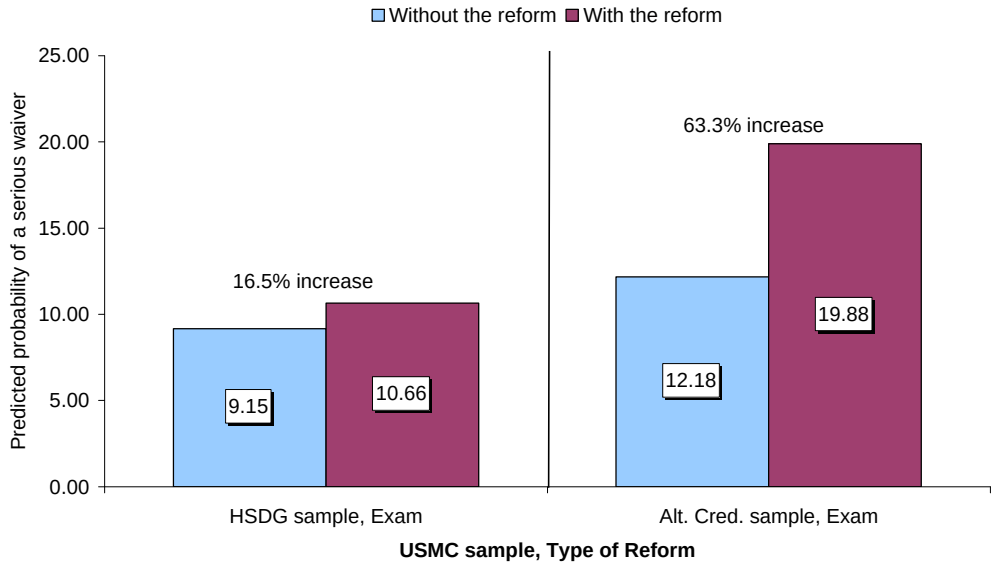


33. Stringent CU standards also decrease the total number of waivers among high school graduates; high CU standards, in contrast, are predicted to increase the total number of waivers among all Sailors.

Marines

Among Marines, the incidence of waivers is higher than among Navy enlistees. The incidence of serious waivers, however, is equal across the two Services (refer to tables 2 and 3). As in the case of the Navy, exit exams are associated with more serious waivers (see figure 14).[34] CU requirements have no effect on the number of serious waivers; GED policies have no significant effect on the incidence of waivers among the Marines.

Figure 14. Education policies and serious waivers, Marine enlistees



Attrition

The cost of replacing enlistees who fail to complete an initial term is quite high—estimated at roughly $35,000 nearly a decade ago [47, 48]. Over time, enlistees with traditional high school diplomas have

34. Exit exams increase the total number of waivers, but only among alternate-credential-holders; higher CU requirements, however, are associated with fewer total waivers among Marines.

exhibited substantially lower attrition than enlistees with alternate credentials. For this reason, both the Navy and the Marine Corps prefer to recruit people with high school diplomas. However, other characteristics are also associated with attrition. In this research, we test the idea that state educational policies may have an influence on the overall recruiting climate, and on the quality of enlistees. Our results to this point suggest that some state policies do, indeed, affect both the quantity and the quality of potential enlistees. In this subsection, we test the idea that education policies may affect attrition rates as well. Our models parallel those used in the earlier sections.[35]

Navy

First, we find that in many cases the education policies examined have little or no substantive effect on either 12- or 36-month attrition. This remains true when we exclude specific education credentials from our model, and when we exclude indications of waivers and AFQT score.[36] Among high school diploma graduates, high CU requirements are associated with somewhat lower attrition, but the result is only marginally significant.

Marines

Our results indicate that education policies have virtually no effect on either 12- or 36-month attrition. The only exception is an indication that stringent CU requirements are associated with higher attrition for those with alternate credentials. As above, we tested an alternate, "reduced form" specification but still found no significant effect. In

35. Our attrition models also include months spent in the Delayed Entry Program (DEP), as well as indicators of any waiver, a serious waiver, the person's education credential, and his or her AFQT score.

36. We exclude these variables to estimate a "reduced form" model. We know that AFQT, education credentials, and waivers affect attrition, but our earlier results indicated that education policies may work through these avenues. For example, enlistees from a state with a given policy may perform as well as other *similar* enlistees; however, if the policy is associated with more waivers, attrition may be higher. Such an effect is really caused by the policy, but it acts through waivers. By excluding these variables, we are able to estimate the total effect of education policies on attrition.

general, education policy changes over the previous 10 to 12 years seem to have had little influence on Marine Corps attrition rates.

Our results indicate a high level of attrition among those holding certificates of attendance/completion, both in the Navy and in the Marine Corps.[37] This is surprising given the strong relationship between "seat time" and military performance; credential-holders have completed all coursework and have spent as much time in school as graduates. This finding also contrasts with earlier research findings that those with certificates performed nearly as well as high school diploma graduates [33]. However, the earlier research used a relatively limited sample of enlistees from the late 1990s. At the same time, there has been no substantial growth in the proportion of enlistees with certificates in either the Navy or the Marine Corps, despite increasingly widespread exit exam requirements (refer to figures 9 and 10)+. It is possible that at this point, most students eventually pass the exit exams, or that those who do not fail to qualify for entry into the Services based on their AFQT scores. Finally, certificate-holders may be misclassified because their credential often is nearly identical to a high school diploma, or these people may attain an adult education credential or some college credits and therefore enlist with a Tier 1 credential. There is no nationally representative database that indicates the number who receive certificates in lieu of diplomas, so it is quite difficult to determine the size of this population.

37. Regression-adjusted 36-month attrition rates for those holding certificates in the Navy are 12 percentage points higher than rates for similar high school diploma graduates; in the Marine Corps, those holding certificates have attrition rates about 6 percentage points higher than similar high school diploma graduates.

