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College Recruits in the Enlisted Navy: Navy Outcomes and Civilian Opportunities

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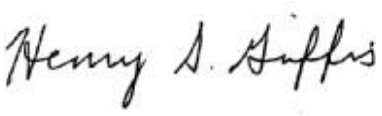

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Executive summary

Background

In his FY04 Leadership Guidance, the Chief of Naval Operations (CNO), Admiral Vernon Clark, emphasized the continuing fight for talent: "We must recruit and retain the talent required to possess the kind of high tech Navy we see in our future." Furthermore, the CNO made college-market recruiting an explicit part of the strategy to win this fight for talent. Specifically, the guidance called for increasing the share of enlisted accessions with college experience by 20 percent in FY04. This translates to roughly 1,000 additional college recruits.

Within this context, Commander, Navy Recruiting Command (CNRC) asked CNA to assess the various reasons for expanding the Navy's presence in the college market, as well as the likelihood of success given current incentive and pay structures.

Approach

Our approach to this tasking is to evaluate the past, current, and likely future validity of the following three arguments in favor of college-market recruiting:

1. Breaking into the college market is necessary to maintain the quality of the enlisted force.
2. Breaking into the college market is a means to improve the quality of the enlisted force.
3. Recruiting in the college market can decrease training costs.

To evaluate the first argument, we use data on youth population size, college enrollment rates, and workforce participation to determine whether changes in these factors have caused, or are likely to cause, the pool of potential high school recruits to shrink until it is too small

to support the Services' recruiting missions. To evaluate the second argument, we use Navy personnel data to determine the extent to which recruiting more people with college experience is likely to increase the overall quality of the enlisted force. (For this analysis, we use several measures of quality, including AFQT scores, continuation rates, schoolhouse performance, and fleet outcomes.) To evaluate the third argument, we use Navy training data to see whether the Navy spends less on training for recruits who access with college education than it spends on training for other recruits. Finally, recognizing that recruiting in the college market may call for increased resources, we determine the likely prospects for successful expansion into the college market by using data on civilian and military compensation to compare economic opportunities for college attendees.

Throughout the analysis, we compare those with college education to high school diploma graduates (HSDGs). We specifically consider the following levels of college attainment: those with some college, those with 2-year college degrees, and those with 4-year college degrees.

Findings

In response to increasing rates of college attendance, analysts predicted that college recruiting would be necessary to maintain quality. These predictions did not come true due to a combination of factors: (1) the increase in college attendance came largely from women, who have a relatively low propensity to enlist; (2) the military drawdown caused recruiting missions to fall sharply. We find that, if college enrollments and population sizes change as predicted and if recruiting missions don't increase substantially, the continued increase in college enrollments will not harm recruiting in the near future either. We also note that there exists a large pool of college "stopouts" and "dropouts" from which to recruit. Especially if college costs continue to rise, increasing college aspirations present an opportunity for the Navy to attract high-quality recruits by offering them the ability to combine education and service. Finally, we note a particularly worrisome trend that may affect recruit quality and supply: the increasing proportion of high school students who substitute General

Educational Development certificates for high school diplomas has the potential to cause problems for recruiting.

Although our results indicate that college-market recruiting is not likely to be necessary, we find that college recruits do, indeed, have the potential to increase force quality. Those who hold college degrees, in particular, have high test scores as well as high rates of training completion, compared with HSDGs. Those with 2-year degrees compare particularly well on continuation measures, including reenlistment. The limited evidence available suggests that those with some college but no degree are comparable to those with 2-year degrees. Finally, evidence suggests that those with college credit but no high school diploma could improve quality if deliberately selected, but they do not do so as a group.

We find no evidence that college recruits yield training savings. They spend more time in training than HSDGs, and cost more per day to train. College-degree-holders tend to complete training successfully, but they enter ratings that require substantial amounts of training which, under the current training process, they do not bypass at any stage. However, changes to the classification and/or training processes (such as those described in Sea Warrior) offer the potential for savings.

Overall, civilian opportunities are much better for college recruits than HSDGs. However, the high level of variation in the civilian labor market means that the Navy compares relatively well with the civilian opportunities of some with college, especially those with 2-year degrees. In addition, those with some college but no degrees earn less than those with 2-year degrees, so the Navy compares favorably with the civilian market for many in this category. Therefore, both markets should be targeted before the market of 4-year-degree-holders.

Finally, we note that the civilian economy always has the potential to change the recruiting environment; such changes can occur much more quickly than the slow swings brought about by shifts in the size of the population or the propensity to enlist. However, during periods when civilian earnings rise and unemployment rates fall, those with college degrees tend to benefit more than others, so it is unlikely that enlisting college recruits is an appropriate strategy for hedging against economic booms.

Introduction

The Commander, Navy Recruiting Command (CNRC) asked CNA to analyze the arguments for recruiting in the college market and to investigate how a career as a Navy Sailor compares with college recruits' other professional opportunities.

Researchers and policy-makers have made three primary arguments for recruiting in the college market for the enlisted Navy:

1. *Breaking into the college market is necessary to maintain the quality of the enlisted force*. Because of increases in college enrollment rates over the past 20 years, the traditional high school market may no longer be large enough to supply all the recruits needed by the Services. Thus, the college market may now be an essential source for the same high school graduates the Navy has always enlisted. (See [1], [2], and [3].)

2. *Breaking into the college market is a means to improve the quality of the enlisted force*. Planned changes in shipboard technology are expected to create requirements for fewer, smarter Sailors [4]. Both because of what they learn in school [5] and because those who pursue postsecondary education are more likely to be high-aptitude students [3], recruits from the college market may be an important source of the highly productive, high-quality young people who will be needed to man the future fleet. (See also [6].)

3. *Recruiting in the college market can decrease training costs*. According to its traditional enlisted recruiting model, the Navy accesses unskilled high school graduates and provides them with all the technical education required for their jobs in the fleet. In a number of fields, however, college education is now comparable to Navy training. By recruiting "pretrained" people from the college market, the Navy can potentially avoid large amounts of training costs. (See [6] and [7].)

Each of these arguments has different implications for how college recruiting should be approached and analyzed. If recruiting in the college market is intended to *improve* quality, college recruiting is mainly discretionary, and the appropriate question to ask is whether the increase in quality makes it worthwhile for the Navy to change its recruiting practices or pay a premium to attract these youths. If recruiting in the college market is a means to *maintain* quality, college recruiting is less discretionary, and the appropriate question to ask is, how can this market be penetrated most effectively and efficiently? Finally, if college recruiting is to be viewed as a *cost-saving* measure, the appropriate area on which to focus is the training system and how it should be structured to most effectively take advantage of pre-trained recruits.

In this study, we take each argument in turn, and examine the available evidence to determine the extent to which it is likely to hold over the next 10 to 15 years. We also use recent data on civilian and military compensation to assess the Navy's prospects for successful expansion into the college market.

Current policy context

The vision of the future Navy is one in which technologically advanced warships will be manned by small crews of highly educated, highly trained Sailors. To achieve this vision, Navy leadership has articulated several policy goals related to increasing the education level of the enlisted force beyond the traditional high school diploma. In the short run, the FY04 guidance from the Chief of Naval Operations (CNO) called for increasing the share of enlisted accessions with college experience by 20 percent for the year. In the longer run, the CNO's Strategic Studies Group has predicted that the Navy will need to recruit 40 percent of its enlisted force either directly from the Associate's degree market or through programs that result in Associate's degrees for Sailors who access as high school graduates (see [8]).

At the same time, there is a continued focus on costs. In his FY04 guidance, CNO Clark stated, "We will spend whatever it takes to equip and

enable our Sailors, but we do not want to spend one extra penny for manpower we do not need."

This study will inform these policy goals (a) by evaluating the extent to which recruits who access with college experience, including Associate's degrees, are likely to improve fleet quality and reduce training costs, and (b) by assessing the feasibility of increasing college accessions with existing incentives and recruiting practices.

Paper organization

Setting the stage

We begin by identifying the data sets on which the analysis is based and by defining specific college-market segments. We then describe the Navy's current college-market recruiting practices and its current presence in each of the market segments for which we have historical data.

Recruiting in the college market to maintain quality

Next, we use census data to track past changes in the potential supply of recruits and to determine the extent to which expected changes in the potential supply of recruits indicate a need to use the college market to continue to achieve accession goals for both quality and quantity. To do this, we examine the past, current, and predicted future supply of recruits. We track changes in the population size, the likelihood of attending college, the quality of high school education, and the propensity to enlist. We also note that changes in the civilian economy always have the potential to change the recruiting environment; such changes can occur much more quickly than the slow swings brought about by demographic shifts.

Recruiting in the college market to improve quality

After exploring likely changes in the supply of high school graduates, we use Navy personnel data to compare measurable, quality-related characteristics of college recruits with those of other recruits. We group college recruits based on the amount of college education they

possess; our primary groups include those with (a) some college credits but no high school degrees, (b) Associate's (2-year) degrees, and (c) Bachelor's (4-year) degrees. Our primary comparison group is recruits with high school degrees, or high school diploma graduates (HSDGs). We also examine how college recruits differ from other recruits in terms of outcomes. A primary outcome measure is continuation, but we also examine such measures as promotion rates, academic setback rates, and reenlistment rates, as well as types of rating assignments.

Recruiting in the college market to save on training costs

We study the amount of training received by each type of college recruit and compare it with the amount of training received by HSDGs to determine whether there are measurable training savings associated with pretrained recruits. We also use comparisons of average total training costs to average time in the fleet for each group as an indicator of how returns on training investments vary by education level.

Is naval service a good career opportunity for youths with college education?

Finally, we evaluate whether the Navy represents a good career opportunity for people with college degrees. Although many college recruits receive special enlistment bonuses, many may still view the civilian market as offering better opportunities because of the high earnings premiums with which it rewards the average college graduate. However, despite the fact that the average returns to college education are large in the private sector, there is wide within-group variation in civilian-sector wages. Therefore, it may still be true that the Navy is a "good deal" for a substantial number of college graduates. To explore this possibility, we calculate the number of college-educated workers for whom Navy compensation is greater than civilian compensation. This number represents an estimate of the potential size of each college market.

Data and background information

This section provides background information for the main analyses that follow. Here we set the scope of the study by defining the four college markets that will be evaluated and by identifying the available data sources and their limitations. To give context for what expansion in these markets might entail, we describe the Navy's current college recruiting efforts in terms of strategy and numbers of accessions.

What is a college recruit?

For enlisted recruiting, the college market includes not only college graduates with different types of degrees but also three additional groups: current college students who may or may not complete their degree programs, traditional job market recruits who have earned some college credits but have not earned degrees, and college-bound high school students. People in each of these groups constitute separate college-market segments that are likely to require different recruiting strategies.[1] The existence and nature of these different markets is understood by Recruiting Command and is reflected in the designs of the different types of college incentives. For example, the Navy College Fund (NCF) targets college-bound high school students, while the Enlistment Bonus for College Credit (EBCC) and the Navy Loan Repayment Program (NLRP) target college graduates and recruits with some college.[2]

This research involves studying recruits who access with some college experience and assessing the markets for these recruits. Therefore, our analysis focuses on the following groups of youths who acquire college credits before enlisting:

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1. For more on differences among college-market segments, see [2], [9], and [10].
2. We will describe the EBCC and the NLRP in more detail in the section on recruiting.

- Non-high-school-degree graduates with some college (NWCs)
- High school graduates with some college credits, but no college degree (HSWCs)
- Holders of Associate's degrees (ADs)
- Holders of Bachelor's degrees (BDs).

The Navy treats members of all four groups as college recruits: they are all eligible to receive both the EBCC and benefits through the NLRP. In addition, they are all considered Tier 1 recruits and thus face no enlistment restrictions in terms of either number of accessions or AFQT scores.[3] We will not deal with recruits from the college segment that includes college-bound high school students because they have yet to accumulate any college experience.[4,5] Our no-college comparison group is HSDGs.

Main data sources

Navy data

We use data from several different sources to analyze the characteristics and behavior of Navy recruits. Data on accessions and recruit

3. All recruits must have a score of at least 31 on the AFQT to be eligible to serve in the Navy; Tier 2 and Tier 3 recruits must have a score of at least 50, and their accessions are capped at 10 percent of total accessions. Thus, earning college credit is a way for non-HSDGs to become Tier 1 and more easily qualify for military service.
4. Two programs targeted at the college-bound high school market allow recruits from this group to access with some college: The Navy College Assistance/Student Headstart (CASH) program and Tech Prep. The CASH program allows HSDGs (and college recruits) who qualify for the Nuclear Field, Missile Technician Rating, or Submarine Electronics Computer Field to earn full Navy pay and benefits while attending college for up to 12 months. Tech Prep participants earn ADs by combining general education credits earned in college before accession with specific credits earned from Navy training after enlistment. Participation in both programs is limited. Among FY03 accessions, we identify only 141 CASH participants and only 13 Tech Prep participants. For more information on Tech Prep, see [7] and [11].
5. See appendix A for more information on excluded groups.

characteristics at accession come from the Navy recruiting database, Personalized Recruiting for Immediate and Delayed Entry (PRIDE). Training data come from the Enlisted Street-to-Fleet (ESTF) database, which combines data from PRIDE with data from the Navy's training database, Navy Integrated Training Resources Administration System (NITRAS). Finally, data on career progression come from the Enlisted Master Record (EMR). For most of the analyses presented in this report, we use data for accession cohorts from FY 1992 through FY 2003. In some cases, however, we use selected subsets of this larger data set; these variations will be noted when appropriate.

Civilian data

Our data source for information about civilian wages and jobs is the Current Population Survey (CPS)—a large, random survey of households. Each month, participants are asked a different series of questions. The March survey focuses on job market experiences and includes questions about hours and weeks worked, as well as total earnings, during the previous calendar year. The survey also includes basic demographic information, such as age, race / ethnicity, and level of education. We form our comparison group from the CPS sample by selecting young men who are not students and who worked at least some hours for pay in the previous year. We include those who did not work full time, as well as those who searched for work during some weeks, because we believe this provides the best representation of likely job experiences of young men. We report all earnings in 2003 dollars, and report weighted figures.[6]

Some data limitations

Identifying HSDGs with some college but no degree in Navy data

Unfortunately, historic PRIDE records do not explicitly identify HSWCs. Therefore, for most of our analyses, we are not able to evaluate the personal characteristics or behavior of this group of college recruits. However, beginning in July 2002, PRIDE identifies recruits who were awarded an EBCC and therefore had at least 12 hours of

6. Weighting allows our figures to be representative of the U.S. population.

college credit at the time of accession. Using data on HSDGs who received EBCCs, we include limited analyses based only on these very recent data; in addition, we use the CPS data to estimate the number of potential recruits in this college-market segment.

Not being able to identify HSWCs is problematic for two reasons. First, HSWCs appear to be the largest group of college recruits—both potential and actual. In FY03, HSWCs were the largest group of college accessions, and the CPS data show that they are also the largest college group in the target-age population. Second, the fact that HSWCs can't be separated from HSDGs in the historical data means that comparisons between HSDGs and the NWCs, ADs, and BDs are not as clean as we'd like. Specifically, when we compare college recruits and no-college recruits, the second group actually contains some HSWCs. Therefore, to the extent that we find differences between college recruits and HSDGs, we can be sure those differences exist.

Finally, as of July 2003, PRIDE identifies not only education level as indicated by the DOD education code, but also the amount of college credit earned and the type of institution attended. Therefore, in future analyses, we will be able to identify not only HSWCs who received an EBCC, but all HSWCs, and we will be able to track the behavior of all four groups of college recruits.

Identifying HSDGs and NWCs in civilian data

In some cases, direct comparisons between Navy data and civilian data are not possible. In the CPS sample, data on high school graduates include both HSDGs and those who completed high school by obtaining General Educational Development certificates (GEDs). Furthermore, although the CPS identifies people with some college, we don't know whether they are high school graduates with some college or high school dropouts with some college.[7]

7. We believe the vast majority who report having attended college in the CPS are, in fact, high school graduates; there no indication that colleges admit large numbers of high school dropouts.

Navy recruiting in the college market, past and present

College-market recruiting practices

Over the years, interest in penetrating the college market for enlisted recruiting has waxed and waned depending on the overall recruiting environment and perceived changes in the labor market. Between 1995 and 1998, CNRC sponsored several CNA studies on recruiting in the college market.[8] However, despite past attentions to college recruiting and despite the CNO's FY04 guidance to increase college recruits' share of accessions, there is currently no official policy specifying how or to what extent individual recruiters should target prospects with college experience.[9] In particular, recruiters are evaluated solely on the number of net new contracts they bring in over the year; they get no "extra credit" for signing college recruits. As a result, college recruits are generally treated as part of the workforce market, and are recruited with the same general approach as any other workforce prospect.[10] Recruiters do, however, have several special financial incentives to offer college recruits.

The primary incentive available to college recruits is the EBCC, which has been available since July 2001 to any recruit who has earned at least 12 hours of legitimate college credit (regardless of high school diploma status) and is willing to extend his or her first-term obligation by 12 months.[11] The EBCC increases with amount of college, and ranges from $2,000 for 12-23 semester hours to $5,000 for an AD and $8,000 for a BD. Thus, while regular enlistment bonuses

8. See [6], [7], [11], [12], [13], and [14].

9. According to CNRC staff, in FY03, CNRC conducted a pilot study to identify best practices for community college recruiting. However, no policy changes were made based on the study's results.

10. According to CNRC staff, anecdotal evidence indicates that college recruits are a "harder sell" and take more recruiter time.

11. The EBCC was first introduced in July 2000, and was initially offered only to recruits enlisting in the Nuclear Field (NF). In November 2000, the program was expanded to include anyone enlisting in a rating that offered a regular EB. In July 2001, it was expanded further to include recruits enlisting in any rating, regardless of EB.

(EBs) have never exceeded $12,000, the EBCC has made it possible for enlisted recruits to receive a total EB award up to the $20,000 maximum allowed by law.

Another incentive available only to college recruits is the NLRP through which the Service repays federally funded student loans for enlisted recruits entering in specific ratings.[12] Currently, the total NLRP amount is capped at $65,000 and payments are made in three disbursements: one-third or $1,500, whichever is greater, is paid at the end of 12, 24, and 36 months of service. Therefore, enlistees must complete at least 3 years of service to receive their full promised payment. For FY04, the Navy estimates the average participant debt to be $24,000. Although this falls far short of the $65,000 maximum, it is still a generous benefit.[13]

Finally, the Navy creates an initial pay premium for college recruits by allowing many of them to access at an advanced paygrade. For example, in FY03, virtually all recruits with a college degree—either an AD or a BD—entered as E3s, while about 40 percent of NWCs entered as E2s and an additional 13 percent entered as E3s. Based on the differences in regular military compensation (RMC), the value of entering as an E3 (compared to an E1) is about $2,700 per year; we discuss this point in more detail in the results section.[14]

College-market accessions

NWCs, ADs, and BDs

For accession cohorts from FY92 to FY03, figure 1 shows the number of accessions and the shares of total enlisted accessions for the three

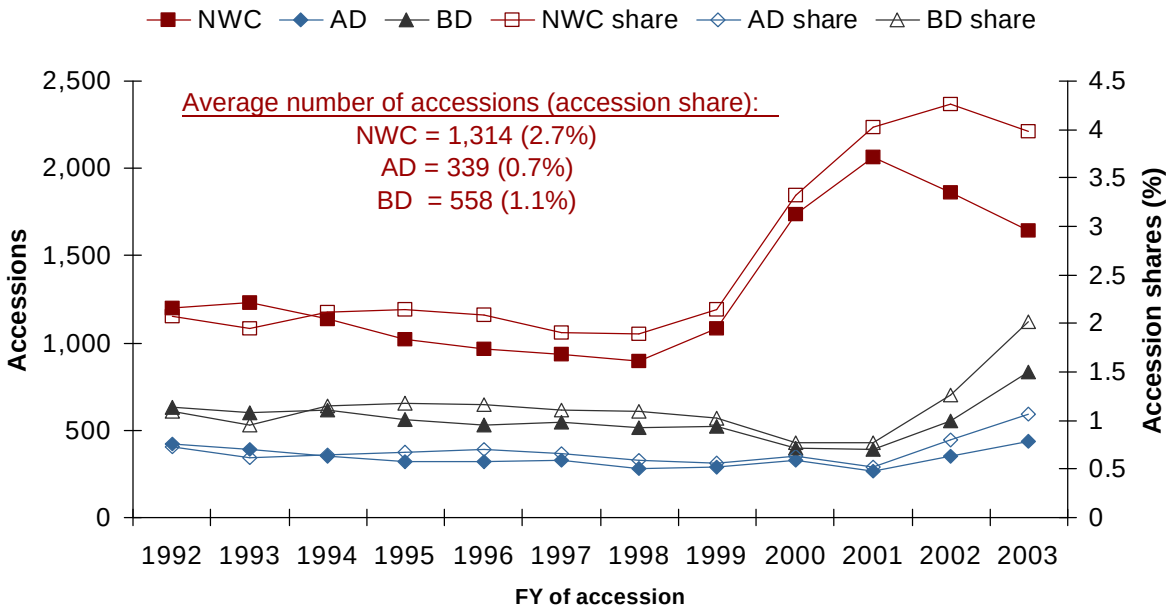
12. As with the EBCC, the minimum college experience necessary for eligibility in the LRP program is 12 hours of credit.

13. In FY03, roughly $200,000 was promised to recruits participating in the NLRP; the figure for FY04 was over $400,000. For more information on the NLRP, see [15].

14. Some recruits with no college experience also qualify to access at an advanced paygrade. For example, NF recruits access at advanced paygrades, as do Eagle Scouts, recipients of the Girl Scout Gold Award, participants in the Navy's junior ROTC program, and those who give referrals to their recruiters.

college groups for which we have historical data. The college group with the most recruits is the NWCs—those without a traditional high school diploma but with some college credit. Over the 13-year period, the average number of NWC accessions was 1,314 and the average NWC share of total accessions was 2.7 percent. Accessions of college-degree holders were substantially smaller. For the 13-year period, annual accessions of ADs and BDs averaged 339 and 583 recruits, respectively, while AD and BD shares of total annual accessions averaged only 0.7 and 1.1 percent, respectively. The average annual number of college accessions in all three groups was 2,211, and the average annual share was just 4.5 percent of total accessions.[15]

Figure 1. College-market yield, FY92 through FY03[a]



a. Data for BDs include those who eventually transferred to the officer community.

It is also useful to think in terms of accession trends for each group. The NWCs experienced the most visible change. After decreasing slowly from FY92 through FY98 (by about 25 percent overall), the

15. NWCs do not count toward the CNO's increased college accession goal.

number of NWC accessions increased substantially during the difficult recruiting years of FY98 through FY01. The total increase in accessions over these years was 130 percent. Then, the number of accessions suddenly decreased: there were 20 percent fewer NWC accessions in FY03 than in FY01.

Accessions of BD recruits followed a different pattern over the 13-year data period. After a very slight downward trend (FY92-FY99), BD accessions decreased sharply in FY00—a 23-percent drop relative to FY99. BD accessions were virtually the same in FY01 as in FY00, but they suddenly increased in FY02 and again in FY03—by 40 and 50 percent, respectively, relative to the previous fiscal year. Finally, the trend of AD accessions was similar to the BD trend. Between FY92 and FY01, AD accessions followed a slight downward trend, but accessions began to increase at the end of the period—by 32 percent from FY01 to FY02 and by 24 percent from FY02 to FY03. It seems likely that the recent increase in accessions of college-degree-holders—both ADs and BDs—is related to the softening of the civilian labor market after 2000.[16] It is not clear whether, or to what extent, the increases are also related to the introduction of the EBCC, but the timing of the increases in college accessions suggests they could be, at least partly, a response to this new incentive.

HSWCs

In our data set, we cannot identify any recruits who entered as HSWCs before July 2002. Even with these recent data, we can only observe those who received EBCC awards; we cannot directly observe whether an HSDG recruit had some college experience. Table 1 shows all those who received EBCCs in FY03 by education level. The data show that 1,960 HSDGs received EBCC incentives during FY03 and, therefore, can be classified as HSWCs. Comparing across education groups, the data also show that HSDGs constitute the majority (nearly 58 percent) of total EBCC recipients. Thus, in FY03, HSWCs were the largest group of college recruits.

16. According to data published by the U.S. Department of Labor's Bureau of Labor Statistics, the average national unemployment rates for 1999 through 2003 were 4.2, 4.0, 4.8, 5.9, and 5.8 percent, respectively. (Source: the Geographic Profile of Employment and Unemployment on the BLS website: http://www.bls.gov/gps/home.htm#data.)

Table 1. Receipt of EBCC for FY03 accessions, by education level

Education level as indicated by education code	Accessions	Number with EBCC	Share with EBCC (%)	Share of all EBCCs (%)
NWC	1,643	289	17.6	8.5
HSDG	34,530	1,960	5.7	57.6
AD	438	375	85.6	11.0
BD	835	729	87.3	21.4

A second insight revealed in table 1 is that not all college recruits receive EBCCs. For example, only about 86 percent of AD and BD holders received EBCCs in FY03, probably because EBCC-eligible college recruits must also agree to 12-month extensions to their contracts in order to receive the award; some college recruits may not have agreed to this stipulation. Thus, based on the data for ADs and BDs, it is likely that there are also some HSDGs who had the requisite 12 semester hours of college credit but were not willing to extend their obligations. This means that 1,960 is probably an underestimate of the number of HSWCs.

Additional data on EBCC recipients (summarized in table 2) indicate that, in FY03, HSWCs (i.e., HSDG recipients of the EBCC) were most likely to have between 24 and 47 hours of college credits; 40 percent had 48 hours of credit or more. In contrast, NWCs were most likely to have between 12 and 23 college credits, and 78 percent had 47 hours or fewer. Thus, the HSWCs have, on average, more college credits than the NWCs.