Conclusion and recommendations

Our Census results have some broad implications for DoD. There is evidence that, as states strengthen graduation requirements (either by raising Carnegie-unit requirements or enacting exit exams), more students drop out of high school. This has two effects: (1) the pool of potential applicants with high school diplomas shrinks and (2) the quality of those who complete high school increases (as indicated by increased college attendance, employment, and earnings). Effects differed across the policies we examined; however, both exit exams and high CU requirements demonstrate these types of mixed (or "sorting") effects.

Exit exams are already in place in a number of states, and half of all states will require an exit exam by 2008. (The states enacting exit exams have relatively large populations, which means that the large majority of students will be required to pass such an exam to graduate in the near future.) High CU requirements are already common; it is likely that states will continue to increase these requirements, if only to help prepare students to pass exit exams. Therefore, graduation requirements clearly are increasing and the trend is likely to continue. At the same time, GED requirements are becoming increasingly important as some students leave school in the face of tougher graduation requirements. The recent growth in the number of young GED-holders poses a problem for DoD because a GED is a Tier 2 credential. Relatively lax GED requirements increase the proportion of people who earn GEDs (rather than high school diplomas); high CU requirements have the same effect. So, it seems likely that DoD will soon face a smaller, but somewhat higher-quality, pool of high school graduates.[38]

38. To be precise, the size of the pool will be smaller than it would have been without these education policy changes. The total size of the youth population has been increasing over the last decade or so and is predicted to continue growing over the next few years [49].

In many ways, recent changes in education policies have had only muted effects on the Navy and the Marine Corps to date. For example, our results indicate that changes in education policies have had little or no effect on attrition rates in the Navy or the Marine Corps. For good reason, attrition remains an important measure of how well recruits are performing. There are other measures of quality, however, and it is primarily in these other measures that one can see the effects of education policies.

In some cases, Navy quality has improved due to education policy changes; for example, Sailors who completed high school in states with exit exams have higher AFQT scores than similar Sailors from other states. However, exit exams in particular are associated with a sharp increase in the proportion of Sailors who enter the Services with serious waivers.

In the case of the Marine Corps, the story is somewhat different. First, the proportion holding alternate credentials remained much steadier, and generally lower, than in the Navy during our sample period. However, just as in the Navy, changes in education policy are associated with changes in measures of Marines' quality. Exit exams and CU policies lower AFQT scores of Marines with high school diplomas. Like the Navy, the Marine Corps admits substantially more recruits who require a "serious" waiver in states with exit exams. Therefore, while the Marine Corps does not have a high (or growing) proportion of recruits with alternate credentials, there are indications that widespread education reforms (especially exit exams) may have a negative effect on some aspects of Marine quality.

These results suggest that rather than recruit more Sailors and Marines with GEDs in the face of stricter high school graduation requirements, these Services have recruited more Sailors and Marines who require waivers. This may be a perfectly reasonable response to a tighter recruiting market since none of our models established a link between the increase in exit exams and attrition. However, we do not test other measures of performance; to the extent that those with waivers ("serious" waivers in particular) perform more poorly than other Sailors or Marines in their jobs, the costs of increased graduation requirements may be substantial.

In the case of the Navy, the proportion of newly enlisted Sailors with alternate credentials has grown dramatically over the last 12 years; this proportion has also decreased over the last 3 to 4 years. To date, the changes in the proportion of Sailors with alternate credentials are *not* related to specific changes in state-level education policies. The changes also are not related to other economic variables (such as the overall unemployment rate or the average weekly earnings of young workers). However, the proportion with alternate credentials was largest during the tough recruiting years of FY98 through FY00.

The overall increase in new Sailors with adult education certificates or some hours of college credit (but no high school diploma) is potentially troubling. Sailors with these credentials historically have exhibited very high levels of attrition, on a par with those holding Tier 2/3 credentials. Also, these alternate credentials are much less standardized than the well-established GED. While GED-holders do not perform on a par with high school graduates, all GED-holders do meet a minimum standard (both because of the little variation across states' passing standards and because of the increased AFQT requirement for these recruits). This is unlikely to be the case with those who enter the Navy with adult education or college credit in place of a high school diploma. Instead, it is likely that their programs of study will vary widely. Because these credentials are classified as Tier 1, their holders may enter the Services with lower AFQT scores than those who hold Tier 2/3 credentials. In particular, the sharp increase in the proportion of new Sailors holding these credentials in certain states is worrisome. Finally, it is very difficult to estimate the size of either the population who complete adult education programs or the population who leave high school and earn some college credit. (The questions in most large, national surveys—such as the Current Population Survey, or even the Census—would fail to distinguish between these groups and high school diploma graduates). Therefore, it is impossible to estimate the number of potential recruits with alternate Tier 1 credentials or to even speculate on the Services' ability to continue to maintain a high proportion of Tier 1 recruits using these groups should the number of young GED-holders continue to increase.

While both Services seem to recruit different people depending on state education policies, the differences in the Marine Corps and the Navy responses to changes in education policy suggest that the two organizations recruit from somewhat different pools. This implies that (a) continuing to model the two organizations separately is appropriate and (b) our findings cannot be generalized to the Army or the Air Force.

In theory, strengthening high school graduation requirements could increase the quality of Tier 2/3 enlistees. Our Census results indicate that, indeed, in states with exit exams or higher Carnegie-unit requirements, fewer people complete high school; higher CU requirements also directly increase the proportion who earn GEDs. Thus, some people who would be high school graduates under less stringent standards now leave school without graduating. These people could perform quite well in the Services. However, this research uncovers no evidence that the quality of enlistees holding alternate credentials is higher in states with higher standards. The most likely reason for this is that Tier 2/3 people are recruited on a walk-in basis early in the fiscal year. Because DoD limits the proportion of recruits with Tier 2/3 credentials, the Services are "demand-constrained"; there are more eligibles available than the Services require. Without dramatic changes to the recruiting system, the quality of Tier 2/3 people is unlikely to change appreciably even in the face of much higher graduation standards.

To place our findings in context, both attrition and the overall incidence of waivers in the Navy have fallen substantially over the last 4 years [50]. Therefore, our findings imply that, within the context of falling levels of waivers and attrition, Sailors from states with stricter graduation standards are more likely than other Sailors to require waivers. It is unclear how our results would differ if our sample included a time period of dramatically increasing attrition or waiver assignment. Also, as states continue to strengthen graduation requirements the full impacts of these education policies could well be larger than what we have seen so far.

In summary, we find little evidence that the recruiting of either the Navy or the Marine Corps has been *directly* harmed by the increasing

proportion of young GED-holders, at least when one looks at the breakdown of recruits by tier. We find attrition rates have changed very little in response to education reforms. Moreover, there is little evidence that today's high school diploma graduates are of dramatically lower (or higher) quality than those during past years. However, in the case of the Navy, we find that the Navy today recruits both *fewer* and *a smaller proportion* of traditional high school diploma graduates than in the past. The Navy has not substantially increased the number or proportion of recruits with GEDs (perhaps partly due to tier restrictions). However, today's Navy is made up of far more enlistees with alternate credentials than in the past. Also, both the Navy and the Marine Corps access more Servicemembers who require a serious waiver in states with exit exams. As more states enact and strengthen exit exams, we expect this trend to continue.

Given our findings, we make some recommendations to the Services:

- DoD and the individual Services should support increasing the stringency of GED passing requirements.
- The Navy should closely examine recruiting practices in states that exhibit very large proportions of recruits with Tier 1 alternate credentials.
- DoD needs to know the size of the pool of potential recruits holding alternate credentials. To this end, DoD should support inclusion of questions to determine a person's exact education credential (versus years of schooling completed) on one or more national surveys. This information would allow planners to differentiate between traditional high school diploma graduates, GED-holders, and those who completed alternate programs, such as adult education, occupational/vocational, or some college credit in lieu of a high school diploma.
- The Services should revisit the relationship between waivers, especially "serious" waivers, and attrition.

Finally, states will continue to use and strengthen exit exams in the near future; Carnegie requirements are likely to increase as well. The effects of these trends are mixed; they are likely to increase some aspects of quality while harming others.

Appendix A: Details about datasets

Census data

As stated in the text, we use data collected in the 2000 Census to test the effects of education reform on civilian outcomes. We make use of the 5-percent PUMS sample; we use weights so that our results are reflective of the U.S. population in 2000. Our outcomes include high school completion, college attendance, participation in the labor force, and average weekly earnings.

One key aspect of our research is the linking of individual Census outcomes to state-level education policy variables. To do so, we must determine where each person in our dataset was educated. The Census does not provide this exact information, but it does indicate where each person was born, lives now, and lived 5 years earlier.

As stated in the main text, our primary dataset includes all who were born in 1 of the 50 states or the District of Columbia, and who lived in the United States both at the time of the Census and 5 years before (we delete those who lived in foreign countries, as well as those who lived in U.S. territories, in 1995 because the state-level education policy variables are likely to be unreflective of their educational experience). We also test a more restrictive dataset, which excludes all people who reported having a disability, those who reported speaking a foreign language *and* reported not speaking English "very well," and those who were on active duty in the military at the time of the Census.

We use information on where people live and where they lived in the past to assign state-level education variables to each person. In our primary dataset, we assign education variables (such as per-pupil spending and GED testing policies) based on the state where each person was *born*. In selecting this methodology, we follow [45], which makes the following argument. Although this method may produce

biased results, the results are biased downward, which means that the estimates provide a lower bound of the true effects. We also experiment with two other datasets using slightly different matching methodologies. First, we assign state education variables based on the state in which the person lived 5 years earlier. Second, we test a more detailed methodology:

- We assign all those who currently live in their birth state to the current state.
- We assign to state A all who were born in state A and lived there 5 years earlier but now live in state B.
- We assign to state B all who were born in state A but now live in state B and resided in state B 5 years earlier.
- We delete "frequent movers"—those who were born in state A, lived in state B 5 years earlier, and now reside in state C.

In general, these alternate samples produce results quite similar to those we find with our primary dataset. We report results from these alternate datasets in footnotes in the Results section.

Navy data

Our goal is to test the impact of state policies on Navy performance, so we deleted observations on people who had home states of record outside the 50 United States and the District of Columbia (e.g., we deleted all who listed Puerto Rico as their home state because we lack information on schools in Puerto Rico). We also deleted observations with no home state listed (we used the EMR home state and substituted the PRIDE home state when the EMR home state was missing). We deleted observations with other key missing variables: specifically, those missing information on sex, age, or AFQT score. We deleted observations in which the person was 22 years old or older at accession. Many of these people are likely to have moved between high school and enlistment, so their home state may not be the state in which they were educated; also, many have substantial postsecondary education and work experience. We coded dummy variables to indicate marital status, the presence of children, and race/ethnicity.

Between FY90 and FY93, the marital status of many people is listed as "Unknown." We coded them as "Single"; after doing so, between 4 and 5 percent of our sample is listed as married in each fiscal year. We use a dummy variable to indicate the presence of one or more children. We coded race/ethnicity into the following (exclusive) categories: White, Black, Hispanic and Other/Unknown. The Navy data allow for slightly richer coding than these categories, but the Marine Corps data do not. For consistency, we followed this simplified coding scheme.

We used EMR information as the source of the person's education credential because our analysis, and conversations with those who work in Navy recruiting, indicate that this field is likely to be more accurate than the education field in the PRIDE database.

We matched individuals to state-level data indicating education policy the year each person was 17, with one exception; in the case of those who entered the Navy at age 17, we match to the (likely) last year in high school—the previous year. The vast majority of these people are high school graduates. It is likely that they skipped a grade at some point and were able to complete high school early.

Finally, as noted in the main text, there was a considerable concentration of recruits with two of the alternate credentials in certain states. First, those with adult education certificates were concentrated in a few states; figure 15 shows the states with the largest proportion of these recruits. Also, dropouts with some college made up a substantial proportion of recruits in some states in recent years; in particular, many of the recruits from the Disctrict of Columbia in recent years held this credential (see figure 16).