Demographic and recruitment characteristics of college recruits

NWCs, ADs, and BDs vs. HSDGs

College recruits might be expected to differ from other recruits in a number of ways. First, college recruits are likely to be older and, therefore, may be more likely to be married and/or have children. Furthermore, since access to and enrollment in higher education in the United States varies by race, college recruits may differ from HSDGs in terms of race/ethnicity. Table 3 details these and other descriptive statistics for college recruits and HSDG recruits.

Table 2. Number of college credits for HSDGs and NWCs receiving EBCC awards in FY03

Amount of college credit[a]	Share of those receiving EBCC awards (%)	
	HSDG	NWC
12-23 college credits	20.8	40.3
24-47 college or 1 year vocational credits	36.5	37.2
48-71 college credits	19.9	9.7
2 years vocational credits	4.2	6.9
72-95 college credits	11.4	3.8
96 or more college credits	7.1	2.1
Total	100.0	100.0

a. Shares estimated based on the size of each recruit's EBCC award. The mapping from number of credits to size of award changed in March 2003. If implementation of the new mappings did not occur automatically or uniformly across all recruiting districts, the estimates may be slightly inaccurate.

As expected, college recruits are older than HSDG recruits and more likely to be married (members of each group had, on average, less than one child each). Those with college degrees are more likely than HSDGs to be white; the opposite is true of NWCs (this is consistent with patterns of high school dropouts). Degree-holders are also substantially more likely than HSDG recruits to be female; the opposite is true of NWCs.

Table 3 also shows that NWCs, ADs, and BDs all spend an average of 3 months or less in the delayed entry program (DEP). This is about 1½ to 2 months less than the average time that HSDGs spend in DEP. All three types of college recruits are also less likely to access during the summer surge than HSDGs, and more likely to access during the difficult February-March-April-May (FMAM) period. Overall, all three groups are much closer to being levelly loaded than HSDGs.[17] The facts that college recruits spend less time in DEP and are less likely to access during the summer surge are consistent with the characterization of college recruits as workforce recruits.

17. Reference [6] cites the ability to level load college recruits as another benefit of recruiting in the college market.

Table 3. Demographic and recruitment characteristics, by education level[a]

	HSDG	NWC	AD	BD
Demographic variables				
Average age in years	19.6	21.6	24.1	25.7
Male sample share (%)	82.7	84.5	77.1	77.6
Married sample share (%)	4.5	10.7	14.4	14.6
White sample share (%)	60.6	53.5	65.7	64.8
Black sample share (%)	19.6	22.9	13.8	15.5
Hispanic sample share (%)	12.8	16.1	11.0	9.6
Other race sample share (%)	7.0	7.5	9.5	10.0
Recruitment characteristics				
Average months in DEP	4.6	2.7	3.0	2.9
Share accessing in				
June–Sept. (JJAS) (%)	49.1	32.1	31.2	28.0
Oct.–Jan. (ONDJ) (%)	25.9	30.8	30.3	33.1
Feb.–May (FMAM) (%)	24.9	37.0	38.5	38.9

a. Data are pooled across accession cohorts from FY92 through FY02. FY03 data are not included because of problems with the race data for that year. (See footnote 17.)

HSWCs vs. HSDGs based on receipt of EBCC

Table 4 shows how HSDGs who received EBCCs in FY03 differed from those who did not receive EBCCs along the same characteristics as shown in table 3. Like the other college recruits, the HSWCs we can identify using the EBCC data are, on average, older than HSDGs and more likely to be married. The difference in the gender mix of HSDGs and HSWCs, however, is less pronounced than differences between HSDGs and other college recruits.[18] Finally, HSWCs spend less time in DEP and are more likely to ship during off-peak months than HSDGs. Thus, like the other college recruits, HSWCs are likely to be workforce recruits.

18. Data on race are not presented because more than half of the FY03 recruits, regardless of EBCC status, were coded as being of unknown race. We hypothesize that this is a data-entry error that may be associated with the changes in coding for race / ethnicity that were introduced around this time.

Table 4. Demographic and recruitment characteristics of HSDGs who did and did not receive EBCCs in FY03

	HSDG	
	With EBCC	Without EBCC
Demographic characteristics		
Average age in years	22.9	19.6
Male sample share (%)	80.3	81.6
Married sample share (%)	10.6	4.6
Recruitment characteristics		
Average months in DEP	4.5	6.0
Share accessing in JJAS (%)	48.0	52.1
Share accessing in ONDJ (%)	21.3	28.1
Share accessing in FMAM (%)	30.7	19.7

Will college recruits be necessary to maintain force quality?

Periodically over the last 20 years, military planners have expressed concern over maintaining the supply of enlisted recruits. A major driver of this concern has been the increasing proportion of high school graduates who continue their education at postsecondary institutions. As we discuss below, thus far the supply of young people willing to serve in the military has generally been sufficient for DOD to access plenty of high-quality recruits. However, college attendance continues to increase and is predicted to increase even more in the future. At the same time, other demographic and educational trends will also affect the size of the pool of eligible recruits.

The purpose of this section is to determine the extent to which expected changes in recruit supply are likely to affect the Services' abilities to meet their enlisted recruiting missions. And, given the factors that are expected to drive changes in recruit supply, we consider whether recruiting in the college market will be necessary to maintain recruit quality. To do this, we document past and predicted future college enrollment rates, then consider various economic and demographic factors that will come into play to determine the ultimate size of the traditional recruiting pool.

Main issues

A number of factors have the potential to affect the supply of recruits. The most important factors include:

- The population of young men[19]
- The likelihood that high school graduates will continue their education
- The propensity of youth to enlist
- The general quality of the recruiting pool.

Below, we discuss the expected changes in the size of the population. Then, we discuss postsecondary trends, including some descriptive statistics on the education and labor force activities of young men. We finish with brief discussions of other factors that could affect the supply of recruits. Here, we briefly summarize the possible effects of each factor.

The size of the target-age population (generally defined as 18- to 24-year-olds) affects recruiting directly; as the size of the target population changes, the number of potential recruits changes. Populations grow or shrink over time due to changes in birth, death, emigration, and immigration rates.

In general, an increase in the likelihood of college attendance implies a decrease in the probability of military service. Indeed, there has been a sharp increase over the last thirty years in the proportion of youth who attend some postsecondary schooling. This has not harmed recruiting as much as it might have for two reasons: (1) the recruiting mission has decreased dramatically over the last 15 years; (2) much of the increased college attendance has been among women.

19. We consider only the population of males because the majority of accessions are men. We recognize that the Services recruit a substantial number of women, and that the proportion of female recruits has grown significantly over the last 20 years. We discuss men and women separately where appropriate in this section, but for simplicity we include only men in our measure of the population. We could consider the total population, but, because the youth population is split almost exactly between men and women, doing so would not affect any of our qualitative results.

The propensity to enlist may change over time as general perceptions of military service change. In addition, changes in the civilian economy are likely to affect the propensity to enlist. For example, during periods when high-paying jobs are plentiful for high school graduates, propensity to enlist typically falls. Finally, propensity may change as aspects of the youth population change. Propensity has fallen over the last 20 years, and past research has shown that immigrants and people whose parents attended college or did not serve in the military are less likely to enlist (see [16], [17], and [18]). Therefore, changes in the proportions of youth in these categories are likely to affect overall enlistment propensity and, thus, the overall supply of recruits.

Along with changes in the population size and in enlistment propensity, a change in the quality of the potential recruiting pool can also affect overall recruit supply. One factor likely to affect the quality of the pool in the future is the increasing proportion of youth who complete high school through the GED, rather than through the traditional high school diploma route.

All of these factors affecting recruit supply are likely to be changing continuously and simultaneously. In some cases, changes will be offsetting, resulting in small changes in supply; in other cases, changes will work together to create large increases or decreases in supply. In any case, the effect of supply changes on the DOD's ability to meet the total recruiting mission will depend on the level of demand. As we discuss how each potential factor is likely to affect recruit quality, we consider its effects holding the recruiting mission constant.

Postsecondary attendance following high school graduation

Traditionally, young people enlisted in the military immediately following high school graduation. Therefore, the increase in the proportion of high school graduates enrolling in college caused concern among military planners and recruiters. In this section, we first look at past and expected future changes in the numbers of new high school graduates, then we examine past trends in college enrollment, and we finally discuss predicted future trends in enrollment and how such trends are likely to affect the size and quality of the potential new-graduate recruiting pool. Then, we expand our attention to

include all 18- to 24-year-old men; looking at this group allows us to examine trends in college *completion* as well as the labor market participation of recruits who have completed at least some postsecondary education.

Controlling for overall population size

First, we examine how the population of 18-year-old men has changed in the past and how it is predicted to change in the near future.[20] Historical data and forecasts are presented in figure 2. Some past concerns over the potential supply of recruits stemmed from the fact that this population peaked around 1980 and then fell throughout the decade. However, the population increased somewhat during the 1990s, and is predicted to continue growing between now and 2010; between 2010 and 2020, the number of 18-year-old men is expected to decrease to just above the 2004 level. Thus, changes in the total population of 18-year-old men should not negatively affect the future supply of recruits. In light of these population numbers, we next discuss past changes in college enrollment rates. Finally, we contrast expected future population increases to expected enrollment rate increases.

Changes in enrollment rates

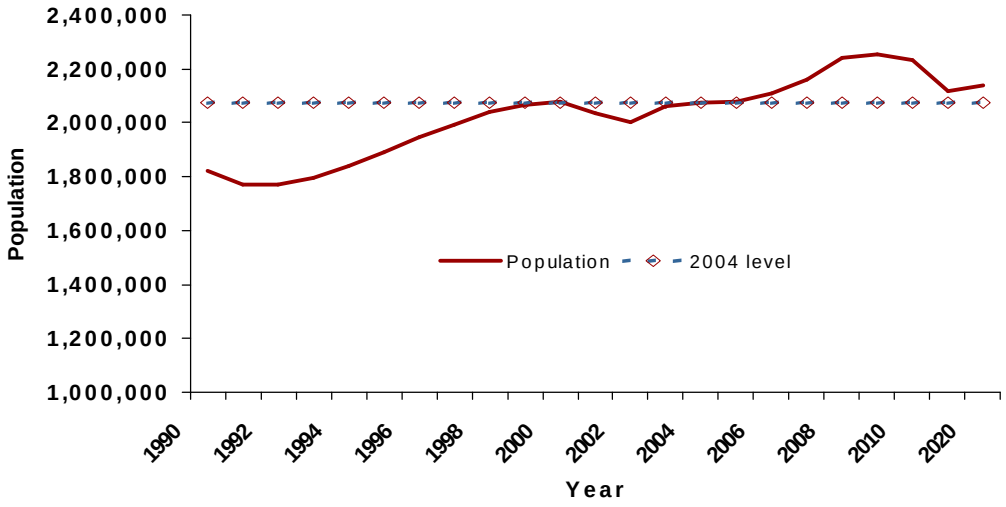
Past trends

Figure 3 shows that, over the last 20 to 30 years, the proportion of high school graduates who continued their educations within 12 months of graduation increased sharply. The increase was especially marked between the mid-1980s and the mid-1990s.

To the extent that potential enlistees were choosing between college and the military, such a change could have had a substantial negative effect on the recruiting climate. But in fact, the Services continued to make their missions throughout most of the 1990s. There are several reasons for this. First, as pointed out in [2], at the same time that the

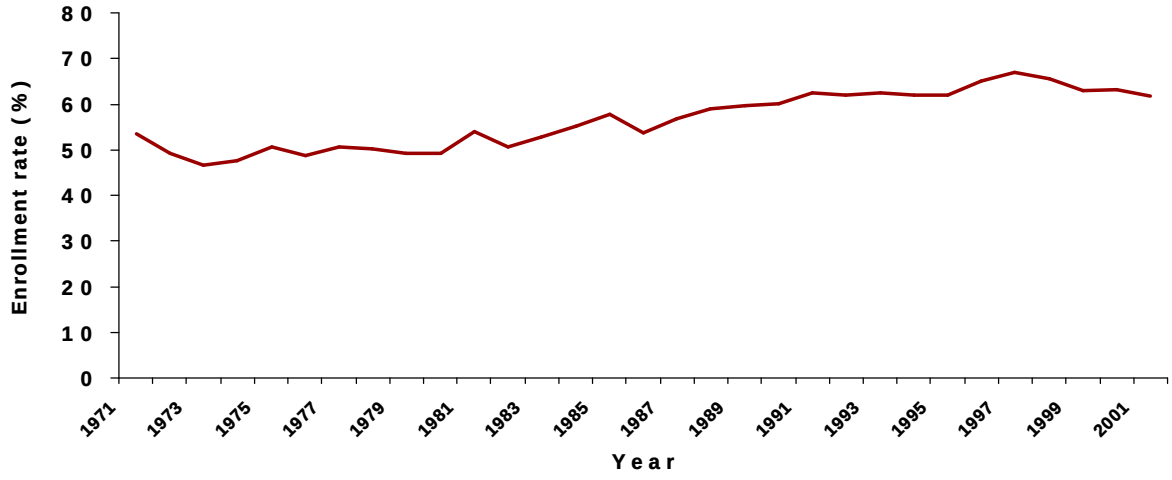
20. When considering the impact of going straight from high school to college, the relevant population is 18-year-olds.

Figure 2. Population of 18-year-old men in the United States, 1990 through 2020[a]



a. Source: U.S.Census Bureau. The 1990 and 200 figures are Census figures; the figures between 1990 and 2000 are intercensal estimates (i.e., these figures are consistent with both the 1990 and the 2000 Census figures). The inter-census estimates were obtained by dividing the estimated population of 15- to 19-year-old males by 5. The figures from years after 2000 are estimates created by the Census Bureau using moderate projections of fertility, life expectancy, and immigration.

Figure 3. College enrollment rates of high school completers[a]



a. Source: Digest of Education Statistics 2002, table 184. "High school completers" 16- to 24-olds who graduated from high school or completed a GED in the previous 12 months.

proportion of high school graduates attending college increased, the Services' total accession requirement decreased sharply for unrelated reasons. (Both trends occurred between the mid-1980s and the mid-1990s; see [2] for a thorough discussion of these changes.) Also, as pointed out by [18], the majority of the growth in college attendance was due to large increases in the number and proportion of women attending college. Table 5 shows data on past and predicted future enrollments and enrollment rates for men and women.

Table 5. Number and percentage of male and female high school completers attending college, past and future[a]

	Women attending college		Men attending college	
Year	Number (thousands)	Percentage	Number (thousands)	Percentage
1970	686	48.5	55.2	741
1975	818	49.0	52.6	796
1980	823	51.8	46.7	700
1985	785	56.8	58.6	755
1990	740	62.2	58.0	680
1995	835	61.3	62.6	775
1998	938	69.1	62.4	906
1999	917	64.4	61.4	905
2000	996	66.2	59.9	749
2001	808	63.6	59.7	762
2002	980	66.6	56.8	796
2010	***1,144***	***72.7***	***57.6***	***901***
2012	***1,135***	***74.6***	***58.5***	***887***

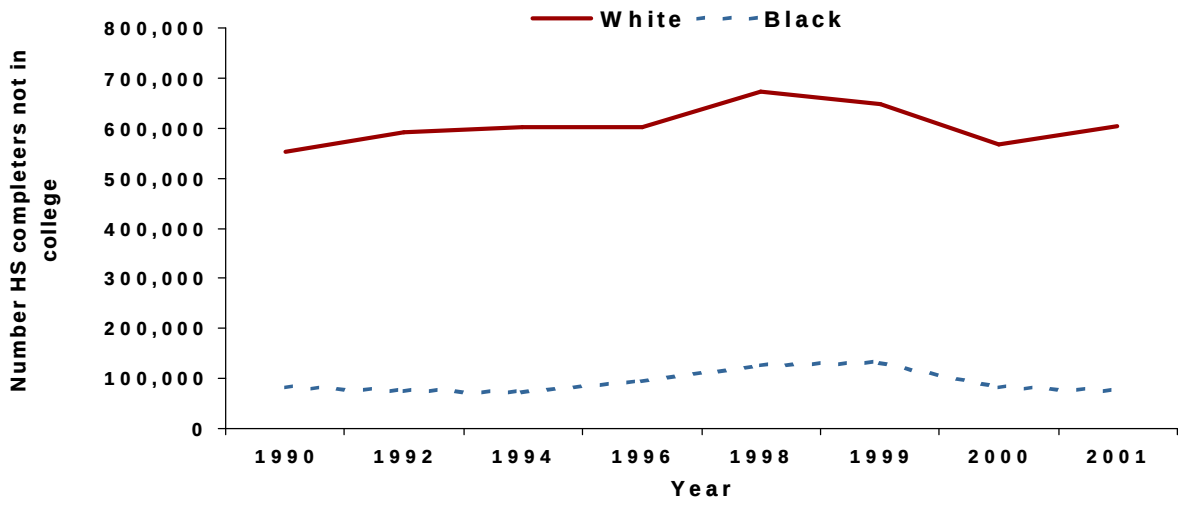
a. Sources: Figures from 1970-2001: Digest of Education Statistics 2002, table 184. Figures from 2002-2012: Digest of Education Statistics 2002, table 174. Totals calculated by dividing predicted number of 18- and 19-year-old graduates by 2. Percentage calculated from Census projections, "(NP-D1-A) Projections of the Resident Population by Age, Sex, Race, and Hispanic Origin," available at www.census.gov, assuming a high school completion rate of 74% for women, 70% for men (approximately the current rates).

Women's college participation rates surpassed those of men in 1988; women have attended college in higher proportions than men every year since (with the exception of 1995). To put the relative changes of male and female enrollment rates into context, we directly

compare 1970 and 2000 enrollments. Table 5 indicates that in 2000, men were almost 5 percentage points more likely to attend college than in 1970, while women's attendance grew by over 17 percentage points over the same period. This means that in 2000 an additional 8,000 men and 310,000 women were attending college compared to 1970. Therefore, because the vast majority of accessions are male, it is not clear that the supply of recruits dipped dramatically due to increased college attendance.

To the extent that the increased college attendance for men was driven by groups with high enlistment propensities, even a relatively small change, such as the one shown in table 5, could be problematic for recruiting. To explore this possibility, we also examine trends in college attendance by race / ethnicity. The number of white male high school graduates who did not enroll in college actually increased during the 1990s before falling in 2001. The number of African-American male graduates not in college stayed fairly constant (see figure 4).

Figure 4. Number of male high school graduates not enrolled in college, by race/ethnicity[a]



a. Authors' calculations from Digest of Education Statistics 2002, tables 183 and 284.

Finally, we note that the Services did struggle to enlist a sufficient number of high-quality recruits in the late 1990s, but this period was characterized by an extremely strong civilian labor market. In particular, during this period, the college / high school wage differential fell for the first time in more than a decade, and college enrollment among men levelled off, probably due to growth in civilian wages.[21] (We address the issue of changes in wages for HSDGs in more detail later.)

Expectations for the future

In addition to shedding light on past events, the data presented in figure 2 and table 5 allow us to make some predictions about the future supply of recruits. First, the number of 18-year-old men in the United States is predicted to increase over the next 6 years, and to remain above the current number until at least 2020 (see figure 2). Second, although college enrollments are predicted to continue to increase between now and 2012, this growth will continue to be largely driven by higher enrollment rates for women (see table 5).

Even if the proportion of men attending college increases more than expected over the next 10 years, it is unlikely that the potential pool of recruits will shrink dramatically because increases in the population should offset the impact of increases in college enrollment rates on recruit supply. For example, the male enrollment rate in 2001 was 59.7 percent and the 18-year-old male population was approximately 2,037,000. This translates to a potential supply of 820,911 young men. In 2009, the population of 18-year-old men is expected to have risen to 2,253,000. With this larger population, the college enrollment rate can increase to as high as 63.5 percent without causing the potential recruit supply to fall below the 2001 level. In a somewhat similar analysis, [18] comes to the conclusion that the expected increase in the size of the population is likely to be large enough to make up for several other demographic changes, including the drop in the

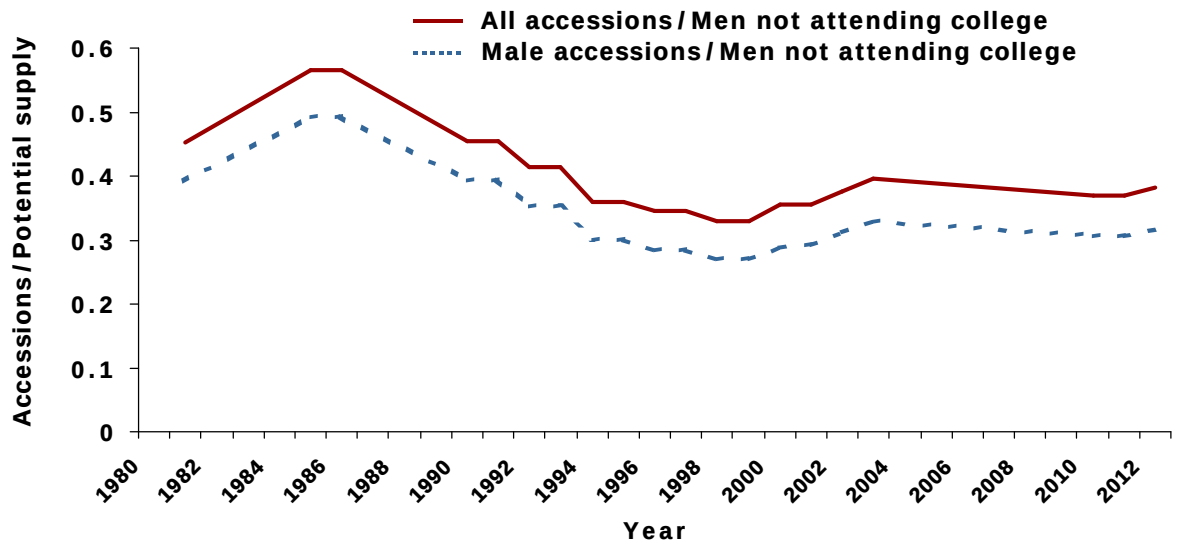
21. References [19] and [20] indicate that men's college attendance is more responsive than women's to relative wages. As shown in table 5, women's attendance has trended upwards fairly steadily over the last 30 years despite shifts in the relative wages of those with college versus high school degrees.

proportion of youth who have parents with active-duty military experience and the increase in the proportion who have highly educated mothers (both of these trends are expected to decrease propensity).

Although projections of college attendance are not available by race/ethnicity, the most recent trends suggest that the number of white men not enrolled in college will probably stay at or above the 400,000 mark in the near future, and the number of black men not enrolled will most likely remain at or close to 100,000. Thus, there is no reason to believe that changes in the racial/ethnic make-up of those not attending college affected recruiting in the recent past, or that such changes are likely to have a large effect in the near future. In fact, all indications are that the pool of potential recruits should remain roughly the size it is today.

Finally, we look at the relationship between the number of men who complete high school but do not attend college and the total recruiting mission. The top line of figure 5 shows this ratio; the bottom line shows the ratio of *male* accessions to men who do not attend college. (The differences in the two lines stems from the substantial proportion of female accessions.) This graph shows two things. First, the toughest recruiting environment, in terms of the ratio of accessions to "supply," was in 1985; the ratio has been substantially lower since then because of a combination of the drawdown, recent increases in the target population, and current historically high reenlistment rates. Second, this figure suggests that the Services should have no tougher time making their accession goals over the next 10 years than they have in recent years. Of course, the Services have not recruited as high a proportion of non-college-bound males as the figure suggests because numerous accessions hold GEDs or other alternate credentials or are high school dropouts; others earn at least some college credit before enlisting. In addition, figure 5 does not include other factors that may affect recruiting, such as changes in overall propensity. But the main point of the graph is that the Services' potential recruiting problems will not be simply a function of inadequate (or falling) supply.

Figure 5. Ratio of total accessions to men not attending college; ratio of male accessions to men not attending college[a]



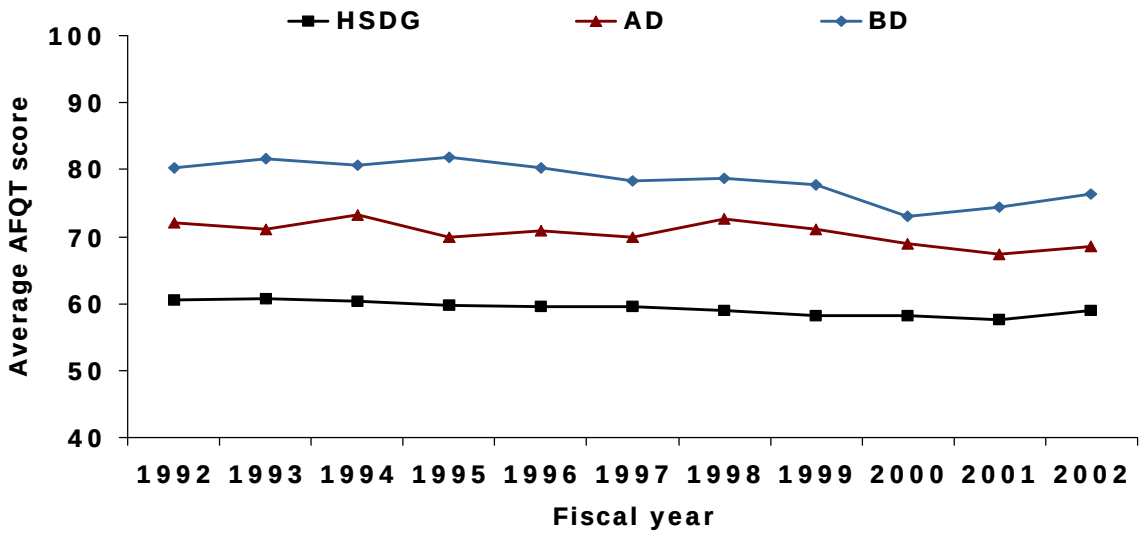
a. Authors' calculations using Digest of Education Statistics 2002, tables 103 & 174; Population Representation in the Military Services 2002, 2003; Census data including (NP-D1-A) Annual Projections of the Resident Population by Age, Sex, Race, and Hispanic Origin: Lowest, Middle, Highest, and Zero International Migration Series, 1999 to 2100. Assumptions: Future accession mission and proportion of female accessions remain constant; proportion who complete high school remains constant.

Impact of college enrollments on quality

An increase in the rate of college enrollment may have negative effects on recruiting even if the size of the potential pool remains constant. Perhaps the most obvious example is that an increase in enrollment could cause the average ability of potential enlistees to decrease, if the most able attended college rather than enlisting in the military. We have shown that most of the increase in college enrollment has been and is expected to be among women, who traditionally have a much lower propensity to enlist than men; for this reason, college enrollment is unlikely to lower the quality of recruits. However, as a second checker, also examine changes in AFQT scores over time. Figure 6 indicates that the average scores of all HSDG enlistees in the Navy have remained approximately constant over the last 10 years. There is no apparent drop in scores during the period when college enrollment was highest among men (1995–1998).

Therefore, past changes in college enrollment appear not to have harmed the overall quality of recruits. To the extent that future changes are small (as our predictions indicate), quality is unlikely to suffer in the near future due to college enrollments.

Figure 6. Average AFQT scores for Navy recruits, by education level and fiscal year of accession



The distinction between college enrollments and college aspirations

Along with actual college attendance, college *aspirations* increased dramatically during the 1980s and 1990s. In fact, aspirations increased far more than college attendance. For example, of a nationally representative sample of high school seniors in 1982, 39 percent stated that they hoped to graduate from college; among a similar sample of seniors in 1992, 69 percent said they hoped to graduate from college. In 1992, one-third hoped to complete a graduate degree, compared with 18 percent in 1982 [21]. Therefore, while the proportion of high school graduates who actually attended college increased by roughly 11 percentage points between 1982 and 1992,

the proportion who aspired to college increased by 30 percentage points [21] and [22].

Likewise, [18] indicates that there has been steady growth in aspirations over the last 25 years; like enrollments, women's aspirations outstripped men's aspirations during the 1980s and 1990s. According to this source, half of men and 60 percent of women stated (during their senior year of high school) that they would definitely graduate from a four-year college.[22] Recent aspirations rates are more similar to college attendance rates, but, as we demonstrate in the next section, many students begin college but do not actually earn a degree. This suggests that, while many people are interested in college, they may be unprepared for college, or unable to pay for it.[23] The Navy represents a potential route to college to these young people; therefore, high levels of college aspirations may present substantial recruiting opportunities for the Navy if they can offer programs that combine service and postsecondary education.

Potential recruits—current education and labor market activities

When tracking population changes in the previous section, we discussed only 18-year-olds because we were specifically considering the group of high school graduates going straight to college. However, the 18- to 24-year-old group is often considered to be the potential pool of recruits. and it makes particular sense to look at a group that includes people older than 18 when considering the question of college recruits. Therefore, in this section, we discuss current college completion rates and examine the education and workforce activities

22. Some stated aspirations are unreasonable; roughly 20 percent of women and 10 percent of men state that they will have a "professional [job] with a doctoral degree" at age 30 [18]. While the rate of graduate degrees is far lower than this, the aspiration again indicates an interest in attaining substantial amounts of postsecondary education.

23. Between 1982 and 2002, the inflation-adjusted cost of college increased by more than 100 percent at 4-year colleges—both public and private—and by roughly 90 percent at public 2-year colleges (see [23], available online at collegeboard.com, see especially table 5b).

of this group using recent March CPS data. To minimize possible year-to-year variation, we combine surveys from March of 2000, 2001, and 2002. (These data provide the most current snapshot of educational attainment and workforce participation.) Figure 2 (presented earlier) indicates that there are roughly 2 million 18-year-old men in the United States; consistent with this, the CPS measures a total of about 13.5 million men age 18 to 24 in any year.

College completion rates

Traditionally, students completed (or dropped out of) high school, and then chose among three paths: postsecondary education, entry into the civilian labor market, or entry into the military. (Of course, most who dropped out had limited possibilities in terms of further education and the military.) Today, more students continue their education, but they also take longer to finish this education. Even those who attend school on a continuous basis take longer to graduate than they have in the past, and many students take a break from school in the middle. Also, many students attend school and work simultaneously; some even manage to work full time while pursuing their studies.[24]

Along with these trends, most estimates indicate that a large proportion of students who begin postsecondary education do not complete their degrees. For example, one source indicates that as far back as 1990, 30 percent of those who began postsecondary school left *before* beginning a second year [24]. Of those who first enrolled in a 4-year college in 1996, nearly half had not yet completed a degree 5 years later; 17 percent were still enrolled [25]. Therefore, in the late 1990s, dropout rates from 4-year colleges were over 30 percent, which means that at any point in time, there was a large number of 18- to 24-year-olds who had completed some postsecondary education but who had not earned degrees. Again, it is likely that some of these people were not academically prepared for college; others of these "stopouts" and "dropouts" may have been deterred by the rising cost of education.[25] In this case, the Navy has the potential to help them complete college.

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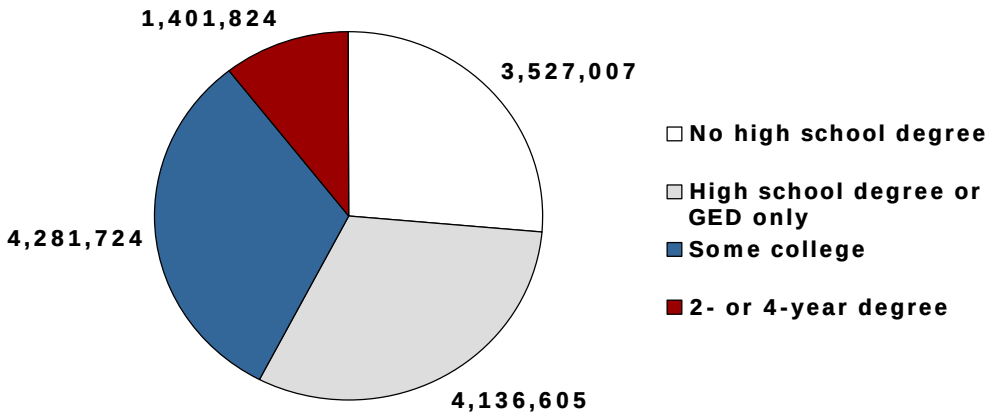
24. For more complete discussion of these changes, see [17] and [18].

25. One-quarter of those who begin at a 4-year school, and over 60 percent of those who begin at a 2-year school, complete some remediation [25]; as discussed above, the inflation-adjusted tuition of the average 4-year college doubled between 1982 and 2002 [23].

Educational attainment

Next, we divide the 3-year CPS sample by level of education. As shown in figure 7, the most common level of education among men in this age group is currently "some college." This is consistent with the figures on attendance and completion cited above. However, a substantial proportion have less education—roughly one-quarter of those age 18 to 24 have no high school degree and another 30 percent have a high school degree (or GED) but no further education. Therefore, despite more than 20 years of increases in college attendance, at the beginning of the 21st century, the majority of men age 18 to 24 had not, in fact, attended college.

Figure 7. Educational attainment of men age 18 to 24[a]



a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Using CPS data, it is not possible to distinguish GED holders from traditional high school diploma graduates. Those who report having completed a graduate degree are included in the "2- or 4-year degree" category.

We also know that many people do not attend college directly after high school; others attend college for some period, then leave, and eventually return. Therefore, we next look at education levels of 19-year-olds compared with 24-year-olds to get an idea of how education

levels change with age. (We begin by looking at 19-year-olds because many 18-year-olds are still in high school.) Table 6 shows that 24-year-olds in the sample do have much higher overall education levels than 19-year-olds; in particular, the proportion holding a 2- or 4-year degree is markedly higher among 24-year-olds than among 19-year-olds. Also, the proportion reporting no high school degree is much lower among 24-year-olds than among 19-year-olds. Even among 24-year-olds, however, 15 percent still do not hold a high school diploma and nearly one-quarter report some college but no postsecondary degree.

Table 6. Level of education by age[a]

Level of education	Percentage of age group	
	19-year-olds	24-year-olds
No high school degree	28.1	15.4
High school degree or GED	35.7	31.9
Some college	35.2	22.9
2- or 4-year degree	1.0	29.8

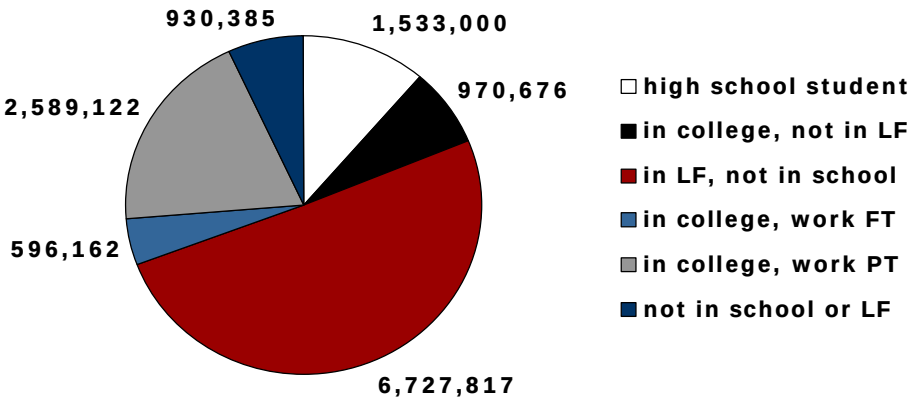
a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Using CPS data it is not possible to distinguish GED holders from traditional high school diploma graduates. Those who report having completed a graduate degree are included in the "2- or 4-year degree" category.

Together, figure 7 and table 6 suggest that the pool of potential recruits with college degrees is currently smaller than the potential pool of high school diploma graduates. Moreover, in this age range, the number of young men who have completed some college is higher than the number who have completed a college degree. This suggests that the "some college" market may be an excellent alternative market for recruits, depending on the quality of these recruits and their motivation for leaving school.

From the numbers in table 6, it is not clear how many of the 18- to 24-year-olds in the sample had actually left school permanently at the time of the survey. Reference [18], among others, documents the increased time frame in which today's youth complete their education. Therefore, we next use the same CPS sample to measure how

many men in this age group are still in school. Figure 8 indicates that, among 18- to 24-year-old men, school enrollment is fairly high; overall, about 43 percent (or about 5.7 million) of these young men are enrolled in school. (Of those in college, a small proportion work full time, while a larger proportion work part time.) However, fully half of this group is in the labor force and not in school; another 7 percent reports neither attending school nor working. Thus, those who are in the labor force but not enrolled in school make up the largest group.

Figure 8. Education and labor force participation of men aged 18 to 24[a]



a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Those who report searching for work are included in the labor force total. Full-time work is defined as working at least 35 hours per week for at least 50 weeks of the previous year.

Like education levels, the workforce/education combinations differ between ages 19 and 24. Table 7 shows that, while over half of all 19-year-olds are enrolled in school, fully three-quarters of 24-year-olds are working and not enrolled in school. As we showed in table 6, about 30 percent of 24-year-olds have a postsecondary degree so the majority of 24-year-olds in the workforce have not completed a college degree. While some of these people may be "stopouts," it is likely that many have completed their education by age 24. This suggests that, despite the sharp increases in college attendance, far fewer than

half of all men eventually complete a college (2-year or 4-year) degree.[26]

Table 7. Education and labor force participation of young men, by age[a]

Education/work	Percentage of age group	
	19-year-olds	24-year-olds
High school student	12.5	0.7
In college, not in the labor force	10.6	3.2
In college, work part time	28.4	9.0
In college, work full time	3.5	5.7
Working, not in school	37.0	75.5
Not in school or working	8.0	5.9

a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Those who report searching for work are included in the labor force total. Full-time work is defined as working at least 35 hours per week for at least 50 weeks of the previous year.

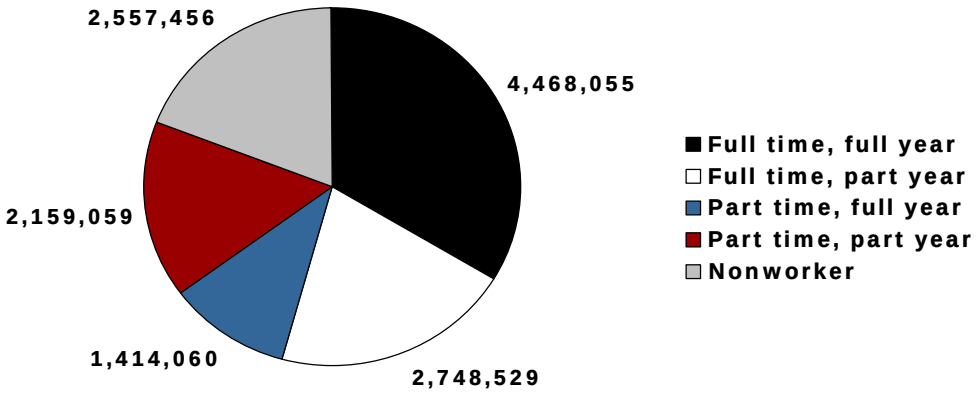
Labor force participation

Finally, we look at labor force participation of this group in more detail (see figure 9). Overall, about one-third worked full time throughout the previous year. Another 20 percent worked full time for at least some of the year, while about the same proportion did not work at all in the previous year. Therefore, roughly 80 percent of this group, or about 11 million young men, took part in the labor force. Those who worked full time probably hold the most potential as recruits.

Labor force participation, like the other outcomes examined above, changes with age. In particular, table 8 shows that the proportion working full time year round is sharply higher among 24-year-olds than among 19-year-olds; the proportion of nonworkers is sharply lower.

26. Consistent with this, the CPS data indicate that 38 percent of all 29-year-olds, who have most likely completed their education, hold some form of a college degree. (We calculate this percentage using data from 2000, 2001, and 2002 as above. We also assume that those who report holding a graduate degree also hold an undergraduate degree.)

Figure 9. Labor force participation of men aged 18 to 24[a]



a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Those who report searching for work are included in the labor force total. Full-time work is defined as working at least 35 hours per week for at least 50 weeks of the previous year.

Table 8. Labor force participation of young men, by age[a]

	Percentage of age group	
Participation level	19-year-olds	24-year-olds
Full time, full year	18.9	58.0
Full time, part year	21.7	19.5
Part time, full year	13.1	6.4
Part time, part year	21.8	6.9
Non-worker	24.5	9.2

a. Source: Authors' calculations using CPS files from March 2000, 2001, and 2002. Figures are weighted to be representative of the U.S. population. Those who report searching for work are included in the labor force total. Fulltime work is defined as working at least 35 hours per week for at least 50 weeks of the previous year.

Other factors with potential to affect future recruit supply

Propensity

In addition to increases in college attendance rates, other changes could also affect the propensity of 18- to 24-year-olds to enlist in the military. First, immigrants or children of immigrants will make up an increasing proportion of this population. These groups have

traditionally had lower propensities to enlist than others [18].[27] Another change in this population group concerns ethnicity; in particular, the proportion of 18-year-old men who are Hispanic is predicted to continue to grow sharply in the near future [17]. It is not clear exactly how this will change propensity. Finally, the proportion of 18-year-old men who are reared by mothers with at least some college, and whose parents did not themselves serve in the military, is predicted to increase [17] and [18]. Both of these trends are likely to have a negative effect on propensity.

Another factor that affects enlistment propensity is the civilian economy. Reference [26] finds that potential recruits respond to the civilian wage; a 1-percent increase in civilian wages results in a 1-percent drop in highly qualified accessions. In general, the pay that someone with a high school diploma (and no additional education) would receive in the civilian sector is the most relevant point of comparison. However, when we consider college recruits in particular, it is likely that they respond to the relatively high pay they could receive in the civilian sector. We discuss these measures in more detail in a later section. However, here we note that a general increase in wages may or may not translate into more pay for members of any given education group. Along with the shift from manufacturing jobs to service-based jobs, during the 1980s through the mid-1990s, American workers with only high school degrees experienced years of stagnant or falling wages; the decline was especially marked for new entrants into the labor market.[28]

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27. The enactment of Executive Order 329 in July of 2002 may change this; while non-citizens in the military have historically faced a waiting period before being eligible to apply for citizenship, this order allows them to apply immediately upon enlistment.

28. Inflation-adjusted wages for those age 18 to 24 with high school degrees fell 24 percent for men and 12 percent for women between 1979 and 1999 [27]. During this time period, returns to experience remained positive ([27, table 2.22] and [28, table 14.3]), so not all individual workers experienced falling wages over time. However, new entrants to the labor force earned less, on average, than similarly educated workers who entered before them. In addition, the experience payoff to men with high school degrees was quite low during this period; in 1979, new male entrants with high school degrees earned $12.19 per hour; by 1995, 34- to 40-year-old men with high school degrees earned $13.93. Therefore, inflation-adjusted wages for this cohort increased less than 1 percent with each additional year of experience. (Authors' calculations are based on [27, table 2.22]).

In contrast, the wages of those with college degrees rose during the 1990s.[29] Only at the end of the long expansion of the 1990s did the inflation-adjusted wages of those with high school diplomas begin to rise [27]. While the growth of the college wage premium may have made it more difficult to recruit college graduates, it is not clear that this wage growth significantly affected overall recruiting. In contrast, the wage growth of HSDGs in the late 1990s almost certainly had a large, negative effect on recruiting [26]. Therefore, the civilian economy certainly affects recruiting; however, to the extent that wage growth tends to occur largely within certain educational groups, the effect may be mitigated or amplified. Any sharp future wage gains of high school graduates are likely to make overall recruiting difficult again. Similar wage gains of college graduates are likely to make expanding the college market particularly difficult.

Changes in school quality

Another important aspect of the recruit pool is overall quality. If the number of potential high-quality recruits falls, the pool effectively shrinks. Earlier, we addressed the likelihood that increased college enrollment rates might cause a decrease in recruit quality if those who attend college are among the most able of the group.[30] However, recruit quality could also decline for other reasons. In particular, if the quality of American secondary education decreases, one might expect the pool of high-quality recruits to shrink.

Periodically over the last 20 years, the quality of American high schools has been subject to wide condemnation. The call for widespread reform began with [29], which stipulated a number of

29. Inflation-adjusted wages of new male entrants with college degrees increased during 1989-1999; growth was sharpest between 1995 and 1999. Inflation-adjusted wages of new female entrants with college degrees increased steadily from 1979 to 1999. By 1999, among new entrants, women with college degrees earned 58 percent more than women with high school degrees; men with college degrees earned 81 percent more than men with high school degrees [27, table 2.22].

30. More generally, any group-specific shift in propensity may cause a change in quality if the group in question is of systematically higher- or lower-than-average quality.

changes as necessary for American students to keep up with those educated in other countries. Although problems certainly exist, especially in specific urban and rural areas, the overall quality of American education has not fallen over the last 20 years. In fact, there is some evidence that test scores increased in some subjects during the 1990s.

The best source of information on overall student quality over time is the National Assessment of Educational Progress (NAEP), a test that is periodically given to a random group of students in each state. The NAEP actually consists of two different types of tests. The Trend Assessment asks the same questions every year it is administered to provide an absolute baseline; the tests began in 1969. In general, the trend is flat over time. The Main National NAEP exams change to reflect changes in the curriculum over time. These test scores show slight upward trends over time.[31]

Another source of information on the quality of students completing high school and applying to college is the Scholastic Assessment Test (SAT). Overall, SAT scores fell through the 1970s and the early 1980s before levelling off. Scores increased slightly during the late 1990s. Most or all of the past decrease, however, can be explained by an increase in the proportion of students taking the test [30]. As the proportion of students attending college increased, the proportion taking the SAT increased as well. There was virtually no change in scores of those from the highest quintile in the 1970s and 1980s; in fact, the verbal scores trended upwards slightly beginning in 1985 [30]. This suggests that the overall quality of high school graduates has not decreased over time, although some who attend college today have lower scores than past college attendees.

Changes in high school completion rates

The mild improvement in test scores suggested by both NAEP and SAT scores is unlikely to either harm or help recruiting, but there is one other troubling trend in secondary education that could well lower the quality of the potential recruiting pool. Many government

31. For more information on the NAEP tests, see http://www.nces.ed.gov/nationsreportcard/.

statistics report a dramatic increase in the number or proportion of people who have completed high school over the last 50 years, with a general flattening of the trend over the last 20 years (see, for example, [31]). These statistics, however, include those with traditional diplomas as well as those who received GEDs. The GED was originally intended to provide an alternative for older high school dropouts for whom returning to school is not practical. However, during the last 15 years the number and proportion of test-takers who are 19 or younger, have increased markedly (see [22] for numbers completing the GED; see [32] for a thorough discussion of this trend). While the GED provides a route to employment and postsecondary education, research shows that those with GEDs have poorer labor market outcomes than traditional high school diploma graduates [33]. Also, DOD treats the GED as a Tier 2 credential for enlistment purposes because GED-holders exhibit much higher attrition than traditional diploma graduates (see, e.g., [34]). Therefore, an increase in the proportion who receive GEDs decreases the pool of high-quality accessions, all else equal.

In 2001, about 650,000 individuals successfully completed the GED exam; of those, over 40 percent were 19 or younger. Therefore, over 260,000 individuals aged 19 or younger received a GED [22].[32] Reference [35] estimates that more than one of every six high school credentials earned today is a GED. Even by more conservative estimates, at least 10 percent of current high school completers earned GEDs rather than traditional diplomas. There are no readily available statistics to estimate the proportion of GED earners who are male, but assuming an even split between the sexes, this implies at least 130,000 young male GED recipients in 2001, or double the number in 1989 (see [22, table 106]).[33] Thus, the growth in GED recipiency since

32. Each state sets the age limit at which a person may take the GED exam. States can change the limits. Also, many states have exceptions to the age limits; for example, a student may be permitted to take the test at an age below the limit with parental or school permission.

33. No information is readily available about the race/ethnicity of GED recipients. More information about the gender and racial/ethnic breakdown of recipients would allow the Navy to more accurately forecast the true effect of the rise in GED recipiency.

1989 is roughly as large as the growth in male college attendance over the same period (see table 5). At the same time, there is potential for additional growth in GED recipiency as states increase the use of end-of-year testing. Therefore, we suggest that this trend could have a negative effect on the pool of high-quality potential recruits.[34]

Combining information from the NAEP and the SAT suggests that the quality of secondary education in the United States has remained at least constant over the last 10 to 20 years. Thus, there is no reason to believe that the overall quality of the pool is shrinking due to falling quality of American high schools. However, the growth in GED recipiency is worrisome; this trend could lower the number of potential high-quality recruits.

Summary

In this section, we have discussed a number of issues, each with the potential to affect the supply of recruits. Our primary focus is on the increase in postsecondary attendance and its effect on recruiting (past and future). However, we also consider other factors, such as the size of the population of potential recruits and changes to the composition of this group. Our analysis indicates that the total number of men in the target age range will actually grow somewhat over the next 10 years. However, changes in the composition of the population may decrease the number who can be successfully recruited. Specifically, the number of immigrants and first-generation Americans in this population is expected to continue to increase. Traditionally, these groups have joined at lower rates than others; however, propensity of immigrants in particular may increase due to Executive Order 329. At the same time, the proportion of youth raised by highly educated parents, and by parents who did not themselves serve in the military, is likely to cause a decline in propen-

34. If the proportion earning GEDs increases sharply, it is possible that the attrition behavior of those with GEDs will change. However, many military researchers theorize that the "seat time" in high school is associated with the low attrition of traditional diploma graduates; coupled with other negative outcomes of GED holders in this case, this suggests that such a change is unlikely [35].

sity. The best estimates of the relative sizes of these factors indicates that the growth in population is large enough to cancel out the other effects [18].

Trends in postsecondary enrollment have received substantial attention from researchers. The past increase in attendance certainly had the *potential* to make recruiting much more difficult. It did not actually do so, for two reasons. First, the increase in postsecondary attendance was largely concentrated among women, who are recruited into the military at much lower rates than men. White non-Hispanic men, in particular, attend college at only slightly higher rates than they did in the past. Thus, we estimate that there remains a large pool of potential recruits who have not earned college degrees. Second, the overall size of the Services' recruiting mission decreased dramatically due to the military drawdown. A combination of a smaller recruiting mission and a concentration of women among those attending college actually meant that the ratio of men who did not attend college to recruits actually increased during the 1990s. Assuming a constant recruiting mission, this ratio is expected to decrease only slightly over the next 10 years.

Beyond an increase in college attendance, several other educational trends could affect recruiting, both positively and negatively. First, the growth in those earning GED certificates, rather than traditional high school diplomas, is potentially troubling to the Services. This trend will decrease the overall size of the recruiting pool since the GED is not a Tier 1 credential. It may also cause a decrease in the quality of the recruiting pool. Second, many people now take much longer to complete their postsecondary education than in the past; a large number also begin, but do not complete, college. These changes create opportunities for the Navy to offer combining education and military service as a recruitment incentive, and to recruit people with some college but no degree. Third, changes in the quality of high school education could affect recruiting. However, there is little evidence that the overall quality of high school education in America has decreased over the last 20 years; some measures, in fact, suggest small gains.