Marine Corps data

In all cases, our decisions and selections on the Marine Corps data parallel those on the Navy data. However, there were some differences between the datasets. First, during FY91 a substantial number of Marine Corps records list unlikely numbers of dependents (i.e., 90). We coded these records simply as having children present. Second, we note that 88 people in our Marine Corps dataset were coded

Figure 15. States with largest proportion of enlistees holding adult education certificates

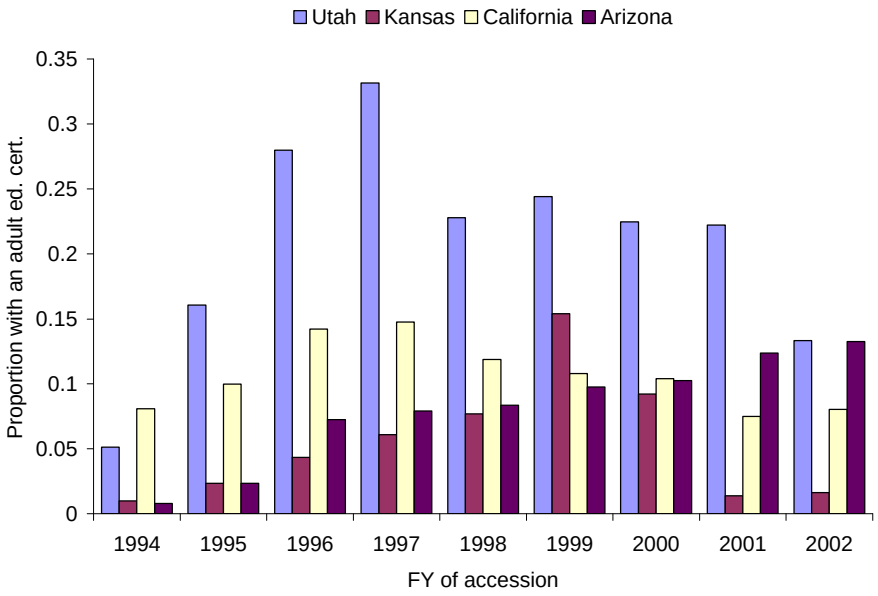
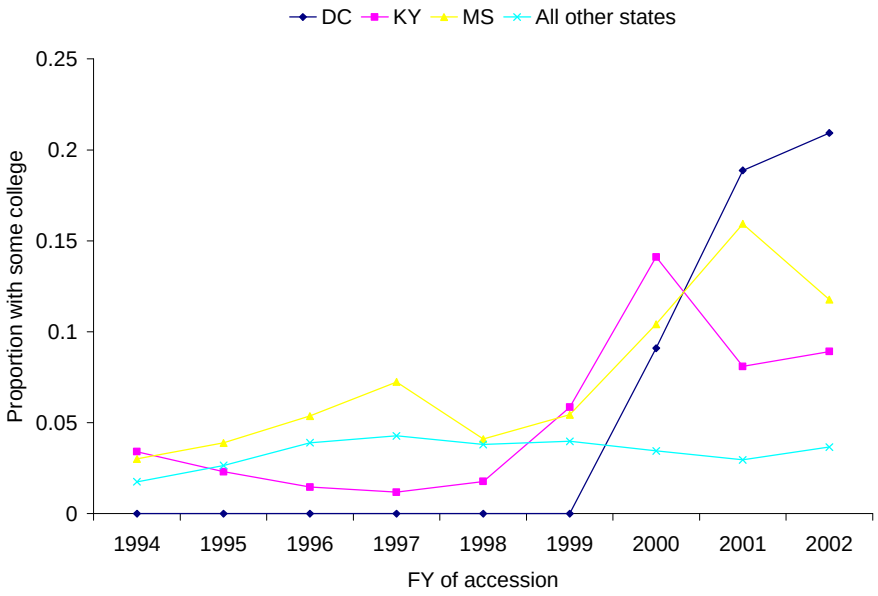


Figure 16. States with largest proportion of enlistees with no high school diploma but some college credits



with education level "Y," which is not an official code. This code first appeared in FY02 and was more prevalent in FY03 and FY04. We suspect that these people either completed the ChalleNGe program or received high school certificates of completion. Because we cannot be sure, however, we deleted these records.

State-level data

GED data

The GED data include indicators of the number of GED credentials awarded in each state during each year. In most years, we indicate the number of credentials issued, rather than the number who took or the number who passed the test. Some researchers have used the number of test-passers as an indication of the widespread use of the exam; we agree that this measure is appropriate in cases attempting to measure the general prevalence of the test because attaining a credential often requires an additional step beyond taking (and passing) the exam.

Given our interest in military Tier-2 enlistees (who must actually receive a GED certificate), however, we believe that the number of credentials issued is an appropriate measure for our purposes. Note that our numbers for 2002 and 2003 indicate the number of passers, not the number of credential-holders. Beginning in 2002, the GED Testing Service began reporting passers instead of credential-holders. Therefore, 2002–2003 numbers may not be directly comparable to numbers from earlier years. In the few cases when the total number of credentials issued was not reported, we imputed the missing value using Stata's imputation strategy.

We indicate the number of credentials awarded to those age 19 or younger. For 2002 and 2003, our data indicate instead the number age 19 or younger who passed the test. In the few cases when the proportion of test-takers who were 19 or younger was not reported, we imputed these values in the same manner as discussed above for the number of credentials.

We also indicate the number of GED testing centers in each state in each year,[39] the minimum age requirement of each state during each year, and the scores required for passing the test each year.[40] We note several important details about these data. First, in many states, numerous people received GED certificates who were younger than the minimum age requirement at the time . To list one of many examples, the General Education Development Testing Service reported that a minimum age of 18 was required in Alabama to receive a GED in 2002, but 23.6 percent of Alabama's GED recipients were 17 or 18 in 2002. Like many other states, Alabama lists a minimum age of 18 except under certain circumstances. These special circumstances include a number of conditions, such as withdrawn from public school, incarcerated, institutionalized, taught at home by a tutor, or attending an unregistered private church school.[41] Given the myriad circumstances under which students can take the GED exam early, we suspect that the minimum age requirement will not have a substantial impact on outcomes of interest. In addition, some states report the number of testing centers in various ways. For example, South Carolina lists one testing center and indeed all paperwork is processed through a central office. However, the test is given in numerous locations throughout the state,[42] so the number of testing centers may be misleading in some cases.