The civilian economy is also an important factor in recruiting. Near the end of the 1990s, wages of those with high school degrees increased for the first time in 20 years. This had an immediate effect on recruiting; the late 1990s were very tough recruiting years with the Navy missing its mission in FY98. It is difficult to predict the growth of relative wages, but, if the economy rebounds and we again see wage growth for high school graduates, recruiting will likely suffer. Also, as long as those with a college degree continue to receive sizable wage premiums, recruiting a substantial number of college-degree-holders is likely to remain difficult.

Finally, our analysis implicitly assumes that the recruiting mission will remain at approximately the current size in the foreseeable future; an increase in the mission will, of course, increase the difficulty in recruiting high-quality enlistees.

Will more college recruits increase the quality of the enlisted force?

We explicitly distinguish between the college market and the traditional high school market because youths from these two sources are expected to differ in ways that affect their desirability as Navy recruits in terms of both quality and cost. Specifically, college recruits are expected to be of higher quality than high school graduates with traditional diplomas, but they are also expected to be more expensive to attract and retain. Since a college education is not required for eligibility in any enlisted rating, one must determine empirically whether extra education does, in fact, contribute to better Navy outcomes. The goal of this section is to do this for college recruits who have accessed in the past decade or so, and who have worked within the Navy's existing systems for classification and training. In particular, since we are interested in understanding the *extra* value of college education, our basis for evaluating college recruits' quality is the extent to which they have better initial qualifications or better Navy outcomes than traditional HSDG recruits. To paint the broadest possible picture of recruit quality, we analyze not only continuation behavior, but also pre-Service indicators of recruit quality and Navy school and fleet outcomes.

Main issues

Expectations regarding education level and recruit quality

The expectation that the quality of recruits increases with education level is based on both economic theory and empirical evidence. In theory, economists expect education to be positively correlated with higher quality (or greater on-the-job productivity) for two reasons that may hold alone or simultaneously. First, a person is expected to accumulate more skills as he or she advances through the education

system. More skills, in turn, are expected to make a person more able and more productive.[35] Second, it may also be true that, independent of what they learn in school, people who choose different educational paths are likely to have different ability levels and different personal characteristics that we may not be able to observe.[36] In particular, we expect people who complete their degree programs to be more likely to complete their initial obligations. College recruits may also be more likely to complete training without setbacks or to be promoted relatively early.

In practice, it is well established that a recruit's initial education level is a primary indicator of his or her future attrition behavior: recruits who access with more education typically have lower attrition. Even after controlling for AFQT score and other personal characteristics, HSDGs have much lower attrition than recruits with either no high school credential (non-HSDGs, or NHSDGs) or alternative high school credentials, such as GEDs or certificates from adult education programs.[37] Furthermore, [6] shows that BD recruits have lower 6-month attrition than AD recruits who, in turn have lower 6-month attrition than HSDG recruits.

Attrition is a commonly used metric for quality for the simple reason that those who fail to complete their terms of service must be replaced; this replacement is costly, especially when the recruit's job requires extensive training. While we recognize that attrition is an important measure, we also note that there are many other important aspects of quality. It is certainly possible that two Sailors, each of whom completes his or her term of obligation, could have vastly different levels of quality. For example, one Sailor may complete training only with difficulty, resulting in setbacks, and may be promoted after most of his peers, whereas the second Sailor completes training easily, scores high on all exams, and is among the first in his or her cohort to be promoted. Most supervisors would disagree with the notion that because both completed their terms, they were of equal

35. This hypothesis is part of the human capital theory of education [5].

36. This hypothesis comes from the signalling theory of education [36].

37. See [34], [37], and [38].

quality. Moreover, it is possible that the second Sailor is less likely to reenlist due to more favorable civilian opportunities; nonetheless, the second Sailor may be of much higher quality than the first.

Caveats—self-selection bias and the classification system

Although we expect college recruits to have higher continuation rates and to be more productive, there may be reasons why this expectation is not, in fact, realized. First, since very few people with college experience join the Navy, it may be that those who do have worse-than-average civilian opportunities because they are less able than the average college graduate. And, if the college recruits currently joining the Navy are indeed of low-ability, they may not be of higher quality than the HSDG enlistees. Second, even if college recruits are high-quality college students, since the Navy fully trains all its recruits, the skills associated with college education may be redundant. Third, the classification process may not fully take into account skills acquired through education. Because we have no information on college recruits' actual courses of study, we cannot test whether the second and third possibilities are true. However, we can directly investigate the first possibility by comparing the education-specific AFQT scores of Navy recruits to the education-specific scores of the population; we do so in the next section. (We also investigate differences in training costs in a later section.)

Data

To analyze continuation behavior, we pulled individual-level data from the EMR by year of accession for FY92 through FY02. Since we measure Sailors' status as of December 2003, we did not look at FY03 accessions because very few of these Sailors would have had the chance to complete at least 12 months of service.

For this time period, our data show that about 9 percent of those who accessed with a BD left the enlisted force to become Officers, compared with less than 1 percent for all other groups of recruits. Since the focus of this study is on the performance of college recruits in the enlisted force, we do not include officer transfers in our main analyses; unless otherwise noted, data we report for BD recruits do not

include those who transferred to the officer community before January 2004. In appendix B, we present a separate analysis of the characteristics and Navy outcomes of BDs who transferred to the officer community.

Pre-Service indicators of recruit quality

AFQT scores

The most direct available measure of a recruit's quality is his or her AFQT score. In general, we expect AFQT scores to increase with education level for the same combination of reasons that we expect quality to increase with education level: the positive relationship may be due to extra knowledge or skills learned in school, or it may be due to an underlying positive relationship between the likelihood of having more education and being more able.

If AFQT scores measure innate ability, it is appropriate to compare raw average AFQT scores by education level to evaluate the relative quality of college recruits. These data are presented in table 9. As expected, AD and BD recruits in the sample have relatively high AFQT scores. NWCs, in contrast, have lower AFQT scores than HSDGs, and much lower scores than college-degree-holders.

Table 9. Average AFQT scores, by education level[a]

	HSDG	NWC	AD	BD[b]
Average AFQT score	59.4	54.7[c]	70.6[c]	77.8[c]

a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data on BDs do not include Sailors who transferred to the officer community. The average score for all BD accessions in the sample is 78.8.
c. Significantly different from the average HSDG score with 95-percent confidence.

If AFQT scores reflect what people learn in school, it is more appropriate to compare education-adjusted AFQT scores to analyze underlying recruit quality. The best estimates of the effect of education level on AFQT score indicate that scores increase roughly 4 percentage points for each additional year of school [39]. We list schooling-adjusted

AFQT scores for HSDGs, ADs, and BDs in table 10.[38] These adjusted scores indicate that the true quality difference between BDs, ADs, and HSDGs in the sample may actually be smaller than the unadjusted scores suggest; when we adjust for the education effect on AFQT scores, the true quality of ADs is equal to that of BDs.[39] The adjusted scores also suggest that differences in AFQT scores by education level may imply smaller quality differences between ADs and BDs than, for example, between two HSDG recruits whose AFQT scores differ by 8 points.

Table 10. Education-adjusted AFQT scores, by education level

	HSDG	AD	BD[a]
AFQT, no college	59[b]	64	64
AFQT, 2 years of college	66	71[b]	71
AFQT, 4 years of college	73	78	78[b]

a. BD average is based on the average for BD Sailors who did not transfer to the officer community.
b. Actual average in the Navy sample.

Do college recruits resemble the population of college graduates?

Although the data show that college-degree-holders who enlisted in the Navy during the study period did have higher AFQT scores than the HSDG recruits, it's still possible that college-degree-holders enlisted because they were less able than the average college-degree-holder in the population.[40] We explore this possibility by comparing

38. We do not calculate adjusted scores for HSWCs or NWCs because we don't know how many years of schooling they actually have.

39. Of course, BDs may pick up skills during their extra years in school that not only raise their AFQT scores but make them more productive Sailors. If this is true, they may be higher quality recruits than ADs in ways that are not captured by AFQT scores.

40. Of course, college enlistees probably differ from the overall population in ways that are not related to their ability. In particular, it is likely that college recruits have a "taste" for the military. In other words, they are likely to prefer military service more than the average college graduate.

education-specific average AFQT scores of Navy recruits to education-specific scores of the U.S. population.

For HSDGs, ADs, and BDs, figure 10 compares the AFQT scores of Navy recruits with those of young men in the U.S. population at large.[41] Beginning with our reference group, HSDGs, the figure shows that during the 1990s, Navy recruits with high school diplomas had a higher average score than civilian HSDGs. This suggests that among HSDGs there was "positive selection" into the Navy; recruits are of higher quality (as measured by AFQT scores) than the general population. Of course, this positive selection is partially imposed by the Navy itself—a result of the AFQT restrictions the Navy puts in place. Thus, the figure demonstrates that a substantial proportion of the high school educated population was not eligible for enlistment. Positive selection may also, however, have been a product of the marketplace—a result of HSDGs weighing their options and their tastes, and finding that the Navy was their best choice.

For college recruits, the average score of AD recruits who accessed during the study period was higher than the average score of the total AD population. Thus, there was also positive selection for ADs. As with HSDGs, this is likely to reflect a combination of two factors: some ADs were not eligible for Navy enlistment and some high-quality ADs chose the Navy. In contrast, the average score of BD recruits was lower than the average score of the total population. This result has two implications: first, the Navy's AFQT restrictions were not binding for most BD recruits;[42] second, relatively good civilian opportunities and/or tastes generated some negative self-selection among BDs. Thus, college recruits do not seem to be of substantially lower quality than the population of college graduates.

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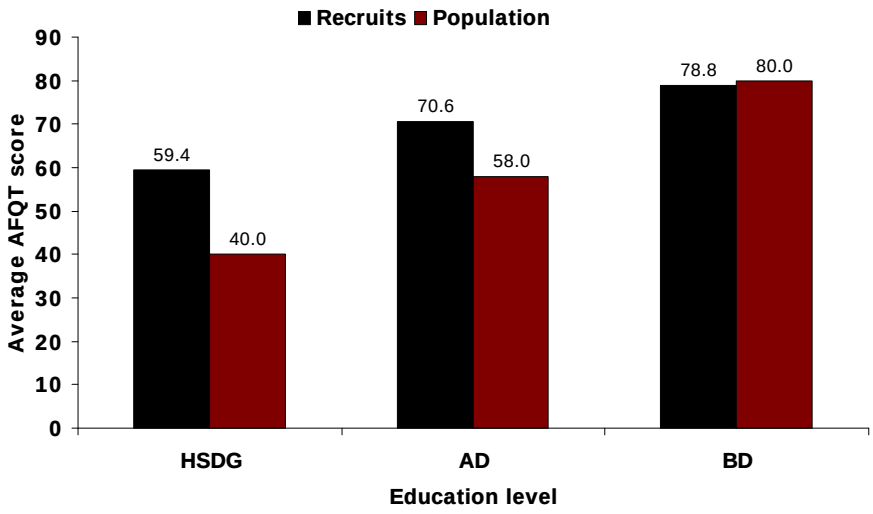
41. Population AFQT scores for white males from National Longitudinal Survey of Youth (NLSY), as reported in [39], translated into percentile scores. NLSY scores were collected in 1980. Because there is little indication that the overall distribution of AFQT scores has changed over time and the NLSY represents the largest sample of college-educated AFQT scores readily available, we use this source.

42. In our sample of BD recruits, only 10 percent had a score of 50 or below and only about 26 percent had a score below 70.

Figure 10. AFQT scores of Navy recruits vs. the U.S. population, by education level[a]



a. Population AFQT scores for white males in 1980 from the National Longitudinal Survey of Youth (NLSY) as reported in [39].

Initial rating assignments

Rating groups based on length of A-school training pipeline

If college recruits have more skills and are more likely to succeed in the Navy schoolhouse, an important requirement of reaping benefits from college recruits is that they be assigned to ratings with longer and potentially more rigorous training pipelines. The fact that college recruits had higher AFQT scores indicates that they were, indeed, more likely to qualify for ratings with technical training. In this section, we look at how rating promised varied by education level in our sample to see if the classification system takes advantage of the college ability premium implied by college-degree-holders' higher AFQT scores.

To make ratings comparisons for different types, we define groups of ratings based on the lengths of their A-school training pipelines. (Creating these groups is necessary because the rating-specific

samples for each type of college recruit are too small to allow meaningful comparisons across groups.) We define four groups of ratings:[43]

- Ratings with short pipelines—60 days or fewer.
- Ratings with medium pipelines—more than 60 days, but fewer than 100 days
- Ratings with long pipelines—100 days or more
- Uncategorized ratings—ratings that could not be categorized using training data.[44]

In addition to these groups, we present data showing education-specific differences in the likelihood of being promised training in the Nuclear Field and of accessing with no school guarantee at all.

Ratings promised for HSDGs, NWCs, ADs, and BDs

Table 11 shows promised rating by education level. The top half of the table shows how many Sailors in each education group were promised ratings in each rating category; the bottom half of the table shows the education-specific distributions of Sailors across rating groups. We first note education-specific differences in the likelihood of accessing without a school guarantee. NWCs were 21 percent more likely than HSDGs to access with no guarantee, while ADs and BDs were, respectively, 28 and 48 percent less likely to access with no school guarantee. The data also show that recruits with ADs and BDs were more likely than HSDGs to be promised ratings in the long-pipeline group; ADs were also less likely to be promised ratings in the short-pipeline group. In contrast, NWCs were more likely to be promised ratings with short pipelines and less likely to be promised ratings with long pipelines. Finally, ADs and BDs were slightly more likely than HSDGs to be promised Nuclear Field (NF) training; NWCs are not eligible for the

43. There are 134 promised ratings or programs and 86 ratings that are actually achieved. Appendix C includes a description of how pipeline lengths were determined, and a complete list of ratings in each group.

44. Some promised ratings could not be categorized because they are actually groups or families of ratings with pipeline lengths that fall into different categories based on the definitions above.

Nuclear Field, but the PRIDE data show that a handful were promised NF training over the 11-year period.[45]

Table 11. Promised rating group by education level, frequencies and education-group distributions across rating groups[a]

Rating group	HSDG	NWC	AD	BD[b]	Total
Frequencies					
No school guarantee	155,009	5,467	844	897	162,217
Short[c]	79,151	2,921	514	865	83,451
Medium[d]	56,560	1,619	392	664	59,235
Long[e]	122,042	3,114	1,290	1,989	128,435
Nuclear Field	33,551	53	329	447	34,380
Uncat	29,869	748	184	376	31,177
Total	476,182	13,922	3,553	5,238	498,895
Education-group distributions across rating groups (%)					
No school guarantee	32.6	39.3	23.8	17.1	32.5
Short	16.6	21.0	14.5	16.5	16.7
Medium	11.9	11.6	11.0	12.7	11.9
Long	25.6	22.4	36.3	38.0	25.7
Nuclear Field	7.0	0.4	9.3	8.5	6.9
Uncat	6.3	5.4	5.2	7.2	6.2
Total	100.0	100.0	100.0	100.0	100.0

a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data on BDs do not include Sailors who transferred to the officer community.
c. Short = 0 - 59 A-school days.
d. Medium = 60 - 99 A-school days.
e. Long = 100 or more A-school days.

When considering needs for the future fleet, it is also important to note that Gendet accessions decreased by 55 percent over the study period—from 41 percent of total accessions in FY92 to 19 percent in FY02. This decrease, however, was not uniform across education levels. The share of NWCs accessing as Gendets decreased by 52 percent, but the shares of ADs and BDs accessing as Gendets decreased by 63 and 80 percent, respectively.[46]

45. In appendix D, we also list the top 10 promised rating programs for each group of recruits.

46. The decrease in the share of HSDGs with no school guarantee was 54 percent—very close to the overall decrease because HSDGs comprise the bulk of accessions.

In general, education-specific patterns for promised ratings indicate that, at least to some extent, college-degree-holders are being directed to ratings in which their additional ability and extra education may be of particular value.

Promised rating and initial obligation length

Ratings with longer, more costly training pipelines tend to have longer initial obligation lengths to increase the likelihood that the Navy will recoup its training investments.[47] Thus, the fact that college-degree-holders are more likely to be assigned to long-pipeline ratings means that they should also be more likely to enter the Navy with longer obligations. The data on the left side of figure 11 confirm that obligation lengths increase with length of training pipeline, and the data on the right confirm that obligation lengths increase with education level. Specifically, all college recruits were more likely than HSDGs to have 5-year obligations, and college-degree-holders were more likely to commit to 6-year obligations.

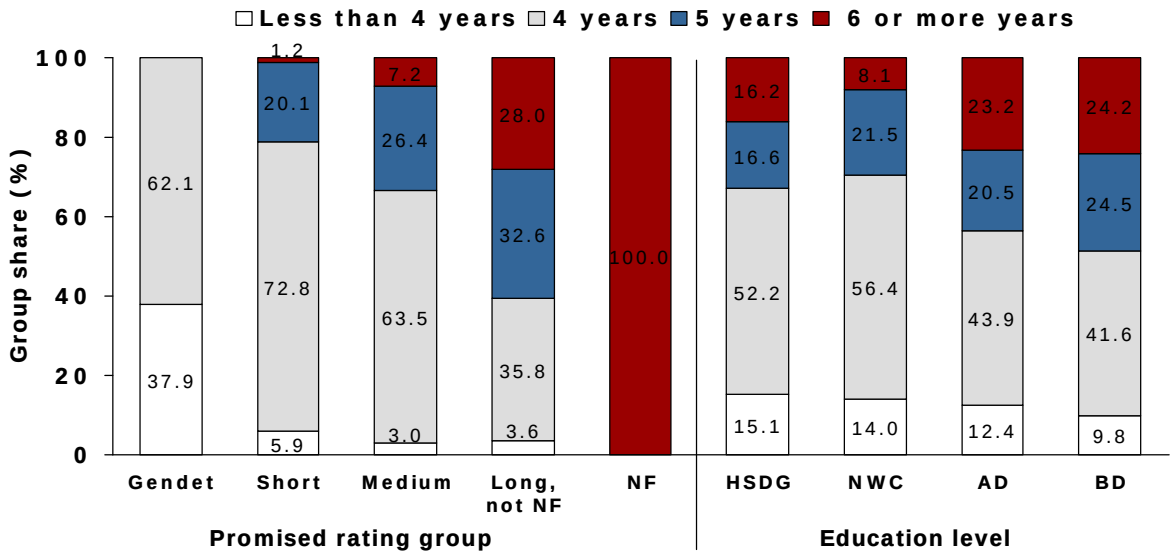
These relationships are important because they have implications for relative continuation behavior. Specifically, college-degree-holders may spend more time in the Navy because they may be more likely to complete their obligations, and/or because their obligations are longer than those of other recruits.

Pre-Service indicators of quality for HSWCs

Table 12 shows data on AFQT scores, ratings promised, and obligation length for HSWCs and other types of recruits who accessed in FY03. In terms of AFQT score, HSWCs look more like college-degree-holders than like NWCs. In particular, the average AFQT score of HSWCs who accessed in FY03 was 3.1 percentage points higher than the average score of ADs who accessed in FY03.

47. Cost of training is an important factor in determining obligation lengths, but it is not the only factor. Other important factors include continuation rates and billet structure. For more on optimal obligation lengths, see [40].

Figure 11. Initial obligation length by promised rating group and by education level[a,b]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data on BDs do not include those who transferred to the officer community.

Table 12. Ratings promised for HSDGs who did and did not receive EBCCs in FY03

	HSDG				
	Without EBCC	With EBCC	NWC	AD	BD
Average AFQT score	58.5	72.2	53.7	69.1	77.6
Sample size	31,776	1,925	1,623	419	801
Percentage of accessions by promised rating group					
No school guarantee	25.3	18.8	33.6	17.2	14.6
Short pipeline	24.1	20.8	30.4	22.0	20.7
Medium pipeline	11.0	10.3	10.3	12.2	12.1
Long pipeline	24.5	30.2	18.8	32.7	38.2
NF training	6.1	11.4	0.3	6.9	8.0
Uncategorized	9.1	8.5	6.7	9.1	6.4
Percentage of accessions by initial obligation length					
Less than 4 years	2.7	1.9	2.5	4.3	2.6
4 years	52.9	42.3	59.2	43.2	38.7
5 years	32.2	33.7	34.3	37.5	36.2
6 or more years	12.2	22.1	4.1	15.0	22.5

Consistent with their higher average AFQT scores, HSWCs who can be identified using the EBCC data were more likely than other HSDGs to be given a school guarantee and to be promised ratings with long training pipelines; they were less likely to be promised ratings with short pipelines. Finally, HWCS—like ADs and BDs—were more likely than HSDGs to commit to 6-year obligations.

Navy outcomes

To assess Navy outcomes for college recruits, we use a number of different metrics. Our primary metric is continuation, which encompasses both differences in attrition behavior and differences in reenlistment rates. Replacing recruits is costly; this is particularly true in the case of recruits who receive extensive training as part of their first terms. Therefore, we examine continuation rates of college recruits carefully; we compare college recruits' continuation rates with those of traditional HSDG recruits.

However, we expect that some of the differences between college recruits and others may not be apparent simply from measuring continuation. Therefore, we examine several other metrics that are likely indicators of relative quality, such as school and fleet outcomes. The schoolhouse outcomes are academic setback and attrition rates, and the likelihoods of being rated, of achieving the rating that was initially promised, and achieving a long-pipeline rating. The fleet outcomes are demotion and promotion rates, and participation in officer programs.

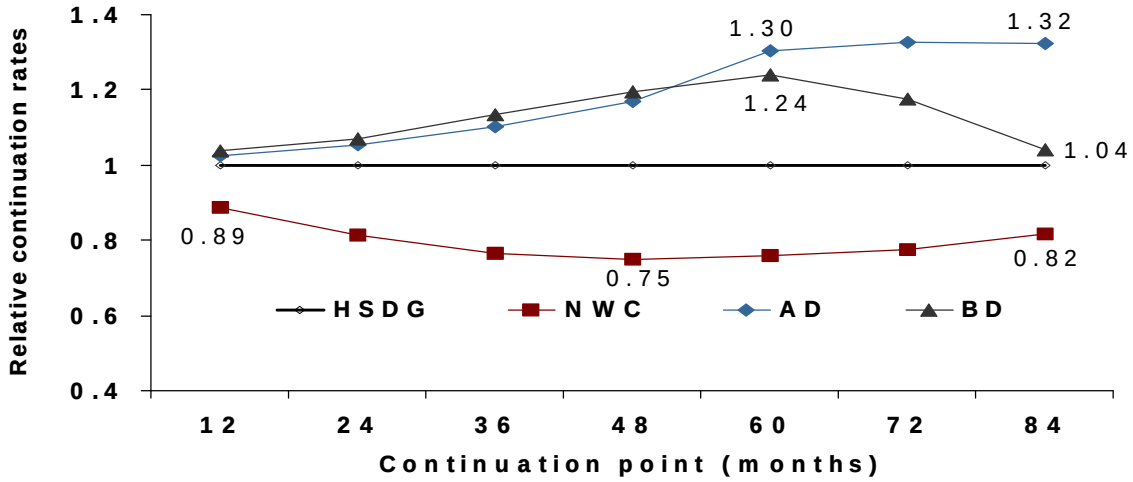
Unadjusted continuation behavior

Our primary measure of continuation behavior is annual or 12-month continuation rates from the first through the seventh year of service (i.e., 12 months through 84 months). We also look at the attrition and reenlistment rates that underlie these annual continuation rates. Since Navy ratings vary substantially in terms of eligibility requirements, first-term obligation length, length and rigor of the training pipeline, and advancement rates, we will make college/no-college comparisons by rating or rating group whenever possible.

Year-over-year continuation rates

Figure 12 illustrates our primary continuation results. Specifically, the data show the *relative* continuation rates of each type of college recruit measured by the ratio of each college group's continuation rates to HSDGs' rates. The data show that, in terms of continuation behavior, NWCs fared much worse than HSDGs through the first term of service and beyond; NWCs had lower continuation rates at every 12-month milestone through 84 months. After reaching a minimum of 75 percent of the HSDG rate at the 48-month point, however, the relative continuation rates of NWCs do begin to recover through 84 months.

Figure 12. Raw continuation rates by education level[a,b,c,d,e]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data for BDs do not include those who transferred to the officer community.
c. For all continuation points, NWC rates were significantly lower than HSDG rates with 95-percent confidence.
d. For all continuation points, AD rates were significantly higher than HSDG rates with 95-percent confidence.
e. For 12 through 72 months, BD continuation rates were significantly higher than HSDG rates with 95-percent confidence; at 84 months BD continuation was not significantly different than HSDG continuation.

The relative continuation rates of BDs show the opposite pattern: 12-month continuation rates for these Sailors were slightly higher than the rate for HSDGs, and the differences increase through the

60-month point to a maximum of 24 percent; then they decline.[48] Finally, ADs had the highest overall continuation rates. Compared to that of HSDGs, AD continuation starts out higher and the differences increase (at a decreasing rate) throughout the first term and beyond. Furthermore, not only did ADs have higher continuation rates than HSDGs, they had higher rates than BDs after the 48-month point.

Underlying attrition/loss rates

Since different types of recruits commit to different obligation lengths and have different school assignments, they also reach various career milestones at different LOS points during the first term. Therefore, interpretation of the annual continuation rates presented in figure 12 is facilitated by looking at the phase-specific, first-term loss rates underlying them.

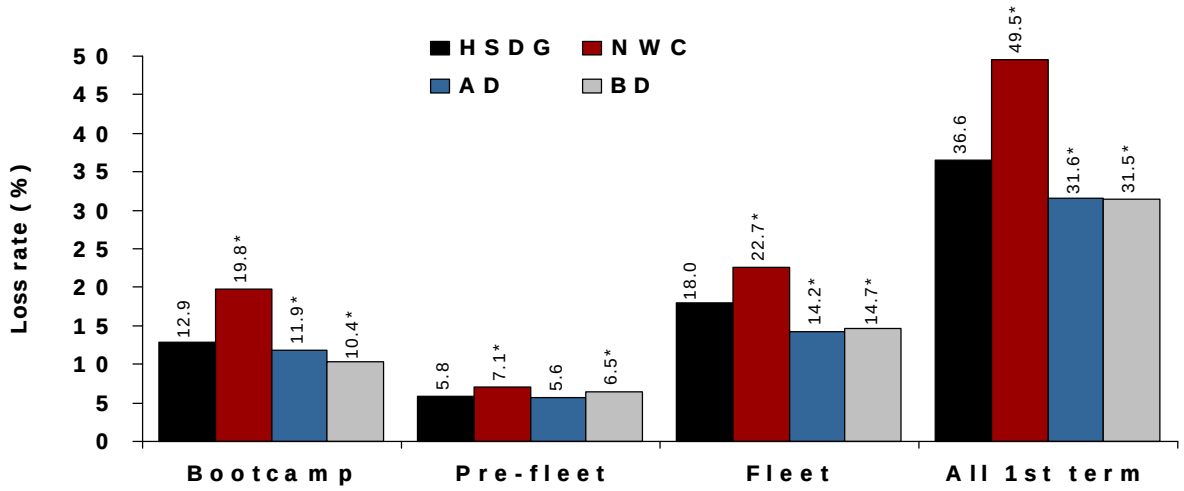
Figure 13 shows bootcamp, pre-fleet, fleet, and overall first-term, pre-obligation loss rates by recruit type.[49] The data show that, relative to HSDGs, NWCs had higher loss rates at all stages of the first term, especially at RTC and in the fleet. As a result, NWCs had a much higher total first-term loss rate than HSDGs—50 percent for NWCs vs. 37 percent for HSDGs. Both ADs and BDs had lower bootcamp and fleet loss rates than HSDGs. The pre-fleet loss rates of ADs were quite close to those of HSDGs, while the pre-fleet loss rates of BDs were a bit higher. Overall, the total first-term, pre-obligation loss rates of ADs and BDs were both about 5 percentage points lower than the overall HSDG loss rate.

One important factor to take into account when considering pre-fleet loss rates is that ADs and BDs tended to be promised ratings with longer training pipelines. Therefore, in figure 14, we show pre-fleet loss rates by education level and promised rating group. The data show that, for all recruit types, pre-fleet loss rates generally increased with the length of the promised training pipeline. Pre-fleet loss rates were especially high for those promised NF training. Therefore, the

48. For both NWCs and BDs, we will later show that the patterns of relative continuation are largely driven by differences in reenlistment behavior.

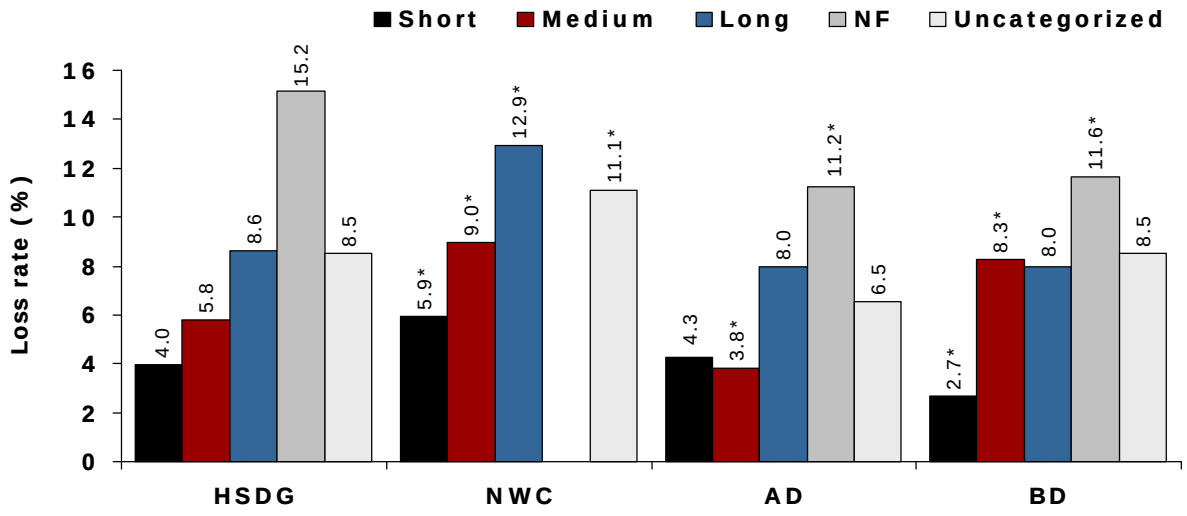
49. First-term, pre-obligation losses are those that occur prior to the end of the first obligated term of service. They include attrition as well as other kinds of losses.

Figure 13. Pre-obligation loss rates (bootcamp, pre-fleet, fleet, and overall), by education level[a,b,c,d]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Loss rates are not regression-adjusted.
c. Data for BDs do not include Sailors who transferred to the officer community.
d. * indicates that the difference between the loss rate of college recruits and the loss rate of HSDGs is statistically significant with 95 percent confidence.

Figure 14. Pre-fleet loss rates by education level and promised rating group[a,b,c]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data for BDs do not include Sailors who transferred to the officer community.
c. * indicates that the difference between the loss rate of college recruits and the loss rate of HSDGs is statistically significant with 95-percent confidence.

fact that ADs and BDs were more likely than HSDGs to be promised long-pipeline ratings increased their overall relative pre-fleet loss rates. To illustrate this idea more concretely, note that if ADs and BDs were promised ratings in each group in the same proportions as were HSDGs, the weighted averages of their rating-group-specific, pre-fleet loss rates would be 4.8 percent (rather than 5.6 percent) and 5.5 percent (rather than 6.5 percent), respectively.

Continuation and loss behavior for HSWCs in FY03

Since we can only identify HSWC accessions from FY03, our ability to analyze continuation and loss behavior for this group is limited. However, we can observe 12-month continuation rates for those who accessed early in FY03, and we can also measure bootcamp loss rates for nearly all of the FY03 cohort. These data are summarized in table 13 for HSDGs who did and did not receive EBCCs, as well as for the three groups of college recruits whose education level we can observe directly. The data show that the HSWCs had lower bootcamp and first-year loss rates than the HSDGs who did not receive EBCCs in FY03. Based on this small sample, the data indicate that HSWCs are likely to have better continuation behavior than HSDGs with no college. In fact, the loss rates of HSWCs with EBCCs are comparable to those of college-degree-holders.

Table 13. Bootcamp and pre-12-month loss rates for HSDGs who did and did not receive EBCC in FY03 and by college recruit type

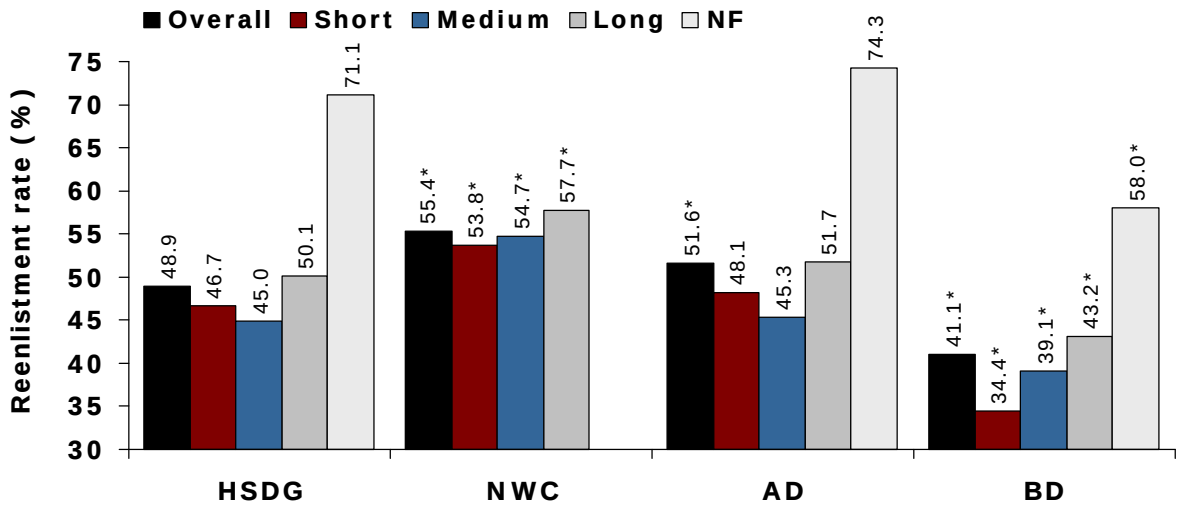
	Bootcamp loss		Loss before 12 months[a]	
Education level	Sample size	Rate (%)	Sample size	Rate (%)
HSDG without EBCC	31,776	9.0	6,874	14.1
HSDG with EBCC	1,925	7.4[b]	261	11.1
NWC	1,623	13.9[b]	400	21.3[b]
AD	419	7.2	89	14.6
BD[c]	801	6.0[b]	148	10.1

a. 12-month continuation rates were calculated for FY03 accessions who shipped in October, November, and December 2002.
b. The difference between the loss rate of college recruits and the loss rate of HSDGs is statistically significant with 95-percent confidence.
c. None of the FY03 BD accessions had transferred to the officer community as of December 2003.

Reenlistment rates

Figure 15 shows data on the Zone A reenlistment rates of Sailors in each education group (conditional on being rated). The patterns by rating group are similar for all four groups of recruits; the lowest rates are in short-pipeline ratings and the highest are in long-pipeline and NF ratings. NWCs had higher reenlistment rates than HSDGs overall and in every non-NF rating group; ADs' reenlistment rates were similar to HSDGs' rates in all three non-NF groups, and slightly higher in the Nuclear Field (though the difference is still not statistically significant). BDs, however, had lower reenlistment rates than HSDGs overall and in every rating group. Indeed, although BDs' reenlistment rates increased substantially with length of pipeline, only in the Nuclear Field did the BD reenlistment rate exceed the lowest rate for HSDGs.

Figure 15. Zone A reenlistment rates by education level and achieved rating group[a,b,c,d]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Reenlistment rates are conditional on being rated and are not regression-adjusted.
c. Data for BDs do not include Sailors who transferred to the officer community.
d. * indicates that the difference between the reenlistment rate of college recruits and the reenlistment rate of HSDGs is statistically significant with 95-percent confidence.

These data indicate that the increases in the relative continuation rates of NWCs and the decreases in the relative continuation rates of BDs after 48 months were due to the fact that NWCs who made it through their first terms were more likely than HSDGs to reenlist, while BDs were less likely to reenlist.

AFQT-adjusted continuation behavior

As shown in table 9, AFQT scores vary greatly by education level. Because AFQT scores are positively correlated with higher continuation rates, we would like to be sure that the differences in continuation rates shown in figure 12 are due to education differences, rather than simply differences in AFQT scores. If we find that performance differences can be traced to AFQT scores, rather than college education, it suggests the Navy should focus on recruiting people with high AFQT scores rather than those with additional education. In this case, college campuses are simply a source of high-AFQT recruits.

Informal control

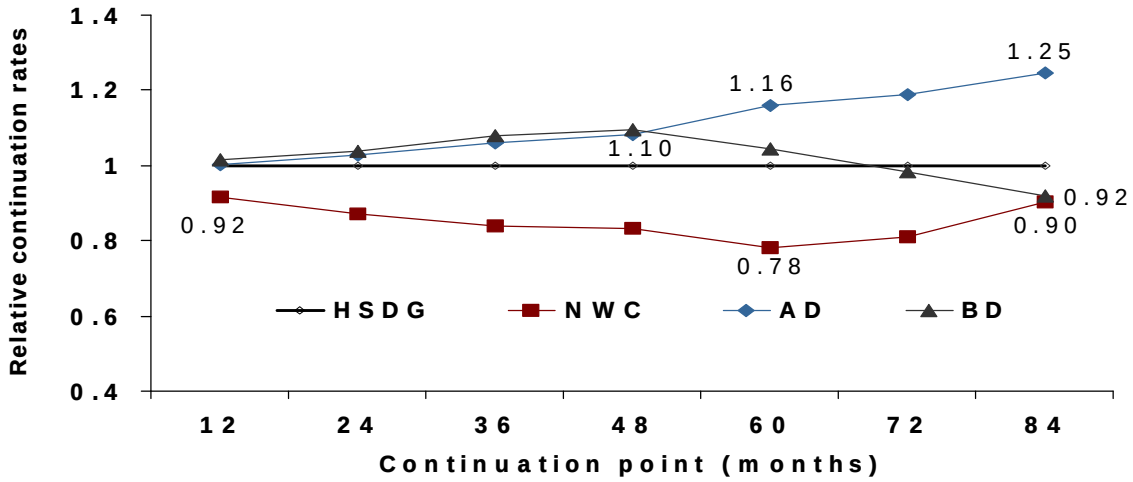
As a first step to examining the interaction between education level, AFQT scores, and continuation, we present in figure 16 relative continuation rates for Sailors with AFQT scores greater than 70. When we control for AFQT in this informal way, differences between the continuation rates of college recruits and HSDGs become smaller, but the general patterns of relative continuation persist.

NWCs' continuation rates are still below those of HSDGs at every 12-month milestone, and they still begin to approach HSDG rates over time. As with the full sample, ADs' continuation rates in the restricted sample are comparable to HSDGs' rates at 12 months, but become increasingly higher over the first term and beyond. Finally, for BDs, the general pattern of relative continuation for the AFQT-restricted sample is similar to that for the full sample, but there are important differences. First, the BD/HSDG ratio peaks at 48 months in the restricted sample, rather than at 60 months. Second, the BD/HSDG ratio actually falls below 1 after 60 months in the restricted sample.

Comparing figures 12 and 16 suggests that, although differences in AFQT scores explain some of the education-specific differences in

continuation rates for the first 8 years of service, they cannot explain all of the differences. Specifically, even for high-AFQT recruits, the continuation rates of ADs remain above those of HSDGs throughout the 84-month period, while the continuation rates of BDs remain above those of HSDGs for the first 60 months. NWC continuation rates remain lower than HSDGs' rates at every 12-month milestone. Therefore, recruits with college degrees still behave differently than recruits without college degrees even after a rough control for AFQT score.

Figure 16. Continuation rates for Sailors with AFQT above 70, by education level[a,b,c,d,e]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data for BDs do not include those who transferred to the officer community.
c. For all continuation points, NWC rates were significantly lower than HSDG rates with 9- percent confidence.
d. For 24 through 84 months, AD continuation rates were significantly higher than HSDG rates with 95-percent confidence; at 12 months, AD continuation was not significantly different than HSDG continuation.
e. For 12 through 48 months and at 84 months, BD continuation rates were significantly higher than HSDG rates with 95-percent confidence; at 60 and 72 months, BD continuation was not significantly different than HSDG continuation.

Formal control: regression-adjusted continuation rates

Next, we use regression analysis to estimate continuation rates for each group of recruits as a function of AFQT scores and other personal characteristics. In particular, the formal model controls for

promised rating group, which allows us to control for the impact of education-specific differences in obligation length and likelihood of completing the initial obligation. We use these models to estimate continuation rates for each group under different assumptions about AFQT scores, all else constant. Full estimation results are presented in appendix E; here we point out that the relationship between AFQT score and continuation varies by education level and by continuation point.

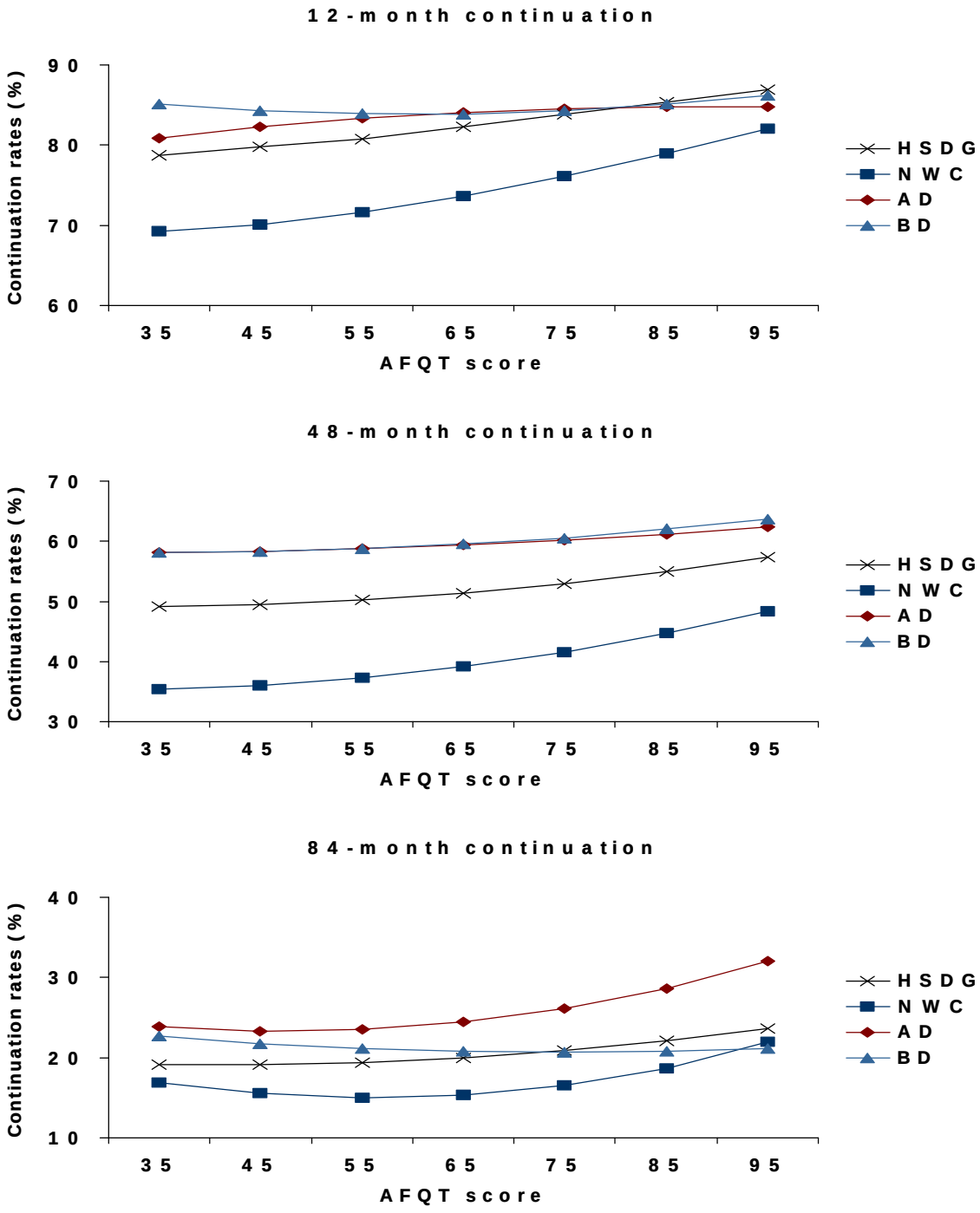
The three panels of figure 17 show how 12-, 48-, and 84-month continuation rates vary by AFQT score for each group of recruits. The panels show that, in general, the continuation behavior of ADs and BDs is estimated to be less sensitive to changes in AFQT scores than is the continuation behavior of HSDGs.[50] Another important result illustrated in the figures is that, for BDs, the estimated relationship between AFQT score and 84-month continuation is negative: as the AFQT score increases, the estimated 84-month continuation of BDs falls. This result may indicate that low reenlistment rates for BDs are associated with better civilian opportunities, especially for high-quality BDs.

In contrast to the college-degree-holders, NWC continuation behavior is *more* sensitive than HSDG continuation behavior to changes in AFQT scores: as AFQT scores increase, estimated NWC continuation rates increase by more than estimated HSDG continuation rates increase.

In general, for regression-adjusted continuation, the differences between HSDGs and the three types of college recruits are larger for those with lower AFQT scores and smaller for those with higher scores. At low AFQT scores, the extent to which the estimated continuation of ADs and BDs exceeds that of HSDGs is larger than at higher scores; at lower scores, the extent to which the estimated continuation of NWCs falls short of that of HSDGs is even more pronounced than at higher scores.

50. The exception to this rule is 84-month continuation of ADs—the estimated likelihood that an AD continues to the 84-month point increases substantially as the assumed AFQT score increases from 65 to 95.

Figure 17. Regression-adjusted continuation rates by education level and AFQT score[a]



a. See appendix E for complete regression results and sample sizes.

To see more clearly the role of AFQT in determining relative continuation by education level, we use the regression models to estimate 12- through 84-month continuation for each recruit type under two different scenarios. In the first scenario, we assume that everyone in each group has the same low AFQT score of 55.[51] In the second scenario, we assume that everyone in each group has the same high AFQT score of 75.[52] The estimated continuation rates for each of these scenarios are shown in the two panels of figure 18. The charts show patterns of relative continuation that are similar to those seen in the raw data for the full sample (figure 12) as well as in the raw data for the AFQT-greater-than-70 sample (figure 16). The important new point that comes from comparing the two panels in figure 18 is that, relative to HSDGs, BD continuation falls as AFQT scores increase, all else equal.

Since the "true" AFQT scores of the average AD and the average BD in the Navy are roughly equivalent (table 10), the fact that we still see education-specific differences in regression-adjusted continuation implies that these differences are not related to ability (as it is measured by the AFQT). Furthermore, the fact that these differences hold even when controlling for promised rating group means that they are not an artifact of differences in initial obligation lengths. There is a real, separate effect associated with each education level.

Schoolhouse outcomes

Next, we look at schoolhouse performance by education level. For each group of college recruits and for HSDGs, we examine A-school and C-school outcomes, as well as the overall the likelihood of being rated.[53]

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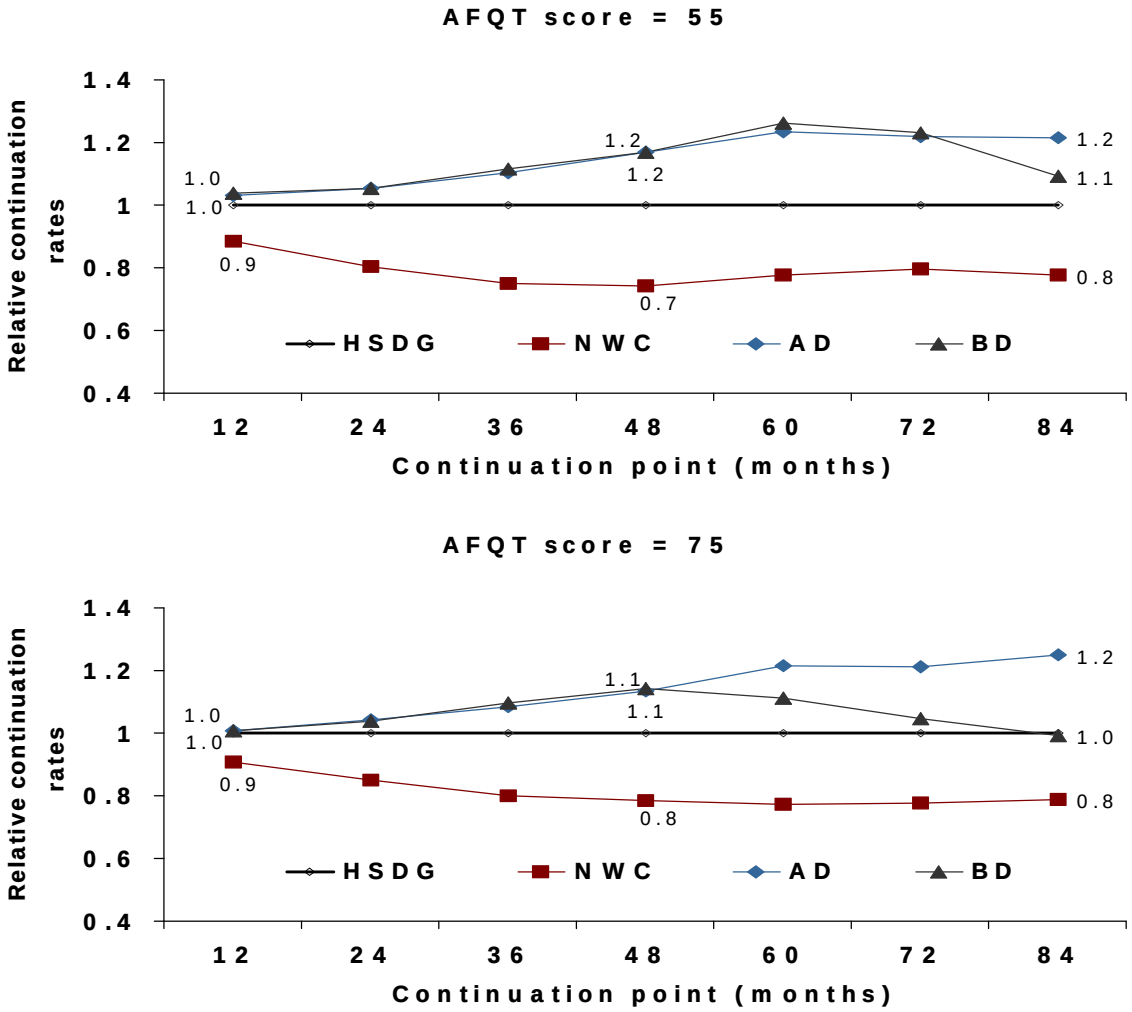
51. A score of 55 falls between the actual averages for HSDGs and NWCs.