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39. We divide the number of testing centers by the youth population (in thousands) to produce a measure of access. We also tested a measure indicating the number of testing centers divided by the area of the state in thousands of square miles. The two measures are negatively correlated; more urban states tend to have more testing centers per area, and fewer per 1,000 youth, than rural centers. However, substituting one measure for the other produced little change in the coefficients of the other variables in our equations.

40. The scoring and the format of the exam changed in 2002, but the passing rate did *not* change [11, 13]. Therefore, we coded the new passing standard of 450 to be equivalent to the old (pre-2002) standard of 45.

41. Website providing Alabama GED regulations as of 30 March 2005: http://www.acs.cc.al.us/ged/faq/eligible.aspx

42. http://sclrc.org/GED.htm accessed 30 March 2005.

ACE has always set a minimum passing threshold, usually in terms of a minimum score on any test and a minimum average score on all tests. However, the states are free to raise the passing standard above the national standard if they choose. Indeed, the minimum score requirements varied substantially across states before 1997; at that point, ACE raised the passing score to a minimum of 40 *and* an average score of 45. Many states raised their passing standards before 1997, but the increase in the national standard essentially erased state-level variation between 1997 and 2001.

Before 1997, a few states set passing standards so that the person must either achieve a minimum score of X on each test *or* achieve a minimum average of Y. Such standards were generally less binding than those requiring a minimum score and a set average; we use a dummy variable to indicate such a passing standard in our regressions. Also note that New Jersey maintained a unique passing criterion throughout the time period covered in our study; before 2002, New Jersey required a minimum score of 42 on Test 1, 40 on Tests 2 through 4, and 45 on Test 5, as well as a total standard score of 225. To keep our coding schemes consistent across states, we coded this as a minimum of 40 and an average of 45. In 2002, New Jersey set passing standards on the new test that were equivalent to those on the old test: 420 on Language Arts, Writing; 410 on Language Arts, Reading, Science, and Social Studies; 450 on Mathematics; and a total score of 2250. In 2002 ten states had additional requirements: Arkansas, the District of Columbia, Indiana, Kentucky, Maine, and Tennessee required that test-takers pass the Official GED Practice Test; Idaho required test-takers to pass a course on American Government; Illinois required that test-takers pass a state civics/constitution exam; Hawaii required test-takers to earn one semester's credit from Community School for Adults; and Wisconsin required that test-takers satisfy additional requirements in the areas of citizenship, health, career awareness, and employability skills to receive a credential [13].

By 2001, a couple of states had begun to again raise passing standards above the national level, but the introduction of new tests in 2002 created a situation with nearly identical passing standards across states. In 2002, several states placed additional requirements (i.e., "Must pass the Official GED Practice Test," as previously detailed), but all states except New Jersey required the same scores for passing.

Carnegie unit data

The source of our data on Carneige unit requirements is the "Clearinghouse Notes—High School Graduation Requirements" published by the Education Commission of the States in November 1996, July 1990, and November 1984. We experimented with one additional measure: the number of elective Carnegie units required for graduation. On close inspection, however, it appeared that the states are quite inconsistent in their coding schemes for electives; for example, some states coded Economics requirements as electives while some coded these courses as Social Studies.

Test-to-graduate data

Table 4 indicates the first calender year the exam was a requirement for graduation and notes the data sources we used.

Table 4. First calendar year exit exam became effective

State	Year exam began	State	Year exam begn	State	Year exam began
Alabama	1985[ab]	Louisiana	1991[ae]	North Carolina	1982[c]
Alaska	2004[c]	Maryland	1987[ac]	Ohio	1994[ce]
Arizona	2006[c]	Massachusetts	2003[c]	South Carolina	1990[e]
California	2006[de]	Minnesota	2000[c]	Tennessee	1986[ac]
Florida	1979[ac]	Mississippi	1989[ac]	Texas	1987[ac]
Georgia	1984[ac]	Nevada	1981[ac]	Utah	2006[c]
Hawaii	1979[fg]	New Jersey	1984[ac]	Virginia	1986[ac]
Idaho	2006[c]	New Mexico	1990[c]	Washington	2007[c]
Indiana	2000[c]	New York	1985[ac]		

a. David Berliner and Audrey Amrein, *An Analysis of Some Unintended and Negative Consequences of High-Stakes Testing,* December 2002.
b. Alabama Department of Education, *Great Expectations: A Guide to Alabama's High School Graduation Exam.* Montgomery, AL: Authors, revised October 2003.
c. Gayler, Keith, Naomi Chudowsky, Madlene Hamilton, Nancy Kober, and Margery Yeager, *State High School Exit Exams: A Maturing Reform.* Center on Education Policy Washington, DC: August 2004.
d. California Department of Education website, http://www.cde.ca.gov/ta/tg/hs/overview.asp, accessed April 8, 2005.
e. Center on Education Policy, *State High School Exit Exams: Put to the Test.* Washington, DC: author, August 2003.
f. Jacob, Brian. 2001 "Getting Tough? The Impact of High School Graduation Exams." *Educational Evaluation and Policy Analysis* 23: 99-121.
g. The Hawaii exit exam was abolished in 2000. Source: Hawaii Department of Education website, http://arch.k12.hi.us/info/faq/student.html,accessed April 8,2005

Other (state-level) data and sources

We made use of the following data and sources:

- **Square miles.** Source: U.S. Census Bureau, *1990 Census of Population and Housing*, Series CPH-2, No. 343: Land and Water Area of States and Other Entities: 1990. We used the measure of total land area. Accessed 30 March 2005.
- **Percentage in poverty.** Source: Historical Poverty Tables, U.S. Census Bureau. http://www.census.gov/hhes/poverty/histpov/histpov21.html accessed 30 March 2005.
- **Per-pupil expenditures,** based on average daily attendance. Source: Digest of Education Statistics, various years.
- **Size of the youth population**—an estimate of the number age 15-19, inclusive, for each year. Source: Series ST-99-8, Population Estimates for the U.S., Regions, Divisions, and States for 5-year Age Groups and Sex. http://www.census.gov/popest/archives/1990s/ST-99-08.txt, and similar. Accessed 30 March 2005.
- **State unemployment rate.** Source: Bureau of Labor Statistics, calculated from data collected through the Current Population Survey (CPS), using Local Area Unemployment Statistics (LAUS).
- **Average weekly wage of young male workers,** defined as those age 19-24, using the March Current Population Survey (CPS) files for 1993-2002 (retrospective earnings data for 1992-2001). We excluded those who were in school or out of the labor force, as well as those who had $0 in earnings during the previous year. Finally, we excluded those earning in the top and bottom 1 percent (those making less than ~$1.20 per hour or more than ~$49 per hour).

We inflated all monetary figures to 2004 dollars using the CPI. Specifically, we use the CPI-U-RS (Consumer Price Index Research Series).[43]

43. For details, see http://www.bls.gov/.cpi/cpiurstx.htm, accessed 30 March 2005.

Appendix B: Regression results

Census results

This subsection contains the results of the regressions for high school completion, college attendance, employment, and earnings using 2000 Census data. (Means of variables appear in table 1.)

Table 5. Logistic regressions results: High school completion and college attendance[a]

	High school completion		College attendance	
	Coefficient[b]	Standard error	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS				
Male	-.342**	.001	-.398**	.001
Black	-.866**	.001	-.741**	.001
Asian	.648**	.007	.834**	.004
Native American	-.929**	.004	-.853**	.004
Other	-.287**	.002	-.223**	.002
Hispanic	-.916**	.002	-.696**	.002
STATE-LEVEL CHARACTERISTICS				
K-12 expenditures per pupil	.000**	.000	.000**	.000
Youth population, aged 15 to 19, per 1,000	.000**	.000	.000**	.000
Unemployment rate	.018**	.001	-.001	.001
Av. weekly wages among youth pop.	.000**	.000	.000**	.000
Av. tuition, state college	—	—	.000**	.000
EDUCATION REFORM REQUIREMENTS				
High Carnegie Units	-.220**	.019	-.132**	.012
Stringent Carnegie Units	-.071**	.006	.010	.005
Exit Exam	-.046**	.005	.043**	.003
GED SPECIFIC REFORMS				
Number of GED centers per 1,000 youth	.240**	.018	.327**	.011
Min. age reqm't of 17	-.014**	.005	-.010**	.004
Min. age reqm't of 18	.003	.004	-.004	.003
Min. age reqm't of 18.5	.163**	.012	.078**	.008
Min. age reqm't of 19	.024*	.011	.043**	.009
Min. age reqm't of 21	.151**	.014	.082**	.010
Av. GED score reqm't	-.005**	.002	.006**	.001
Meet av. **or** min. GED score reqm'ts	.015	.005	-.002	.004
Pseudo R^2	.048		.039	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white, non-Hispanic, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 6. Logistic regression results: Labor force participation during the previous year[a]

	Labor force participation	
	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS		
Male	.348**	.002
Black	-.660**	.003
Asian	-.569**	.008
Native American	-.622**	.009
Other	-.099**	.005
Hispanic	-.118**	.004
Still in school	-.815**	.003
Less than High School	-.804**	.003
Some college	.480**	.003
Associate Degree	.765**	.005
Bachelors Degree	1.037**	.004
Graduate School	1.121**	.009
STATE-LEVEL CHARACTERISTICS		
K-12 expenditures per pupil	.000**	.000
Youth population, aged 15 to 19, per 1,000	.001**	.000
Unemployment rate	.002	.002
Av. weekly wages among youth pop.	.000	.000
Av. tuition, state college	.000**	.000
EDUCATION REFORM REQUIREMENTS		
High Carnegie Units	-.156**	.032
Stringent Carnegie Units	-.013	.012
Exit Exam	.089**	.009
GED SPECIFIC REFORMS		
Number of GED centers per 1,000 youth	-.497**	.027
Min. age reqm't of 17	.028**	.009
Min. age reqm't of 18	-.030**	.007
Min. age reqm't of 18.5(	-.130**	.020
Min. age reqm't of 19	-.032	.021
Min. age reqm't of 21	-.219**	.026
Av. GED score reqm't	-.018**	.003
Meet av. **or** min. GED score reqm'ts	.054**	.009
Pseudo R^2	.084	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white, non-Hispanic, high school diploma, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 7. Regression results, weekly wages[a]

	(Natural log of) weekly wages	
	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS		
Male	.250**	.003
Black	-.061**	.004
Asian	.012	.013
Native American	-.092**	.015
Other	-.007	.007
Hispanic	.020**	.006
Still in school	-.332**	.004
Less than High School	-.144**	.005
Some college	.061**	.004
Associate Degree	.168**	.006
Bachelors Degree	.375**	.005
Graduate	.493**	.009
STATE-LEVEL CHARACTERISTICS		
K-12 expenditures per pupil	.000	.000
Youth population, aged 15 to 19, per 1,000	.000	.000
Unemployment rate	-.003	.003
Av. weekly wages among youth pop.	.000	.000
Av. tuition, state college	.000**	.000
EDUCATION REFORM REQUIREMENTS		
High Carnegie Units	.073	.043
Stringent Carnegie Units	.017	.018
Exit Exam	-.010	.012
GED SPECIFIC REFORMS		
Number of GED centers per 1,000 youth	-.009	.039
Min. age reqm't of 17	.068**	.013
Min. age reqm't of 18	.021*	.010
Min. age reqm't of 18.5	-.022	.027
Min. age reqm't of 19	.058	.032
Min. age reqm't of 21	-.025	.038
Av. GED score reqm't	.000	.004
Meet av. **or** min. GED score reqm'ts	.000	.014
Adjusted R^2	.232	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white, non-Hispanic, high school diploma, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 8. Regression results, proportion of youth population with GED[a]