52. A score of 75 falls between the actual averages for ADs and BDs.

53. A-school includes all initial skills training; it does not include Gendet apprenticeship training. This training may be attended pre-fleet or post-fleet. C-school training includes three types of follow-on training: skill progression training, functional training, and umbrella segment skill progress training. In NITRAS these types of training are identified by codes C, F, and G, respectively. As with A-school, we make no distinction between training that occurs pre-fleet vs. post-fleet.

Figure 18. Regression-adjusted continuation rates holding AFQT score constant, 12- through 84-month continuation by education level[a]



a. Other characteristics held constant at sample-specific averages.

The schoolhouse outcomes of interest are academic setback and academic attrition. Academic setback occurs when a Sailor's progress in a training course is temporarily interrupted because he is deemed to be academically unprepared. When this occurs, the Sailor is typically sent to remedial training before being allowed to continue with the course in question. Ways in which students may be considered ill prepared include lack of reading and math skills, lack of subject matter

comprehension, and lack of motivation. Academic attrition is a more severe form of academic failure than academic setback. Academic attrition occurs when a Sailor fails to graduate from a training course.[54] Reasons for academic attrition include inability to read at the level required by the course material, ineffective use of tools and equipment needed in laboratory or shop performance tests, and inability to transfer classroom information to laboratory or shop assignments. Academic setback and attrition and the reasons for them are identified by personal event codes (PECs) in NITRAS.[55]

A-School outcomes

Table 14 shows academic setback and attrition rates from initial skills training by education level, overall and in each rating group. For context, the top third of table 14 also shows the numbers of Sailors with each education level who attended training in each rating group. In particular, the data on attendance show that the samples sizes for AD and BD recruits are quite small in some rating groups. As a result, differences in setback and attrition rates for HSDGs and for college-degree-holders must be fairly large to be statistically significant with 95-percent confidence.

Beginning with setback rates, the data show that, for this sample, the incidence of academic setback in A-school decreased with education level. However, differences between HSDG rates and college recruits' rates were significant only for college-degree-holders.

As with pre-fleet loss rates, we expect academic setback rates to vary by training pipeline. Therefore, table 14 also shows education-specific setback rates from initial skills training by promised rating group.[56] Only for BD recruits were rating-group-specific differences

54. Academic attrition does not imply attrition from the Navy.

55. Setbacks and attrition can also occur for nonacademic reasons. However, to analyze school performance and how it is related to recruits' ability levels, we focused specifically on academic setback and attrition.

56. We look at academic setback and attrition rates by promised rating group rather than achieved rating group so that we will include Sailors who started training but did not complete it.

Table 14. Academic setback and attrition rates from A-school by education level and promised rating group

	HSDG	NWC	AD	BD[a]
Sample sizes—Sailors attending A-school[b,c]				
Total	***301,288***	***7,529***	***2,499***	***3,884***
No school guarantee	32,523	1,030	226	267
Short	64,460	2,128	417	719
Medium	46,844	1,257	314	561
Long	104,823	2,532	1,110	1,672
NF	29,438	--	284	370
Uncategorized	23,200	537	148	295
Setback rates during A-school (%)[d]				
Overall	***12.4***	***11.7***	***9.6[e]***	***8.3[e]***
No school guarantee	8.5	9.6	8.8	5.2[e]
Short	4.7	5.6	3.4	2.2[e]
Medium	7.3	8.8[e]	3.8[e]	5.4[e]
Long	19.7	18.0[e]	13.0[e]	11.7[e]
NF	13.8	--	10.9	11.4
Uncategorized	15.2	17.7	13.5	8.1[e]
Attrition rates during A-school (%)[d]				
Overall	***3.6***	***3.1[e]***	***3.0***	***2.9[e]***
No school guarantee	2.7	2.8	2.2	1.5
Short	1.1	1.1	0.5	0.7
Medium	1.4	2.0	1.0	1.1
Long	4.9	4.8	3.4[e]	4.4
NF	8.2	--	7.4	5.1[e]
Uncategorized	4.4	5.8	3.4	2.0[e]

a. Data on BDs do not include Sailors who transferred to the officer community.
b. Data are pooled across accession cohorts from FY92 through FY02.
c. School attendance may occur before or after reaching the fleet.
d. Rates are conditional on A-school attendance.
e. The difference between the setback rate of college recruits and the setback rate of HSDGs is statistically significant with 95-percent confidence.

from HSDG setback rates consistently statistically significant. In all but one rating group—the Nuclear Field—BD rates were significantly lower than HSDG rates; even during NF training, BD holders were more than 2 percentage points less likely to experience setback. In general, AD holders in the sample also had lower A-school setback rates than HSDGs. The only group for which the AD rate was not lower than the HSDG rate was the group that did not access with a school guarantee. However, the only rating groups for which differences between ADs and HSDGs were statistically significant were medium- and long-pipeline ratings. Finally, NWCs in the sample had lower setback rates than HSDGs only in long pipeline ratings, and this is the only NWC-HSDG difference that was statistically significant; in all other rating groups, NWCs had insignificantly higher setback rates than HSDGs.[57]

Finally, table 14 also shows that, in general, A-school setback rates increased with length of training pipeline. Therefore, the overall setback rates of college-degree-holders are, in a sense, inflated because college-degree-holders were, relative to HSDGs, disproportionately concentrated in longer training pipelines.

The data on academic attrition, presented in the bottom third of table 14, show that this more serious form of academic failure occurs less often than academic setback. However, the data also show that the education- and rating-group-specific patterns of academic attrition from A-school are similar to the education- and rating-group-specific patterns of academic setback: overall rates decreased with education level, but within rating groups, NWCs were more likely to have higher rates than HSDGs, while AD and BD holders were more likely to have lower rates than HSDGs. However, college / HSDG differences in academic attrition rates were much less likely to be statistically significant than the college / HSDG differences in setback rates.

57. In contrast to the total sample of NWCs, when conditioning on A-school attendance, the rating group with the largest share is the long-pipeline group. Therefore, the overall setback rate for NWCs is lower than the overall rate for HSDGs despite the fact the NWCs have higher rates in all but long-pipeline rating groups.

Overall, the data on academic setback and attrition from initial skills training indicate that ADs and BDs may indeed do better in A-school than HSDGs and could potentially be cheaper to train. The data on NWCs is mixed: NWCs appear to do better in long-pipeline ratings, but less well in other rating groups. Since qualification for long-pipeline ratings requires high AFQT scores, the data on school performance, like the data on continuation, suggest that high-AFQT NWCs do well in the Navy.

C-School outcomes

The format of table 15 is similar to that of table 14, showing the numbers of Sailors in each education group attending follow-on training in each rating group, as well as academic setback and attrition rates in each education-rating-group cell. Overall, the data show that for this sample, academic setback during follow-on training was much less common than setback during initial skills training; academic attrition was slightly less common. The other notable difference between A-school and C-school outcomes is that, in the more advanced training, academic setback and attrition rates increase with education level. However, very few of the HSDG/college differences in likelihoods of academic setback and attrition were statistically significant. Therefore, it is difficult to draw strong conclusions regarding relative performance at this stage of training.

Likelihood of being rated

Here, we consider the overall measure of training success: the likelihood of being rated. For each recruit type, table 16 shows the likelihood of being rated conditional on attending A-school and the likelihood of being rated in one's promised rating conditional on being rated at all. The data show that, conditional on attending A-school, ADs and BDs were more likely than HSDGs to get rated, but NWCs were less likely to get rated. The same pattern holds for achieving the promised rating.

Overall, ADs and BDs appear to be more likely than HSDGs to achieve ultimate academic success in Navy training; NWCs appear to be less likely to be successful. In a later section of the report, we explore the extent to which training time differs by recruit type and whether it appears that the differences in training success by recruit type are likely to translate to differences in training costs for the Navy.

Table 15. Academic setback and attrition rates from C-school by education level and promised rating group

	HSDG	NWC	AD	BD[a]
Sample sizes—Sailors attending C-school[b,c]				
Total	***287,943***	***6,801***	***2,380***	***3,258***
No school guarantee	83,572	2,449	512	504
Short	44,077	1,266	288	486
Medium	33,364	807	249	436
Long	81,768	1,813	934	1,238
NF	25,281	37	259	345
Uncategorized	19,881	429	138	249
Setback rates during C-school (%)[d]				
Total	***0.9***	***1.0***	***1.1***	***1.4[e]***
No school guarantee	0.5	0.3	0.0[e]	0.4
Short	1.1	0.9	2.4	3.9[e]
Medium	1.4	2.1	2.8	2.3
Long	1.1	1.1	1.0	0.7
NF	0.3	--	0.4	0.0[e]
Uncategorized	1.9	2.6	1.4	1.6
Attrition rates during C-school (%)[d]				
Total	***2.4***	***2.5***	***2.9***	***2.5***
No school guarantee	2.0	2.2	2.0	2.8
Short	1.4	1.7	1.7	1.9
Medium	3.0	3.5	5.2	3.0
Long	2.2	2.4	1.9	2.3
NF	3.7		6.2	2.9
Uncategorized	3.4	4.2	4.3	2.4

a. Data on BDs do not include Sailors who transferred to the officer community.
b. Data are pooled across accession cohorts from FY92 through FY02.
c. School attendance may occur before or after reaching the fleet.
d. Rates are conditional on C-school attendance.
e. The difference between the setback rate of college recruits and the setback rate of HSDGs is statistically significant with 95-percent confidence.

Table 16. Probabilities of being rated and of being rated in promised rating, by education level

Education level	Event probability (%)	
	Got rated[a]	Got promised rating[b]
HSDG	92.0	67.9
NWC	88.0[c]	65.1[c]
AD	94.8[c]	70.3[c]
BD[d]	95.0[c]	74.7[c]

a. Probability of getting rated is conditional on attending A-school.
b. Probability of getting rated in the promised rating is conditional on being rated.
c. The difference between the event likelihood for college recruits and the event likelihood for HSDGs is statistically significant with 95-percent confidence.
d. Data on BDs do not include Sailors who transferred to the officer community.

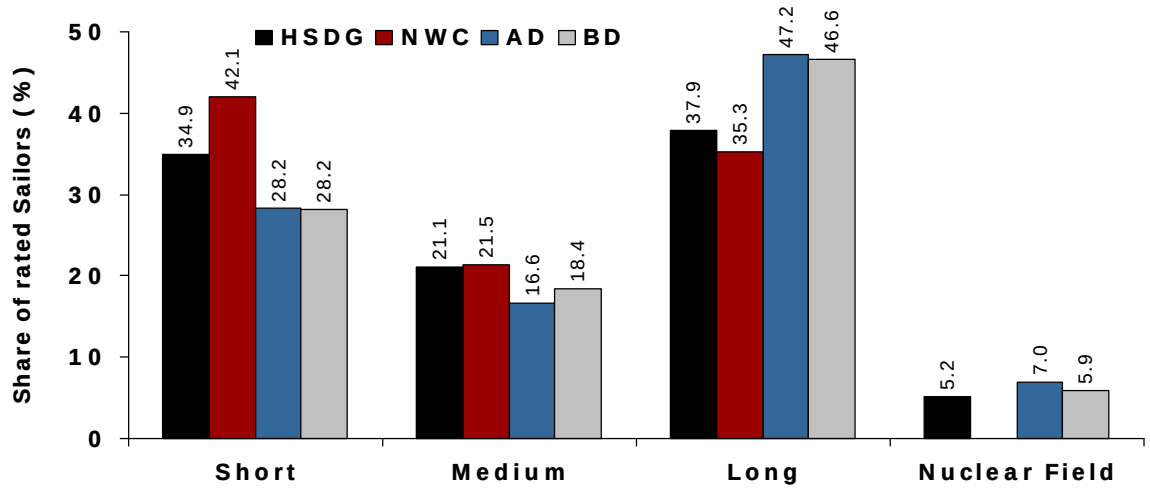
Ratings achieved

Based on education-specific patterns of promised ratings (see table 11) and on education-specific differences in the likelihood of achieving the promised rating, college recruits with ADs and BDs should be more likely than others to achieve a long-pipeline rating; we expect the opposite to be true of NWC recruits. Figure 19 shows that, indeed, this is the case. Relative to HSDGs, NWCs were more likely be rated in Navy occupations with short pipelines and less likely to be rated in occupations with long pipelines. In contrast, recruits with ADs and BDs were less likely to be rated in occupations with short pipelines and more likely to be rated in occupations with a long pipelines. College-degree-holders were also more likely than HSDGs to be NF-qualified.[58]

Overall, the data on school-house performance, combined with the data on initial classification, indicate that college-degree-holders were assigned to jobs most likely to benefit from any college productivity premium. Furthermore, if the rating structure becomes more technical in the future, these results also indicate that college-degree-holders may indeed be more likely to have the qualifications and abilities needed to man a more technical Navy.

58. In appendix D, we also list the top 10 ratings achieved for each type of recruit.

Figure 19. Achieved rating group by education level[a,b,c]



a. Data are pooled across accession cohorts from FY92 through FY02.
b. Data on BDs do not include Sailors who transferred to the officer community.
c. Sample sizes are: HSDG = 333,221; NWC = 8,003; AD = 2,818; BD = 4,305.

Fleet outcomes

Finally, we look at fleet, or on-the-job, outcomes. We begin by comparing average time spent in the fleet across education levels to show whether college recruits spend more or less productive time in the Navy than HSDGs do. (Time spent in the fleet is a function of length of training pipeline, length of obligation, and continuation.) Then, we analyze data on three indicators of on-the-job performance: demotion rates, promotion rates, and transfers to the officer community. Since we cannot directly measure performance, or productivity, these metrics provide indirect evidence of performance as assessed by Navy leadership.

Time in fleet

Using the difference in total months the Sailor spent in the Navy and number of months of training, we calculate the amount of time each Sailor spent in the fleet. As shown in table 17, the amount of time spent in the fleet does vary with education. Because the number of college recruits increased somewhat over time (see figure 1), and

those who entered most recently have spent less time in the fleet, we also calculate how much time each Sailor could have spent in the fleet, given the year he or she accessed, and compare actual time to potential time. This figure appears in the last column of table 17.

Table 17. Time spent in the fleet, by education level

Education level	Months in the fleet		Percentage of potential time in fleet
	Average	Median	
HSDG	34.4	31	55.5
NWC	26.2[a]	19	51.1
AD	37.7[a]	33	60.2
BD[b]	36.2[a]	34	59.3

a. Value differs from that of HSDGs at the 99-percent confidence level.
b. Data on BDs do not include Sailors who transferred to the officer community.

The data show that NWCs spent, on average, about 8 fewer months in the fleet than did HSDGs. In contrast, recruits who accessed with college degrees spent *more* time in the fleet than HSDGs; AD recruits spent more than three extra months in the fleet compared with HSDGs, and BD recruits spent nearly two additional months in the fleet.[59] The percentage-of-potential-time figures tell the same story; these differences are not driven by the proportions of college recruits over time.

Several other factors could be driving these education-specific differences in fleet time. First, college recruits in the sample entered different ratings than HSDG recruits, committed to longer initial obligations, and completed those obligations at different rates. Therefore, rating-specific differences, rather than education-specific differences, could be responsible. Also, attrition and reenlistment rates fluctuate somewhat over time. Therefore, year-over-year changes in the accession shares of college recruits may have an effect on average fleet time separate from its effect through differences in

59. The difference between ADs and BDs is driven by the low reenlistment rates of BDs.

potential fleet time. To address these issues, we next run a simple regression using education level, rating, and fiscal year of entry to explain months in the fleet.[60]

Table 18 summarizes our regression results by showing the number of months a recruit with each education level is predicted to spend in the fleet, controlling for fiscal year of accession and rating.[61] The regression results indicate that, after correcting for rating and fiscal year, BD recruits spent about 2 *fewer* months in the fleet than HSDGs; ADs, in contrast, spent about 1 extra month. (NWCs spend a few weeks less than HSDGs.) Therefore, to a large degree, the differences in fleet time shown in table 17 were driven by rating-specific and fiscal year effects, not by education-specific effects.

Table 18. Regression-adjusted months in the fleet, by education level

Education level	Months in the fleet[a]
HSDG	34.4
NWC	33.7
AD	35.6
BD[b]	32.1

a. Regression-adjusted months hold constant fiscal year of accession and rating.
b. Data on BDs do not include Sailors who transferred to the officer community.

Without making any assessment of on-the-job productivity, the fact that BD recruits in the sample spent less time in the fleet when controlling for year of accession and rating promised indicates that their *potential* productivity in the Navy is less than that of HSDGs. The same is true for NWCs. In contrast, ADs have the potential to be more productive.

60. We include those who do not achieve a rating in our regression results. Including length of obligation makes virtually no difference in the results.

61. Complete regression results are shown in appendix F.

Demotion and promotion rates

Table 19 presents education-specific demotion and promotion rates. Over the study period, ADs and BDs were less likely than HSDGs to be demoted, and NWCs were more likely to be demoted. Indeed, NWCs are four times more likely than BDs to be demoted and nearly three times more likely than ADs.[62]

Table 19. Demotion and promotion rates by education level

	HSDG	NWC	AD	BD[a]
Demotion rates (%)[b]	11.1	14.5[c]	5.3[c]	3.6[c]
Probability of promotion to indicated paygrade by FY of accession (%)[d]				
FY92—E7	6.6	5.0	16.1	24.4
FY93—E6 or E7	56.2	58.4	60.0	78.8
FY94—E6 or E7	42.2	37.5	55.7	61.6
FY95—E6 or E7	32.2	29.2	37.2	54.7
FY96—E6	22.9	17.5	34.5	45.4
FY97—E6	11.6	10.6	21.4	25.7
FY98—E5 or E6	70.8	67.5	89.1	86.8
FY99—E5 or E6	53.9	51.6	69.0	76.7
FY00—E5	25.2	19.4	45.3	47.8
FY01—E4 or E5	57.8	53.3	84.7	85.6
FY02—E4	24.8	22.0	56.7	60.0

a. Data for BDs do not include Sailors who transferred to the officer community.
b. Data are pooled across accession cohorts from FY92 through FY02.
c. The difference between the demotion likelihood for college recruits and the demotion likelihood for HSDGs is statistically significant with 95-percent confidence.
d. HSDG-college differences in these probabilities were not tested for statistical significance.

62. Our data do not include direct information on the incidence of demotion or on the reason for demotion. We identify Sailors as being demoted if we observe that they move from one paygrade to a lower paygrade. Therefore, there is likely to be some error in this measure of demotion rates. However, we have no reason to expect that the direction or size of the error differs by education level.

In terms of promotion, ADs and BDs appear to advance faster than HSDGs, and NWCs advance more slowly. By accession cohort, the data in table 19 show the shares of each education group that reached the highest observed paygrade as of December 2003. For example, conditional on still being in the Navy as of December 2003, 6.6 percent of HSDGs from the FY92 cohort had reached E7. The shares for NWCs, ADs, and BDs are 5.0, 16.1, and 24.4 percent, respectively. Thus, conditional on staying in the Navy, ADs from the FY92 cohort were more than twice as likely as HSDGs to reach E7, and BDs from the FY92 cohort were nearly four times as likely to reach E7.

Because advancement rates vary significantly by rating, we next account for education-specific differences in rating assignments by creating an index measuring slow, average, or rapid advancement at the rating level.[63] Creating this index allows us to account for rating-specific variations in promotion rates without worrying about issues associated with small rating-specific sample sizes for all three groups of college recruits. The index is defined in the following way: First, we calculate the average time in a specific paygrade for each rating achieved. Then, we create a dummy variable that indicates rapid advancement to the next paygrade if a Sailor's time in the specified paygrade is more than one deviation less than the average time for all in his or her rating.[64] We then use the likelihood of rapid advancement by education level to measure the extent to which Sailors in each education group are promoted more quickly than their peers. The paygrades for which we make this calculation are E4 and E5. We start with E4 because advancement from E4 to E5 is the first promotion that is not lock-step and is not clouded by the fact of advanced paygrade at accession for college recruits. We don't go beyond E5 because sample sizes become prohibitively small after that point.

Table 20 shows the percentage of each recruit group that advanced more quickly than average from E4 to E5 and from E5 to E6. Based

63. This approach to measuring speed of advancement was adapted from [41].

64. The dummy variable equals 1 if the individual advances rapidly and 0 if not.

on this measure, NWCs were more likely than HSDGs be fast promoters at both career points, while ADs were less likely to be on the fast track. BDs were more likely than HSDGs to advance rapidly to E5, but less likely to advance rapidly to E6.

Table 20. Rapid advancement by education level

	Percentage of education group experiencing rapid advancement			
Paygrade	HSDG	NWC	AD	BD[a]
E4 to E5	11.2	12.0	10.8	13.9[b]
E5 to E6	14.0	16.2	13.6	12.1

a. Data for BDs do not include Sailors who transferred to the officer community.
b. The difference between the likelihood of fast advancement for college recruits and the likelihood of fast advancement for HSDGs is statistically significant with 9-percent confidence.

In addition to varying by rating, promotion rates also vary by fiscal year. This is because manning profiles vary by fiscal year, and it is the manning profile that determines the promotion rate in each rating. Therefore, to take this year-over-year variation into account, we also use simple logit models to estimate the likelihood of rapid advancement controlling for both education level and fiscal year of accession. In the model for rapid advancement from E4 to E5, only BDs were significantly more likely than HSDGs to experience rapid advancement when controlling for fiscal year of accession. The model indicates that BDs in the sample were 25 percent more likely than HSDGs to advance rapidly. In the E5 to E6 model, only NWCs were significantly more likely than HSDGs to experience rapid advancement. The model indicates that, when controlling for fiscal year of accession, NWCs were 40 percent more likely than HSDGs to advance rapidly.[65]

65. A similar analysis [42] finds that, across the Services, the more formal education that enlisted members have, the more likely they are to be among those with the fewest years of service for their paygrade and Service branch, but not occupational specialty. This analysis included servicemembers who had college at accession as well as those who got additional education after enlistment, either on their own or through military-sponsored voluntary education programs.

Thus, the combined information on promotion and demotion indicate that, while on the job, AD and BD holders performed as well as HSDGs and had fewer disciplinary problems. In contrast, NWCs appear to have performed better than HSDGs, as judged by those who make promotion decisions, but they were also more likely to experience demotion. These contrasting results suggest that there is a wider range of quality among NWC recruits than among college-degree-holders.

Transfer to officer community

A final indicator of excellent performance in the enlisted Navy is selection for transfer to the officer community. In our sample, 3,297 Sailors made this transfer. Table 21 shows how these former Sailors were distributed across education levels and how the number of transfers in each education group compares to the total number of accessions in each education group. The data show that most of the transfers, like most of the accessions, were HSDGs. But, the data also show that the education group making the largest relative contribution to the officer community was BDs. Just under 9 percent of the BD accessions in our data eventually transferred to the officer community, compared to under 1 percent for every other type of recruit.

Table 21. Transfer to the officer community, by education level[a]

Education group	Number of officer transfers	Percentage of accessions
HSDG	2,722	0.6
NWC	16	0.1
AD	24	0.7
BD	497	8.7
Other	38	0.1
Total	3,297	0.8

a. Data are pooled across accession cohorts from FY92 through FY02; recruits who accessed later in the period may still choose to transfer.

Of course, a primary reason that more BD-holders transfer to the officer community is that their degrees make them immediately

eligible for Officer Candidate School (OCS). Indeed, according to data from CNA's Officer Master Tapes (OMT), 95 percent of the BDs whom we identified as leaving the enlisted community and could also identify as eventually becoming active Officers accessed through OCS. In contrast, most of the HSDGs who could be similarly identified attended the Naval Academy (23 percent) or participated in Navy ROTC programs at other institutions (55 percent).[66]

The value of the enlisted ranks as an accession source for the officer community was demonstrated in [43]. That study showed that, in the surface warfare and submarine communities, OCS accessions with enlisted experience were more likely to promote to O3 than OCS accessions without enlisted experience.

Summary

The CNO's call to increase college recruits' share of total accessions was part of the on-going battle for talent; it was about increasing the quality of the enlisted force. The purpose of this analysis is to determine the extent to which recruiting in the college market is likely to be an effective strategy for achieving the CNO's goal. More generally, we aimed to present empirical evidence that would allow us to weigh in on the argument that college campuses are a valuable source for high-quality recruits who can fill technical ratings.

The empirical evidence presented here indicates that, by several measures, college-degree recruits are indeed of higher average quality than traditional HSDG recruits. In addition, HSWCs also appear to be of relatively high-quality, as do some NWCs. Below we give more nuanced summaries of the results for all four groups of college recruits.

Mixed evidence for NWCs

Based on our data, we cannot generally characterize NWCs as high-quality recruits. In particular, NWCs have relatively low AFQT scores and, therefore, qualify for a much more limited range of ratings, and

66. Data show the status of individuals as of March 2004.

are more likely than other college recruits to access as Gendets. NWCs also have high first-term loss rates and, when compared with HSDGs they are less likely to get rated and more likely to be demoted. Therefore, we do not think that an untargeted expansion into the NWC market is a good strategy to increase force quality.

However, there are factors indicating that some NWCs make good Sailors. First, when we control for rating and fiscal year of accession, NWCs spend about as much time in the fleet, on average, as do HSDGs. Second, those NWCs who complete their terms of service reenlist at a relatively high rate. Third, NWCs who stay in the Navy appear to perform well on the job, as indicated by their rapid promotion rates. Finally, our regression results indicate that NWCs' attrition rates vary more with their AFQT scores than the rates of other groups; rating-group differences in NWC A-school performance also indicate that NWC quality varies more by AFQT score. These results suggest that the quality of the NWC recruits could potentially be improved by making a special effort to ensure that the NWCs who enter the Navy have high AFQT scores.

College-degree-holders compare favorably to HSDGs

By all indicators, ADs stay as long as or longer than and perform as well as or better than HSDGs: ADs have higher AFQT scores coming in and, therefore, qualify for more technical ratings. They commit to longer obligations, and they fulfill these obligations. They complete their initial skills training with few setbacks, are quite likely to become rated, and are unlikely to be demoted. ADs are also more likely to reenlist than HSDGs.

Even more than ADs, BDs compare favorably to HSDGs on nearly all our metrics. In particular, BDs have consistently lower academic setback rates during A-school and are more likely to promote quickly from E4 to E5. However, there is one key metric on which BDs fall short, and that is reenlistment. The BDs in our sample have much lower reenlistment rates than any other group. Additionally, our regression results indicate that high-AFQT BDs are particularly unlikely to reenlist. Therefore, many BDs choose to leave the Navy at the end of their obligations, and those with the highest AFQT scores

are the most likely to leave. In contrast, ADs are generally more likely to reenlist, and the highest-scoring ADs are more likely to reenlist than other ADs. This suggests that ADs may be a better deal than BDs for the Navy.

Finally, another factor to consider when measuring the quality of BDs is their relatively high rate of transfer to the officer community. A given BD is about 15 times more likely to transfer to the officer community than a given HSDG. This is another indicator of the high quality of recruits who access with BDs.[67]

HSWCs

Finally, we note that although the Navy recruits many HSDGs who also have some college credits, data limitations do not allow us to measure the same outcomes for this group as we can for the groups listed above. However, our short-term attrition results indicate that HSDGs who receive EBCCs perform better than HSDGs who do not receive EBCCs. This suggests that those Sailors who enlist with college coursework are of higher quality than Sailors who enter the Navy with no college credits. However, we note that these data suffer from a sample selection problem; not all HSDGs with college credits receive EBCCs because not all agree to extend their obligations. Therefore, we recommend interpreting these results with caution. Data now being collected will allow us to examine this question with greater accuracy in the future.

67. To determine whether BD Sailors are a cost-effective source of Officers would require a complete cost-benefit analysis comparing BD transfers with other *Officers*, rather than other enlisted personnel. Such an analysis is beyond the scope of this study. However, we do present summary data on the characteristics and some Navy outcomes of these officer transfers in appendix B.

Does the Navy spend less on training for college recruits?

Main issues

The third argument for college-market recruiting is that recruits with college education should cost less to train because they can be treated as pretrained recruits. In the previous section, we showed that recruits who accessed with ADs and BDs did have slightly lower academic setback and attrition rates during A-school. However, the notion that college recruits enter the Navy as pretrained recruits is slightly different; it implies that they will require less training overall.[68]

For the Navy to benefit from college recruits as pretrained recruits, three conditions must hold. The first condition is that college curricula must be comparable to Navy training curricula. Although this is not true for all ratings, it is likely to be true for some. For example, according to [6], many of the Navy C-school courses for the Hospital Corpsman (HM) rating are accredited by civilian accrediting bodies.[69] This means that community college programs accredited by the same accrediting bodies will have a common curriculum and set of standards. Reference [6] also lists 26 other community college majors that are likely to have curricula that overlap with Navy A- or C-school training. These majors include: Dental Services, Journalism, Aviation Technology, Aircraft and Missile Maintenance, Computer Science, Food Services, Accounting, and Nuclear Technology.

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68. Between 1995 and 1999, CNA conducted a series of research studies to explore the value of pretrained recruits. See [6], [7], [11], [12], [13], and [14].

69. According to [6], as of 1996, there were 11 accredited programs in the HM rating.

The second and third conditions are that college recruits must be classified into ratings that correspond to their civilian education majors, and they must be able to skip or test out of at least some of their Navy training. Results from the Executive Review of Navy Training (ERNT), indicate that neither of these conditions held during the study period. According to the ERNT summary report [44],

> The Navy has difficulty recruiting people who already are trained. The Navy does not assess the person's skills against Navy training requirements. For example, individuals who enter with an associate's degree in electronics technology start at the same place in the Navy's electronics technician training pipeline as an untrained high school graduate. In these cases, the Navy pays for training the individual does not need or want.[70]

In this section, we present data to show that within the existing classification and training systems, the Navy did not, in fact, spend less on training for the college recruits in our sample. As in the previous section, our approach is to compare the experiences of college recruits with the experiences of HSDGs. We examine both the total amount of training (days spent in formal training), and the total cost of training because college recruits access at higher paygrades and, therefore, receive more pay during training.

Time and cost to train—college recruits vs. HSDGs

Amount of training

We calculate amounts of training, or training time, from individual-level data. Specifically, we use data on accessions from FY97, FY98, and FY99; we include all training courses these Sailors undertook

70. At the time of enlistment, Navy manpower needs to determine not only a recruit's qualifications but also the rating into which a recruit is classified. Specifically, the ratings that are considered critical change over time, as does rating availability, which is determined by the numbers of training seats available at the time of enlistment. For more information on the classification process, see [45].

during the year of accession and each of the following three years.[71] To ensure that our comparisons of training time across education levels aren't confounded by education-specific differences in attrition rates, our sample includes only Sailors who received the rating they were initially promised and did not attrite during the first three years of their initial obligations.

Table 22 shows average training time by education level for the sample. The data show that Sailors in each group took about the same number of courses during the first three years of service. However, although the number of courses didn't vary substantially by education level, the number of days under instruction did. On average, NWCs had fewer days of actual instruction than did HSDGs, while ADs and BDs had more instruction days than HSDGs. College-degree- holders also spent more time "between" classes (awaiting instruction, awaiting transfer, in interrupted instruction, or in "other" status) than HSDGs, whereas NWCs spent less time. As a result, total training time for ADs and BDs exceeded total training time for HSDGS by 44 and 50 days, respectively. Total training time for NWCs was 37 days shorter than total time for HSDGs.

Table 22. Amount of training by education level

	HSDG	NWC	AD	BD[a]
Number of courses	6.8	6.8	6.9	6.2
Days of instruction	271	237	312	312
All other days[b]	43	40	46	52
Expected length of pipeline[c]	259	229	294	290
Days over expected for rating	11.9	8.1	18.3	22.1

a. Data for BDs do not include Sailors who transferred to the officer community.
b. Awaiting instruction, in interrupted instruction, awaiting transfer, or "other."
c. Expected pipeline lengths are based on the planned lengths of each course taken by members of each education group.

71. We analyze data from only these three accession cohorts for two reasons: First, we began with FY97 to focus on post-drawdown data, which we consider to be most representative of the current training environment. Second, we did not go beyond FY99 to ensure that all Sailors in the sample would have completed three years of service and thus the vast majority of their training. We include time in bootcamp as part of the total training time.

Based on the planned length of each course taken by the Sailors in the sample, table 22 also shows how the average *expected* pipeline length varies for each education level. The table shows that the average recruit (regardless of education level) spent more time under instruction than the planned length of the courses would suggest; of the four education groups, BDs spent the most extra days under instruction, although the difference between ADs and BDs is quite small. NWCs had fewer extra instruction days than HSDGs, but the difference is also quite small.

Training costs

Education-specific training costs are presented in table 23. We calculate training costs based on the pay Sailors receive for days spent under instruction, awaiting training, in interrupted instruction, awaiting transfer, and "other" days. We calculate the rate of pay using MPN rates from 2003; we calculate the cost of each class by assigning the appropriate MPN rate based on the Sailor's paygrade and dependency status when the Sailor enrolled in the class. Therefore, ratings with faster promotion rates will have higher training costs. In addition, recruits who enter the Navy at a higher paygrade or who have more dependents will have higher training costs.[72] Therefore, along with differences in the total number of days spent in training, differences in rank and dependency status mean that training costs were higher for the college-degree-holders in the sample than for HSDGS; about 20 percent higher for both ADs and BDs. In contrast, it cost

72. Obviously, MPN costs of students' time do not include all the costs of training. Training costs also include instructors' salaries and the cost of equipment and supplies used. In this case, we use only student salaries (MPN costs) to estimate training costs because we are interested in how costs *vary* between recruits with and without college degrees. This variation will be driven by how long the recruits spend in training, and their pay rate. Of course, recruits who spend longer in training require more instruction, but the average course is quite large (roughly 25 students) so the difference in the proportionate instructors' salary is small in comparison to the recruits' salary [46]. Reference [47] performs detailed rating-specific calculations of training costs, including the costs of supplies (the authors do not include fixed costs, i.e., the costs of equipment); in general, our costs follow a similar pattern to theirs.

about 12 percent less to train the NWCs in the sample than to train the HSDGs.

Table 23. Cost of training by education level

	HSDG	NWC	AD	BD[a]
Average cost of days under instruction ($)	23,343	20,580	28,375	28,114
Average total cost of training ($)	27,011	24,032	32,496	32,742

a. Data for BDs do not include Sailors who transferred to the officer community.

Factors driving education-specific differences in training time and costs

Finally, the data in table 24 allow us to separate differences in training time from differences in training costs. First, compare the college / HSDG ratios of total training time in row 1 to the college / HSDG ratios of expected training time in row 2. The fact that these ratios are quite similar for all three types of college recruits indicates that differences in total training time relative to HSDGs are largely due to differences in planned training time. Thus, the fact that NWCs spent less time in training, while college-degree-holders spent more time in training, is consistent with already documented differences in rating assignments.

Table 24. Ratios of training time and costs—College recruits vs. HSDGs

College/HSDG ratios	HSDG	NWC	AD	BD[a]
Total training days	--	0.88	1.14	1.16
Expected training days[b]	--	0.88	1.13	1.12
Total training costs	--	0.89	1.20	1.21

a. Data for BDs do not include Sailors who transferred to the officer community.
b. Expected pipeline lengths are based on the planned lengths of each course taken by members of each education group.

Next, comparing the ratios of total training time to the ratios of total training costs shows the extent to which college / HSDG differences in

training costs were driven by differences in training time vs. differences in costs per day. The data show that NWCs spent 12 percent fewer days in training than HSDGs, but the total cost of training NWCs is only 11 percent lower because NWCs receive slightly higher pay than HSDGs during training. College-degree-holders spent about 15 percent more days in training than HSDGs, but the total cost of their training was about 20 percent higher. Thus, about 25 percent of the total differences in training costs between college-degree-holders and HSDGs was due to differences in daily pay during training.[73]

Rating-specific differences in training amounts

The length of the training pipeline (i.e., the amount of training) varies considerably by rating. For example, Sailors in the Storekeeper (SK) rating spend an average of 127 days under instruction and another 19 days either awaiting instruction, awaiting transfer, or of interrupted instruction. In contrast, Sailors who become Electronics Technicians (ETs) spend an average of 413 days under instruction and another 78 days either awaiting instruction, awaiting transfer, or of interrupted instruction. To further explore potential rating-specific differences in training time and costs between college-degree-holders and HSDGs, we next examine time and cost data for the four "large" college recruit ratings—the four ratings with the most BDs and the four ratings with the most ADs. As in the previous section, we calculate days spent under instruction, total training days, and expected days under instruction for each rating, by education; the results appear in table 25.[74]

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73. The data on training time and training costs also demonstrate contrasts between AD and BD recruits. Although the two groups spent the same number of days under instruction, BD recruits took slightly fewer courses. At the same time, BD recruits spent more time between classes. Mainly because of this time between classes, BDs spent slightly more days in training overall. Thus, BDs cost slightly more to train than ADs, although per-day costs are practically equivalent for the two groups.

74. Since the training data are more limited than our main dataset, we have a sufficient number of observations to perform rating-specific analysis only in the following ratings: for ADs, AT, ET, HM, RM/IT; for BDs, CTI, ET, HM, RM/IT.

Table 25. Training time and costs for HSDGs, ADs, and BDs in large AD and BD ratings[a,b]

Education	Days under instruction	Training days		Total cost of training ($)
		Total	Expected[c]	
HSDGs in AD ratings	305	354	290	30,374
ADs	320	366	312	32,889
HSDGs in BD ratings	291	340	276	28,967
BDs[d]	304	351	288	31,610

a. The four AD ratings are AT, ET, HM, RM/IT.
b. The four BD ratings are CTI, ET, HM, RM/IT.
c. Expected pipeline lengths are based on the planned lengths of each course taken by members of each education group.
d. Data for BDs do not include Sailors who transferred to the officer community.

Table 25 makes it clear that, when we look at specific ratings, college recruits still spent more days under instruction and more total days in training than did HSDGs in the same ratings. Within these specific ratings, however, college recruits did not spend more "other" time in training. Perhaps they spent more "other" time overall because they entered the Navy year-round; there could be less "other" training time for summer surge recruits.

As in the all-rating sample, HSDGs and college-degree-holders spent more than the expected amount of time in training. Table 25 also indicates that college recruits got more training than HSDGs in the *same ratings*; the average planned pipeline length was longer for AD and BD recruits than for HSDGs. This could be because the college recruits were trained for more technical NECs within each rating. The final column in table 25 indicates that it cost more to train college recruits than HSDGs. Again, part of this difference was due to the longer training pipelines that college recruits completed; part was due to the higher paygrade college recruits hold during training.[75]

75. Specifically, ADs spent 3 percent more days in training than HSDGs in AD ratings but cost 8 percent more to train; BDs spent 4 more days in training but cost 9 percent more to train than HSDGs in BD ratings. Therefore, in both cases, just over half the total cost differences is due to differences in paygrade/dependency status while slightly less than half is due to differences in length of training. (We calculated these figures only for the large ratings listed in table 25.)

Return on training investment

Although the Navy does not spend less on college recruits' training, education-specific differences in continuation rates may mean that the Navy does earn a higher return on its training investments in college recruits. While college-degree-holders are likely to receive more training than HSDGs, the fact that they are also likely stay in the Navy longer may mean that the extra costs are worth it. Similarly, although NWCs are less likely than HSDGs to complete their first terms of service, the fact that they are likely to receive relatively little training may mean that they serve long enough for the Navy to garner a reasonable return on its investment in their training.

Methodology

To explore the extent to which returns on training investments vary by education level, we form a rough measure of the net gain the Navy incurs from the average recruit in each education group by taking the ratio of each group's average training cost (see table 23) to the average number of months Sailors in each group spend in the fleet (see table 17). This measure has two important features. First, by using average time in the fleet as our measure of training benefits, we implicitly assume that Sailors are productive during all the months they spend in the fleet, and that they are all equally productive during those months, regardless of education level or rating. Thus, although there may be other productivity differences aside from fleet time (e.g., leadership skills or technical competence), we do not include such differences in these calculations. Second, by comparing the average cost of Sailors who *complete* training to the average fleet time of *all* Sailors, we are taking into account the facts that, for each Sailor who completes training, there is some number who do not, and this number varies by education level.

Comparison of time in fleet to cost-to-train

Navy wide comparisons

By education group, table 26 shows average training time and cost, as well as the expected number of post-training months of service (i.e., time in the fleet). Table 26 also shows the ratio of average months in

the fleet to average months of training time. In each case, the ratio is in the range of 3—meaning that for each Sailor who completes training the Navy gets roughly 3 months of productive time for each month spent in training. However, the ratio of productive time to training time is higher for HSDGs than for any of the college recruits; although ADs and BDs spend more time in the fleet than HSDGS, they spend proportionally more time in training.

Table 26. Training costs vs. time in fleet, by education level

	HSDG	NWC	AD	BD[a]
Average time in the fleet (months)[b]	34.4	26.2	37.7	36.2
Average training time (months)[c]	10.4	9.2	11.9	12.1
Average training cost ($)[d]	27,011	24,032	32,496	32,742
Time in fleet/time to train	3.31	2.85	3.17	2.99
Cost to train/months in fleet ($)	***785***	***917***	***862***	***904***

a. Data for BDs do not include Sailors who transferred to the officer community.
b. Reproduced from table 17.
c. Calculated from training days in table 22.
d. Reproduced from table 23.

The last row of table 26 shows the cost-benefit ratios for each education group. Intuitively, the ratios give the training cost per month of fleet service for each education level. The data show that for all three types of college recruits, the ratio of costs to benefits is higher than for HSDGs. Thus, in terms of cost per month, HSDGs are the best deal for the Navy. Although NWCs have short training pipelines, their high attrition rates still make their time in the fleet fairly expensive. BDs cost slightly more than ADs to train; they also spend slightly less time in the fleet. For both of these reasons, the cost per month of service of BDs is higher than that of ADs. Although ADs spend more time in the fleet than HSDGs, the relatively high cost of training ADs means that they cost more per month of service.[76]

To create more context for understanding these differences in training time and costs, we calculate the decrease in training time necessary to make the cost per month in the fleet of BDs equal to that of HSDGs: assuming BDs still spend an average of 37.4 months in the

fleet, they would have to be trained in roughly 10.9 months rather than the current 12.1 months to cost the same per month in the fleet as HSDGs ($785). This is roughly a 10-percent decrease in training time.

Of course, rating assignment and, therefore, expected training time, vary by education level. Furthermore, our earlier analysis of fleet time indicated that education-specific differences in rating assignment were partially driving the education-specific differences in average fleet time. To address this issue, we next examine training costs and time in fleet for selected ratings.

Rating-specific comparisons

Table 27 shows training costs and time in fleet for the ratings for which we have the most training data on ADs and BDs. In general, the patterns are consistent with what is shown in table 26. Again, HSDGs have the lowest ratio of training costs to time in the fleet; in other words, training an HSDG costs less per month of service than training an NWC, an AD, or a BD. Within ratings, the training cost per month of service for an AD is often quite similar to that of training an HSDG. NWCs spend far fewer months in the fleet than those with more education; however, table 27 shows that this difference is much smaller when we examine specific ratings. The rating-specific data reveal that, in some cases, training an NWC costs less per month of service than training a BD; this is because, within certain ratings, NWCs spend more months in the fleet than BDs.

76. The sample for time-in-fleet calculations comprises FY92 through FY02 accessions, while the sample for training-cost calculations comprises FY97 through FY99 accessions only. We determined that education-specific differences in time in fleet are not dependent on sample selection by fiscal year in the following by estimating for each sample identical regressions specifying time in fleet as a function of education level, rating, and fiscal year of accession. The predicted fleet times by education level are quite similar for both samples.

Table 27. Cost to train for specific ratings

Rating	Cost to train ($)	Months in fleet	Ratio of cost to months ($)
AT			
HSDGs	28,020	44.2	634
NWCs	30,535	38.5	793
ADs	29,603	44.7	663
CTI			
HSDGs	61,900	37.4	1,655
NWCs	64,667	39.3	1,645
BDs	67,029	35.3	1,899
ET			
HSDGs	43,320	43.6	994
NWCs	42,798	40.0	1,070
ADs	45,766	43.8	1,045
BDs	44,422	44.3	1,003
HM			
HSDGs	24,677	53.3	463
NWCs	25,395	47.4	536
ADs	25,469	53.7	474
BDs	26,491	48.1	551
RM/IT			
HSDGs	19,077	50.7	376
NWCs	21,167	50.5	419
ADs	20,407	50.9	401
BDs	22,019	44.9	490

Sea Warrior may change the context for evaluating training savings

The Sea Warrior program is the personnel component of the Navy's strategy to achieve warfighting effectiveness in the 21st century. Specifically, the program focuses on developing Sailors by identifying the knowledge, skills, abilities, and tools needed for mission accomplishment. According to the CNO, "Our goal is to create a Navy in which all Sailors—active and reserve, afloat and ashore—are optimally assessed, trained, and assigned so that they can contribute their fullest to mission accomplishment" [48].

For the cohorts we studied, the Navy did not realize training savings from accessing college recruits. This result is consistent with findings from the ERNT, which indicated that two of the three conditions necessary for realizing cost-savings from pretrained recruits were unlikely to hold: (1) the classification system doesn't necessarily assign college recruits to ratings in which their college education and Navy training overlap and (2) the training system is not currently structured to allow pretrained recruits to skip training that duplicates what they have already received in the civilian sector.

If these reasons do explain the relatively long training time and high costs of training college recruits, several initiatives within the Sea Warrior program are likely to change the context for evaluating recruit quality, particularly as it relates to potential training savings associated with college recruits.

Changes in recruiting and classification

According to [49], one of the Sea Warrior goals is to develop a business model that ties fleet manpower and skill requirements directly to the recruiting and classification processes. Specifically, recruiters will be asked to recruit to specific skill sets, rather than to a goal for a set number of individuals. To do this, the recruiting community will develop strategies that allow recruiters to identify candidates more selectively based on the candidates' academic aptitudes, as well as on the skills and qualifications they already possess. There may also be scope for new programs of lateral entry.

Under this system, it is likely that college recruits whose training matches the newly defined skill requirements will be more effectively identified and, therefore, will be classified in ratings in which their training will be most useful.

The Revolution in Training

The Revolution in Training reflects the Navy's commitment to improving its Sailors' professional and personal development. The new training system that will result from the revolution is being designed to complement the revolution in technologies, systems, and platforms for tomorrow's fleet. In particular, Navy planners are

applying information-age methods to improve the efficiency of the training process by making learning more individualized for Sailors' needs, as defined by their educational backgrounds, their approaches to learning, and the skills required in the jobs they will fill.[77]

If Navy training becomes more individualized and self-paced, and if Sailors with college education are allowed to "test out" of certain training courses, it is very likely that college recruits of the future will indeed yield substantial savings to the training budget. For example, according to our data, training time for BDs must be decreased by only 10 percent to make their cost per month in the fleet equal to that of HSDGs. In addition, a past CNA study found that the Navy saved about $665,000 in student pay and allowances by allowing 29 recruits with ADs in selected medical fields to attend bootcamp and HM A-school, and to be awarded the appropriate NEC without being required to attend C-school.[78]

Summary

Those with more education cost more to train. This occurs for several reasons. First, college recruits enter the Navy at higher paygrades and were more likely to have dependents at entry than HSDGs. However, college recruits also enter different ratings than HSDGs; recruits with college degrees entered ratings that required about 15 percent more days in training. Finally, recruits with college degrees seem to have received more training even *within* ratings. This difference in days in training made up nearly half of the cost difference between training a college-degree recruit and an HSDG in the same rating; the rest of the cost difference is due to differences in paygrade and dependency status.

Thus, regardless of the reasons behind the differences, the data presented here show that the Navy is not currently reaping substantial savings in training costs from recruiting so-called pretrained college

77. Summarized from [49] and [50].

78. For a complete description of the HM experiment and its results, see [6], [13], and [14].

recruits. In fact, our comparison of training costs and time in the fleet indicates that the combination of college recruits' additional training and their reenlistment rates means these recruits cost more per month of service than HSDG recruits.

Prospects for expansion

To this point, we have concentrated on determining the value to the Navy of Sailors who access with college experience. An equally important question to consider is what value the Navy represents to the college recruits themselves.

Two potential reasons for the relatively small numbers of college recruits in the enlisted Navy are the relatively small sizes of the college populations and the fact that civilian jobs offer large rewards to college education. In this section, we build on our earlier discussion of education-specific recruit supplies and detail the civilian opportunities available to those with college degrees.[79] We compare civilian jobs and military enlistment in terms of earnings, the probability of unemployment, and other job characteristics. We then make an assessment of the number of young college-degree-holders for whom enlistment in the Navy is likely to be a relatively good opportunity. We also consider why the Navy might be a better opportunity for some ADs and BDs than for others. Finally, we briefly consider the issue of reenlistment.

Again, we focus on the number of recent male graduates in the labor force. Of these 13.3 million men, roughly 1.4 million have a (2-year or 4-year) college degree, while another 4.3 million have some college but no degree (refer back to figure 7). We also use our CPS data to detail the number of men in each education category who earn less in the civilian sector than they would in the Navy. Some recruits with a taste for the military may enlist even if they could earn more in the civilian sector, and some who could earn more in the Navy may not consider joining; however, comparing economic opportunities across

79. We do not include NWCs in this analysis because they cannot be identified in the civilian data. Also, based on the results showing that NWCs are not uniformly high-quality recruits, we do not recommend a general increase in efforts to recruit them.

education categories gives us a convenient measure of how easy it is likely to be to recruit people with various levels of education.

Is enlistment in the Navy likely to be a good deal for college-degree-holders?

We begin by comparing entry-level Navy pay and benefits with the civilian earnings and likely benefits of average HSDGs, ADs and BDs. (HSDGs are included as a reference point.) We use Regular Military Compensation (RMC) as our measure of military pay.[80] RMC includes basic pay, subsistence and housing allowances, and a calculation of the tax advantage of being in the military. By this measure, an E3 earned about $25,800 per year in FY03. (Our data indicate that most ADs and BDs enter the Navy as E3s. HSDGs most often enter as E1s, with earnings of about $23,100 in FY03.)

In addition to basic annual salaries, the Navy offers enlistment bonuses as incentives to join. In addition to the EBCC, there are regular enlistment bonuses (EBs) that are associated with a recruit's program of entry.[81] In FY03, average incentive amounts for each education group were:

- HSDG—total incentive equal to $2,600 in regular EB
- AD—$3,200 in EB plus $5,000 in EBCC for a total incentive of $8,200
- BD—$3,700 in EB plus $8,000 in EBCC for a total incentive of $11,700.

Total incentive amounts for college recruits are greater than incentives amounts for HSDGs mainly because of the EBCC. However,

80. Reference [51] also uses RMC as the representative measure of military pay.

81. Regular EBs vary in size from $1,000 to $12,000 depending on the rating promised and the ship date. (EBs are larger for recruits who ship in off-peak months.) As for EBCC, recruits who receive regular EBs must extend their obligation lengths by 12 months. If the recruit receives an EB and an EBCC, the extensions run concurrently.

college recruits also have higher average EBs than HSDGs. This is because college recruits are more likely to ship during high-EB months and more likely to be promised technical ratings with larger EBs. Enlistment bonuses are usually paid within the first year of enlistment.