	Proportion of youth with GED	
	Coefficient[b]	Standard error
STATE-LEVEL CHARACTERISTICS		
K-12 expenditures per pupil	.0001	.000
Youth population, aged 15 to 19, per 1,000	-.0003	.002
Unemployment rate	.101	.109
Av. weekly wages among youth pop.	.001	.002
EDUCATION REFORM REQUIREMENTS		
High Carnegie Units	1.592**	.564
Stringent Carnegie Units	-.112	.399
Exit Exam	.767	.569
GED SPECIFIC REFORMS		
Number of GED centers per 1,000 youth	-1.955	1.183
Min. age reqm't of 17	.221	.458
Min. age reqm't of 18	-.341	.348
Min. age reqm't of 18.5	-.542	1.120
Min. age reqm't of 19	.461	.711
Min. age reqm't of 21	-3.920**	1.065
Av. GED score reqm't	-.159	.133
Meet av. **or** min. GED score reqm'ts	1.405**	.502
Adjusted R^2	.813	

a. Dependent variable: proportion of young GED holders to high school diploma graduates, in each state and year. The regressions also controlled for year and state fixed effects. Omitted categories include no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Navy results

Our main Navy sample results begin with table 9—the regression results for the proportion of Navy enlistees with alternate credentials. Tables 10 and 11 present AFQT and serious waiver regressions regression by the samples of Navy enlistees with high school degrees and enlistees with alternate credentials.

Table 9. Regression results, proportion of Navy enlistees with alternate credentials[a]

	Proportion of enlistees with alternate credential	
	Coefficient[b]	Standard error
STATE-LEVEL CHARACTERISTICS		
K-12 expenditures per pupil	-.00001*	.000005
Youth population, aged 15 to 19, per 1,000	.00005	.00005
Unemployment rate	.0026	.0021
Av. weekly wages among youth pop.	-.000032	.000032
Av. tuition, state college	-.00001	.000005
Proportion with a GED	.016**	.0061
EDUCATION REFORM REQUIREMENTS		
High Carnegie Units	.0061	.010
Stringent Carnegie Units	-.0028	.007
Exit Exam	-.018	.011
YEAR FIXED EFFECTS		
Year = 1991	-.045**	.006
Year = 1992	-.065**	.007
Year = 1993	-.033**	.006
Year = 1994	-.025**	.007
Year = 1995	-.0083	.007
Year = 1996	.00065	.008
Year = 1997	.0037	.009
Year = 1998	.019	.010
Year = 1999	.078**	.011
Year = 2000	.085**	.012
Adjusted R^2	.727	

a. The regressions also controlled for state of accession fixed effects. Omitted categories include no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, must meet minimum GED score requirement on all tests and the year 2001.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 10. Regressions results, Navy, AFQT score[a]

	High school degree holder sample		Alternative credential sample	
	Coefficient[b]	Standard error	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS				
Male	1.911**	.087	.817**	.282
Black	-13.962**	.091	-9.396**	.248
Hispanic	-7.764**	.117	-3.733**	.263
Other	-4.003**	.144	-.762*	.318
Married	1.770**	.224	.562	.395
Age 18 at accession	-.978**	.150	1.157**	.349
Age 19 at accession	-3.681**	.154	-.454	.350
Age 20 at accession	-2.044**	.165	-.956**	.368
Age 21 at accession	-.638**	.188	-.982*	.400
STATE-LEVEL CHARACTERISTICS				
K-12 expenditures per pupil	.001**	.000	-.001	.000
Unemployment rate	.155	.092	.153	.236
Av. weekly wages among youth pop.	.002*	.001	.004	.002
Av. tuition, state college	.000	.000	-.002**	.000
EDUCATION REFORM REQUIREMENTS				
High Carnegie Units	-.108	.633	-.643	1.626
Stringent Carnegie Units	-1.275**	.333	-3.742**	.781
Exit Exam	1.532**	.308	.833	1.003
GED SPECIFIC REFORMS				
Number of GED centers per 1,000 youth	-.843	1.046	-.627	2.409
Min. age reqm't of 17	.737*	.331	.118	.778
Min. age reqm't of 18	.131	.228	-.360	.539
Min. age reqm't of 18.5	-.779	.748	-2.468	1.794
Min. age reqm't of 19	-.522	.682	-3.700*	1.476
Min. age reqm't of 21	1.196	.783	-2.304	1.773
Av. GED score reqm't	-.049	.110	.253	.247
Meet av. **or** min. GED score reqm'ts	.218	.246	.681	.567
Adjusted R^2	.105		.085	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white non-Hispanic, age 17 at accession, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 11. Logistic regression results, Navy, serious Waiver[a]

	High school degree holder sample		Alternate credentials sample	
	Coefficient[b]	Standard error	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS				
Male	.957**	.023	.824**	.067
Black	-.257**	.019	-.249**	.048
Hispanic	-.272**	.024	-.161**	.049
Other	-.271**	.029	-.064	.058
Married	-.079	.042	-.118	.073
Age 18 at accession	.167**	.036	.064	.072
Age 19 at accession	.557**	.036	.334**	.071
Age 20 at accession	.810**	.038	.513**	.073
Age 21 at accession	.985**	.040	.669**	.077
STATE-LEVEL CHARACTERISTICS				
K-12 expenditures per pupil	.000	.000	.000	.000
Unemployment rate	-.052**	.018	-.102*	.043
Av. weekly wages among youth pop.	.000	.000	.000	.000
Av. tuition, state college	.000	.000	.000	.000
EDUCATION REFORM REQUIREMENTS				
High Carnegie Units	.179	.118	.252	.300
Stringent Carnegie Units	-.176*	.081	-.120	.165
Exit Exam	.502**	.064	.540*	.215
GED SPECIFIC REFORMS				
Number of GED centers per 1,000 youth	-.473*	.189	-.652	.430
Min. age reqm't of 17	.187**	.064	.431**	.140
Min. age reqm't of 18	.162**	.047	-.029	.102
Min. age reqm't of 18.5	.075	.124	.263	.290
Min. age reqm't of 19	.098	.132	.188	.261
Min. age reqm't of 21	.157	.136	-.734*	.323
Av. GED score reqm't	-.007	.018	-.012	.040
Meet av. **or** min. GED score reqm'ts	-.048	.055	.088	.117
Pseudo R^2	.041		.031	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white non-Hispanic, age 17 at accession, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Marine Corps results

Our main USMC sample results follow. Table 12 presents the regression results for the proportion of USMC enlistees with high school degrees. Tables 13 and 14 present AFQT and serious waiver regressions regression by the samples of USMC enlistees with high school degrees and enlistees with alternative credentials.

Table 12. Regression results, proportion of USMC enlistees with alternate credentials[a]

	Proportion with alternate credentials	
	Coefficient[b]	Standard error
STATE-LEVEL CHARACTERISTICS		
K-12 expenditures per pupil	-.000006	.000004
Unemployment rate	-.005**	.0016
Av. tuition, state college	-.000004	.000004
Proportion with GED	.0064	.0046
EDUCATION REFORM REQUIREMENTS		
High Carnegie Units	.0099	.0075
Stringent Carnegie Units	.0063	.0054
Exit Exam	.0051	.0081
YEAR FIXED EFFECTS		
Year = 1991	-.016**	.005
Year = 1992	-.031**	.005
Year = 1993	-.015**	.005
Year = 1994	-.0077	.005
Year = 1995	-.010*	.005
Year = 1996	-.0064	.006
Year = 1997	-.0073*	.006
Year = 1998	-.0085*	.007
Year = 1999	-.011**	.007
Year = 2000	-.0043	.007
Adjusted R^2	.417	

a. The regressions also controlled for state of accession fixed effects. Omitted categories include no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, must meet minimum GED score requirement on all tests and the year 2001.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 13. Regressions results USMC, AFQT score[a]

	High school degree holder sample		Alternative credential sample	
	Coefficient[b]	Standard error	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS				
Male	-1.671**	.149	-.740	.754
Black	-11.186**	.118	-7.237**	.454
Hispanic	-8.726**	.127	-6.998**	.479
Other	-5.379**	.186	-2.229**	.717
Married	-.124	.155	.161	.458
Age 18 at accession	-1.634**	.162	-1.558**	.573
Age 19 at accession	-5.452**	.168	-3.503**	.578
Age 20 at accession	-4.127**	.187	-3.529**	.611
Age 21 at accession	-2.308**	.221	-2.793**	.671
STATE-LEVEL CHARACTERISTICS				
K-12 expenditures per pupil	.000	.000	.000	.001
Unemployment rate	.145	.106	-.044	.378
Av. weekly wages among youth pop.	.000	.001	-.001	.004
Av. tuition, state college	.000	.000	.001	.001
EDUCATION REFORM REQUIREMENTS				
High Carnegie Units	-1.256	.704	.056	2.619
Stringent Carnegie Units	-.387	.370	-.724	1.418
Exit Exam	.753*	.350	1.030	1.302
GED SPECIFIC REFORMS				
Number of GED centers per 1,000 youth	.111	1.135	-5.538	4.129
Min. age reqm't of 17	.899**	.351	2.770*	1.349
Min. age reqm't of 18	.283	.256	.663	.957
Min. age reqm't of 18.5	-1.554*	.754	1.391	2.953
Min. age reqm't of 19	-1.760**	.633	4.435	2.819
Min. age reqm't of 21	.814	.946	-3.371	3.382
Av. GED score reqm't	.219	.124	.143	.408
Meet av. **or** min. GED score reqm'ts	1.006**	.276	.151	1.156
Adjusted R^2	.072		.043	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white non-Hispanic, age 17 at accession, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

Table 14. Logistic regression results, USMC, serious Waivers[a]

	High school degree holder sample		Alternative credential sample	
	Coefficient[b]	Standard error	Coefficient[b]	Standard error
INDIVIDUAL-LEVEL CHARACTERISTICS				
Male	1.150**	.047	1.041**	.196
Black	-.136**	.025	-.173*	.084
Hispanic	-.227**	.028	-.281**	.093
Other	.082*	.037	-.199	.134
Married	.071*	.028	.078	.078
Age 18 at accession	.299**	.042	.168	.121
Age 19 at accession	.711**	.042	.416**	.120
Age 20 at accession	1.068**	.044	.770**	.123
Age 21 at accession	1.309	.047	.968**	.130
STATE-LEVEL CHARACTERISTICS				
K-12 expenditures per pupil	.000**	.000	.000*	.000
Unemployment rate	-.029	.022	-.024	.068
Av. weekly wages among youth pop.	.000	.000	.001	.001
Av. tuition, state college	.000	.000	.000	.000
EDUCATION REFORM REQUIREMENTS				
High Carnegie Units	-.010	.157	-.067	.532
Stringent Carnegie Units	-.116	.108	.457	.297
Exit Exam	.175**	.064	.622*	.247
GED SPECIFIC REFORMS				
Number of GED centers per 1,000 youth	-.087	.195	.876	.585
Min. age reqm't of 17	-.037	.076	.021	.258
Min. age reqm't of 18	.104	.053	.176	.186
Min. age reqm't of 18.5	-.044	.140	-.103	.498
Min. age reqm't of 19	-.166	.172	-.091	.599
Min. age reqm't of 21	.066	.173	-.817	.541
Av. GED score reqm't *(*	.034	.022	.036	.062
Meet av. **or** min. GED score reqm'ts	.185*	.079	-.147	.265
Pseudo R^2	.048		.050	

a. The regressions also controlled for year and state fixed effects. Omitted categories include female, white non-Hispanic, age 17 at accession, no high Carnegie units, no stringent Carnegie units, no exit exam, GED min. age requirement of 16, and must meet minimum GED score requirement on all tests.

b. ** indicates significance at the 1-percent level; * indicates significance at the 5-percent level.

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