Servicemembers also receive valuable in-kind compensation. Sailors are guaranteed full medical benefits for the terms of their enlistments and, if they remain in the Service for 20 years, are eligible for generous retirement benefits. An additional benefit to military enlistment is job security. Servicemembers can confidently expect to experience no unemployment during their military careers" [82]

Table 28 compares elements of Navy compensation with the average earnings and other benefits of HSDGs, ADs, and BDs in the civilian sector. The EB and EBCC raise Sailors' initial wages, but wages in the following years are likely to be lower. In the civilian sector, in contrast, wages generally increase over time. Therefore, to compare Navy and civilian earnings, we calculate the present discounted value (PDV) of wages during the Sailor's first 4 years in the Navy; we compare this to the PDV of average earnings paid during the first 4 years of employment in a civilian job.[83] We calculate Navy pay with and without EB and EBCC payments. As shown in table 28, Navy earnings substantially exceed average civilian earnings for those with a high school diploma. Navy earnings also exceed civilian earnings for those with an

82. See [52] for more on the total compensation received by Servicemembers.

83. We use a 15-percent discount rate when calculating PDV of earnings. Reference [53] suggests that young enlisted Servicemembers' discount rates may actually be higher than this; if this is true, the differences between Navy and civilian earnings streams are somewhat smaller than what is shown in table 28, but the qualitative results are unchanged. Also note that we include wages for all civilian workers who recorded positive earnings and were not full-time students; therefore, many in our sample experienced some unemployment. We believe this is the appropriate sample because the young men in the civilian labor market often experience (nonvoluntary) unemployment; if we considered only full-time, full-year workers, civilian earnings would be substantially larger. We report median civilian earnings in each case.

AD, but the difference is smaller than for HSDGs. Also, in the case of ADs, including enlistment bonuses increases the difference between Navy and civilian earnings by nearly 50 percent, suggesting the enlistment bonuses may be key in attracting those with a 2-year degree. Finally, in the case of BDs, civilian earnings outstrip Navy earnings, even when the relatively generous enlistment bonuses are included. This is mainly because those with college degrees can expect their wages to increase more quickly in the civilian sector than in the Navy.[84]

Table 28. PDV of earnings in the Navy versus the civilian sector[a]

	Navy earnings ($)[b]		Civilian data[c]			
Education	Without EB and EBCC	With EB and EBCC	Earnings ($)	Working for firms with 500+ employees (%)	Average wks. of unemployment, civilian sector	Have employer-provided pension plan (%)
HSDG	86,894	89,501	54,672	34	2.8	33
AD	90,786	99,005	78,439	35	1.7	48
BD	90,786	102,561	108,587	47	1.2	53

a. PDVs calculated using a 15-percent discount rate.
b. Navy earnings are Regular Military Compensation, which include basic pay, subsistence pay, housing allowance, and tax advantage.
c. Civilian earnings are calculated using March CPS data from 1999 to 2002 for all males with positive earnings for the following age groups: HSDG: 19-22, AD: 21-24, BD: 23-26. We report median earnings for each group. Data on firm size, pension coverage, and unemployment come from the same sample.

In terms of nonmonetary compensation, the data in table 28 show that both health and retirement benefits in the civilian sector vary with education level. First, consider medical benefits. Employer-provided health insurance is quite common in the civilian sector, but employees often pay at least some of the cost. Because larger firms are more likely to offer health care benefits and tend to pay larger portions of the premiums, we use the proportion of each group working in firms with 500 or more employees as a simple indicator of the likelihood of getting health benefits that are comparable to the benefits

84. We emphasize that while our Navy earnings figures include the value of certain in-kind benefits (i.e., housing), the civilian figures include only earnings.

provided by the military.[85] The data show that this proportion increases with education level.

Turning to retirement benefits, the data also show that workers with college degrees are more likely to be employed in firms that offer pension plans. Furthermore, it is likely that the value of a pension plan increases with education as well, since the value is often calculated as a percentage of the employee's earnings.[86] Finally, the Navy offers a guarantee of constant employment. In contrast, as shown in table 28, HSDGs in the civilian sector can expect to experience 3 weeks of unemployment annually, while ADs and BDs can expect between 1 and 2 weeks. Thus, for HSDGs the nonsalary benefits offered by the Navy are likely to be much more valuable than those they receive in the civilian sector. This is less true for ADs and even less so for BDs.

An additional element that may make the Navy appear less attractive to BDs is the fact the earnings premium awarded to BDs in the Navy is much smaller than the civilian premium. In the civilian sector, the average worker with a BD earns nearly twice as much as the average high school graduate and substantially more than the average AD.[87] In the first 4 years in the Navy, however, a BD earns only about 15 percent more than an HSDG and only about 4 percent more than an AD.

In summary, table 28 suggests that, based on average civilian salaries and other forms of compensation, enlistment in the Navy is likely to be a "good deal" for the average HSDG or AD, but not for the average BD. Of course, factors other than pay and benefits are certainly

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85. Reference [54] shows that larger firms are more likely to provide health benefits and to pay larger portions. Reference [18] also uses this proxy to compare military and civilian health benefits.

86. Although pension coverage is lower in the civilian sector than in the military, all workers are vested within 5 years, compared with 20 years for the military. Since people typically make their enlistment decisions before they are 25, it may be that pension benefits weigh relatively lightly in that decision. However, the extent to which this is true may vary by education level.

87. These earnings differences persist in regression analysis.

important in job choices. For example, job conditions also vary; those in the civilian sector will not face long deployments. Therefore, taste for naval service is an important factor that we cannot take into account in this comparison of earnings.

How big are the potential AD and BD markets?

In the previous section, we evaluated average Navy compensation relative to the average civilian compensation received by members of each education group. However, since there is wide variation in earnings within education levels, as well as across education levels, it is likely that for all three groups there are people for whom the Navy is a relatively good opportunity and people for whom it is not. In this section, we use data on the distribution of earnings within each education level to calculate the numbers of people in each group for whom civilian compensation does not measure up to Navy compensation, and use this as an estimate of potential market size. We then compare market size to actual market presence to determine the extent to which the Navy has penetrated each market.

For this analysis, we make education-specific comparisons between first-year Navy earnings (with and without bonuses) and average annual earnings of 18- to 24-year olds.[88] Then we count the numbers of 18-to 24-year-olds for whom civilian pay is likely to be less than Navy pay. Our results, listed in the top half of table 29, indicate that, in absolute terms, the potential BD market is larger than the potential AD market, but relatively more ADs can be considered likely to join

88. Here we compare annual earnings rather than 4-year PDVs because our civilian earnings data are cross-sectional; therefore, we can calculate average earnings easily but the variation in earnings changes over time. For this reason. figures are not directly comparable to those shown in table 28. For example, table 28 shows that the average AD in the Navy can expect to earn slightly more than the average AD in the civilian sector over 4 years, but table 29 shows that at any given time 75 percent of ADs in the civilian market earn less than they could *during their first year* in the Navy when we include the expected EB and EBCC amounts. This is another way of emphasizing the different patterns of pay in the Navy and the civilian world (see text that follows).

the Navy. It is not surprising that the potential HSDG market is the largest, both absolutely and relatively.

Table 29. Potential market sizes and estimated market penetration, by education level[a]

	HSDG	AD	BD
Potential market sizes			
Earning < a new recruit			
Number	2.98 million	271,000	279,000
Percentage	72	51	32
Earning < a new recruit, including incentive			
Number	3.19 million	398,000	514,000
Percentage	77	75	59
Estimated market penetration			
FY01 accessions	40,706	266	393
Accessions/number earning < a new recruit (%)	1.4	0.10	0.17
Accessions/number earning < a new recruit, including incentive (%)	1.3	0.07	0.08

a. Civilian data include men age 18 to 24; results are weighted to represent the U.S. population.

The patterns of market size are the same whether we include incentive payments or not. When we include the EB and EBCC, a new Navy enlistee earns more than the majority of civilian employees, at any education level. However, enlistment bonuses are crucial in making the Navy competitive for college-degree-holders; without these incentives, two-thirds of those holding 4-year degrees would expect to earn more in the civilian sector. In the case of ADs, about half would earn more in the Navy even without the EB and EBCC; in the case of HSDGs, Navy pay still outstrips civilian pay for a large majority. Thus, it appears that enlistment bonuses, especially the relatively large EBCCs, act to substantially expand the potential college markets.

Finally, for each education group, we calculate the ratio of the number of recruits to the number for whom the Navy represents a good economic opportunity. These ratios, shown in the lower part of

table 29, are an index of the Navy's presence in each market. Whether we include the incentives or not, these measures indicate how much more effectively the Navy has penetrated the HSDG market than either of the college markets. This result suggests that the Navy should be able to expand its presence in the markets for college recruits.[89]

Is reenlistment a good deal for college recruits?

One of our findings is that BD recruits reenlist at a much lower rate than other recruits. Therefore, we next consider education-specific differences in economic opportunities available to Sailors at the time of reenlistment. We analyze reenlistment in a manner similar to the approach used to analyze enlistment opportunities. We begin by calculating PDV amounts for Sailors who have completed 4-year terms of obligation and are considering reenlistment.[90]

Many Sailors are eligible for Selective Reenlistment Bonuses (SRBs) at the first reenlistment point. For a 4-year enlistment, these bonuses are paid in four installments; we include 50 percent of the average SRB with the first year's earnings and one-sixth with each of the next 3 years of earnings. Table 30 indicates that, overall, Navy earnings are still expected to be much higher than civilian earnings for those with high school diplomas and substantially higher for those with ADs (this is true both when we consider the likely SRB and when we do not). As was true for EBs and EBCCs, in the case of ADs, the SRB makes the Navy much more competitive with civilian pay. For those holding 4-year degrees, however, civilian earnings substantially outstrip Navy earnings, even when we include the likely SRB.

Finally, we look more closely at the distribution of civilian earnings and calculate the proportion of Sailors who could earn more in the

89. Our Navy data include individuals with some college credit (but no degree) along with HSDGs; therefore, our measure of market penetration for HSDGs may be somewhat overstated.

90. Although college recruits are more likely than others to have long (5-plus-year) obligations, assuming 4-year reenlistments for all recruits clarifies our analysis.

civilian sector at the first reenlistment point. These data are shown in table 31. In the case of HSDGs, Sailors earn more than the majority of those in the civilian sector with and without the SRB. Those with 2-year degrees earn more than the majority in the civilian sector (with or without considering the SRB), but many in the civilian sector out-earn Sailors at this point.[91] In the case of those holding 4-year degrees, the majority in the civilian sector out-earn Sailors, even when we include this group's average SRB.

Table 30. PDV of civilian and military pay at first reenlistment point[a]

Education	Navy earnings (dollars)[b]		Civilian earnings (dollars)[c]
	Without SRBs	With SRBs	
HSDG	112,090	117,784	75,626
AD	112,090	119,987	101,916
BD	114,653	124,045	138,219

a. Earning streams calculated using a 15-percent discount rate.
b. Assumes that first reenlistment takes place at 4 years of service. Includes average SRB, by education level, assuming a 4-year reenlistment.
c. Civilian wages calculated using March CPS data from 1999 to 2002 for all men with positive earnings for the following age groups: HSDG: 23-26, AD: 25-28, BD: 27-30. In each case, we report median earnings.

At this point, pay in the civilian sector is *more* likely to exceed pay in the Navy than at the enlistment point for those holding college degrees because earnings in the civilian sector increase faster than earnings in the Navy for those with college degrees (see figure 20, which follows). However, HSDGs are more likely to out-earn civilians at the first reenlistment point than at enlistment because pay in the civilian sector increases quite slowly for this group (again, refer to figure 20).

Thus, at the time of reenlistment, the Navy still represents a good deal (economically speaking) for the majority of HSDGs, over half of ADs, and somewhat less than half of BDs. However, the Navy now

91. As in the analysis of pay during the first term, note that table 30 includes discounted pay over 4 years while table 31 focuses on pay during the first year after reenlistment.

constitutes a good deal for fewer college recruits than before. This is particularly true for BDs, and is likely to be a large factor in this group's very low reenlistment rates.

Table 31. Navy vs. civilian pay at time of first reenlistment, by education level[a]

	HSDG	AD	BD
Navy pay at reenlistment (E5 with 5YOS)			
Earnings, no SRB ($)	33,736	33,736	33,736
Earnings, including SRB ($)	37,429	38,799	39,827
Average military raise from entry level ($)[a]	10,635	7,905	7,905
Civilian pay after 4 years in the labor force			
Average civilian earnings ($)	24,978	33,859	48,106
Average civilian raise from entry level ($)	6,865	7,032	10,623
Percentage of civilians earning < $33,736 (%)	79	57	32
Percentage of civilians earning < E5 with 5 YOS and SRB	84	61	45

a. See table 20 for entry-level salaries. Difference calculated for salaries excluding EB, EBCC, and SRB amounts.

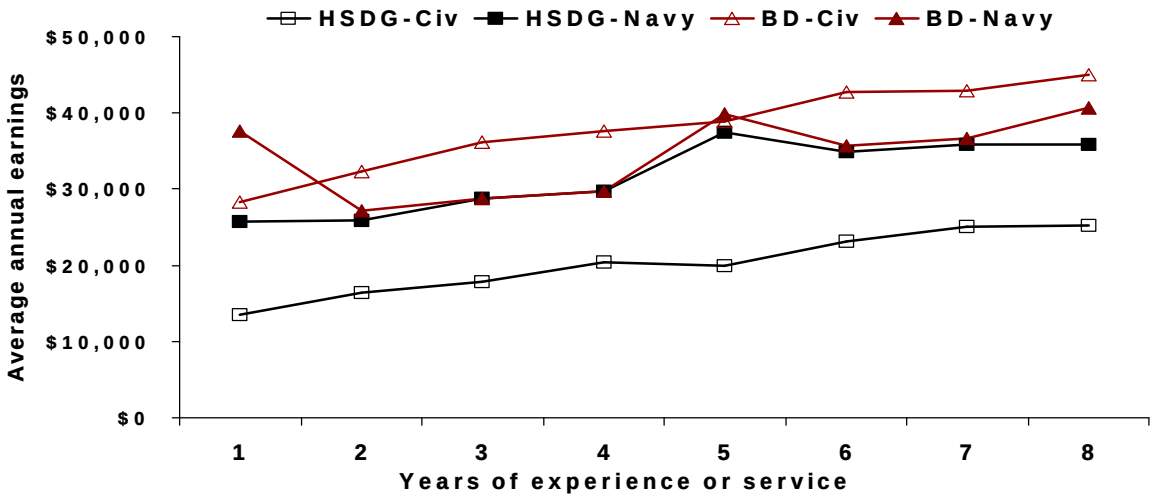
Returns to experience and education in the Navy and the civilian sector

Next, we summarize the relationship between Navy and civilian earnings for HSDGS and for college-degree-holders. Now, however, we plot earnings for each year (rather than a discounted earnings stream) to show that earnings tend to evolve in different ways in the Navy versus the civilian sector. These differences have important implications for understanding the role of enlistment and reenlistment incentives in expanding the college markets.

Figure 20 plots expected Navy and civilian pay for each year over the 8-year period following the completion of schooling for HSDGs and BDs (values for ADs fall between the values for HSDGs and BDs in each case; ADs are omitted for clarity). The data show that earnings

are relatively equal across education levels in the Navy; although those with BDs receive higher enlistment bonuses, access at a higher rank, and receive higher reenlistment bonuses, earnings of both groups remain fairly close for most of the first 8 years of service. In the civilian labor market, in contrast, those with high school diplomas earn far less than those with BDs at all points, and BDs' earnings increase more quickly. (Although college recruits access at higher paygrades, the average HSDG recruit is at the same paygrade as the average college recruit by the end of the first term; this remains true until the end of the second term, when the majority of BD recruits reach E6 before other recruits.)

Figure 20. Annual earnings of HSDGs and BDs in the Navy and the civilian labor market



Because EB incentives are paid at the beginning of one's obligation, Navy pay actually *decreases* substantially for Sailors with BDs between the first and the second years of obligation. In contrast, Navy pay increases for Sailors with HSDGs, on average, because the increase in RMC due to increased rank is slightly greater than the average EB awarded to HSDG enlistees. As shown in figure 20, because of the large EBs and EBCCs offered to BD recruits, expected Navy pay is more than expected civilian pay for this group during the first year of

obligation. However, during most of the first 4 years, expected Navy pay is far below expected civilian pay. The information in this figure, combined with information in tables 28 and 29 suggests the following notions: recruiting incentives are larger for college recruits because civilian pay is greater for this group. Therefore, the return to education in the Navy occurs at enlistment. In contrast, the return to education in the civilian sector occurs over time. Therefore, the more college recruits value current pay over future pay, the better the Navy appears to them, all else equal.

A similar phenomenon occurs at the time of reenlistment. In figure 20, we see that Navy earnings exhibit a "bump" at year 5; this is due to SRB payments. Again, Sailors collect a return for their education at the beginning of the term of service, although the pattern is somewhat different than in the first 4 years of service because SRB payments continue over 3 years. Note also that the difference between Navy earnings for those holding a 4-year degree and those holding a high school diploma are small during the second term; in contrast, differences in the civilian sector continue to increase over time.

Summary

In summary, our data indicate that education-specific differences in Navy pay are small and primarily driven by one-time incentives. Navy benefits are, of course, equally available to all Sailors. In contrast, both initial earnings and raises are much higher in the civilian sector for those with college degrees than for other workers. Also, those with college degrees experience less unemployment and have more generous employer-provided benefits than those without college degrees. For these reasons, the average high school graduate can expect to earn more in the Navy than in the civilian sector, as can the average person holding a 2-year degree. The reverse is true for the average 4-year-degree-holder; however, the Navy is still a good deal for some of these college graduates. The enlistment bonuses make the Navy's earnings much more competitive for both 2- and 4-year-degree-holders.

That said, the patterns of earnings are starkly different in the Navy and the civilian sector. In the Navy, those with more education

receive a pay-off at the initial enlistment point and another at the reenlistment point; otherwise, their wages are quite similar to those of HSDGs. In the civilian sector, in contrast, those with college degrees receive regular pay increases and the difference in earnings between those with and without college degrees grows over time.

Although the pool of potential AD recruits is relatively small, they may be preferable to BDs because the Navy is more likely to constitute a good deal for this group, both at enlistment and at reenlistment. Despite the relatively small size of the pool of people with college degrees and their substantial civilian earnings, college recruits in the Navy represent less than one-half of 1 percent of those who earn less than Navy pay in the civilian sector. Therefore, expansion should be possible in this market without dramatically increasing marginal recruiting costs.

Conclusion

Findings

Maintaining quality

To date, increases in college enrollments have not substantially decreased the potential supply of high-quality military recruits. This is because of two unrelated trends. First, the increase in college attendance has been driven largely by the increasing tendency of *women* to attend college. Because women enlist at much lower rates than men, college attendance has harmed recruiting less than was expected. Second, during this same period, the overall recruiting mission decreased sharply. Smaller trends have also been important: although propensity has fallen over time, the size of the youth population was increasing during the 1990s.

Estimates of future population growth for 18- to 24-year-old men and expected trends in college enrollments suggest that the supply of high-quality recruits will remain adequate for the next 10 to 15 years. Therefore, we conclude that, for this time frame, recruiting in the college market will not be necessary to maintain fleet quality. We do note, however, that if the recruiting mission increases or the proportion of men attending college increases beyond expectations, overall quality may become more of a concern. Furthermore, increases in the number of high school completers who get GEDs rather than traditional diplomas may make maintaining quality more difficult.

Improving quality

Recruiting more people with college degrees could indeed increase the average quality of the enlisted force. Based on a variety of measures, those with college degrees compare favorably with HSDGs in terms of quality; relative to HSDGs, college-degree-holders have higher average AFQT scores, lower first-term attrition rates, and

lower rates of academic setback and attrition during initial skills training. Furthermore, BDs appear to promote more quickly from E4 to E5 than other Sailors in their cohorts and ratings. The distinguishing factor between AD and BD quality is reenlistment rates; Sailors with BDs is lawler substantially lower reenlistment rates than any other group.

Our analysis indicates that NWC recruits are not of particularly high quality on average. It is likely that recruiting more NWCs in place of HSDGs would lower the average quality of the force. However, high-AFQT NWCs appear to be good performers; they have relatively high reenlistment rates and promote more quickly from E5 to E6 than HSDGs.

Although we have only limited data on HSWCs, our analysis suggests that they perform well relative to HSDGs. They have relatively high AFQT scores, on average, and they have lower bootcamp and 12-month attrition rates.

Decreasing training costs

There is no evidence that the Navy spends less money on training as a result of recruiting Sailors with college experience. On the contrary, we find that the Navy spends more on training for ADs and BDs than on training for HSDGs. Two factors drive this result: (1) college-degree-holders are paid more per day of training because they access at advanced paygrades and are more likely to be married and (2) they attend more training overall, partially because they are assigned to long-pipeline ratings. We estimate that factors 1 and 2 account for 25 and 75 percent, respectively, of the total difference in training costs between college-degree-holders and HSDGs. In addition, the data do not indicate that college recruits skip any phase of training. In fact, ADs and BDs receive more training than others within the same ratings. We suspect that college recruits engage in more technical training, and perhaps qualify for more technical NECs, although empirically testing this hypothesis is beyond the scope of this project.

In contrast to ADs and BDs, the Navy spends less on training for NWCs than for HSDGs, on average. This difference is primarily due

to the fact that NWCs are assigned to ratings with shorter training pipelines.

Finally, because of education-specific differences in average pipeline length and average continuation, we also estimated the relative return on training investments for each type of recruit. We calculate that the cost to train per month in the fleet is lower for HSDGs than for any type of college recruit; among college recruits, this ratio is lowest for ADs and highest for NWCs. The primary factor driving the difference between ADs and BDs is the low reenlistment rates of BDs. Our analysis implies that it would be necessary to cut BDs' training time by about 10 percent to lower their costs to train per month to that of HSDGs.

Does the Navy represent a good opportunity for college recruits?

We use civilian data to characterize the alternate employment opportunities available to Navy recruits with different education levels. As expected, average civilian-sector opportunities improve with education. However, we find that the Navy still represents a good deal, in terms of earnings, for a substantial number of college-degree-holders, especially when we take into account enlistment bonuses. To assess the Navy's prospects for expansion in the college markets, we created a measure of market penetration that incorporates relative population sizes and relative market opportunities for college recruits. Despite the small sizes of the AD and BD markets relative to the HSDG market and despite their better civilian opportunities, our penetration index indicates that the Navy's presence in both college markets is still much smaller than its presence in the HSDG market. Therefore, we believe that expansion is possible without requiring significantly greater recruiting resources.

We also consider how Sailors' likely civilian opportunities might affect their decisions to reenlist. Again, we find that reenlistment is a good deal for many college-degree-holders, but it is a good deal for relatively fewer BD-holders. This is partially because the Navy's pattern of earnings over time is very different from the pattern of earnings in the civilian sector. Specifically, SRB awards mean that Sailors with college degrees receive a substantial payoff to their education at

the beginning of their second terms. In civilian jobs, the payoff is larger but it accrues more slowly over time. We expect those with more education to have lower discount rates than others, based on the fact that they were willing to forgo current earnings while in school. This suggests that the "lumpy" paystream experienced by BDs in the Navy, with payoffs to education at the beginning of each term, may actually be more appropriate for HSDGs than for BDs.

Finally, because HSWCs do not receive a large wage premium in the civilian sector, Navy pay is even more likely to be attractive to this group than to those holding college degrees. Of course, it is not clear how many HSWCs intend to return to college. On one hand, their desire for additional schooling may provide an opportunity for the Navy; the NCF could be a particularly effective recruiting tool among this group. On the other hand, it may be that HSWCs' desire to return to school will mean that this group will have a relatively low reenlistment rate.

Recommendations

Market-specific recommendations

NWCs

We do not recommend expanding efforts to recruit those who did not complete high school but did earn some college credit (NWCs). Instead, we recommend that the Navy more carefully screen these potential recruits; for them, AFQT score seems an especially important predictor of success, so extra efforts to recruit NWCs with high AFQT scores are likely to be worthwhile. We also suggest offering EBCCs only to high-AFQT NWCs.

BDs

We find no compelling reason to dramatically increase the number of enlisted Sailors with 4-year degrees (BDs). However, since they are relatively high-quality recruits, we do not recommend turning away the BD-holders who are currently enlisting without being specifically targeted. Furthermore, for these Sailors, finding a way to provide sub-

stantial increases in pay over time might be an effective way to improve their reenlistment rates.

ADs

We find that ADs are good Sailors on most measures. They also reenlist at higher rates than both BDs and, as a result, yield a higher return on the Navy's investment in their technical training. Like BDs, ADs may also have valuable, unmeasured qualities. Furthermore, because the Navy's penetration into the AD market is quite limited, it should be possible to expand the number of ADs without disproportionately increasing recruiting resources. We recommend that the Navy continue to explore ways to gain access to the community college market.

HSWCs

Our findings suggest that high school graduates who have earned some college credits, but no college degree (HSWCs), are high-quality recruits compared with HSDGs. Therefore, we recommend continuing to monitor the performance of this group with the data that are now available. In the meantime, we also recommend targeting this group with incentives that will allow them to pay back debts they may have incurred while in college and/or to combine service with education so that they can complete their degrees. Since there are many more HSWCs than ADs and BDs among those age 18 to 24, and since HSWCs have less lucrative and less certain civilian opportunities than those with college degrees, we believe they represent a good target market.

General recommendations

Changing the classification and training processes

Our analysis revealed that, within the current systems for classification and training, the Navy does not realize training savings from college recruits. For the Navy to fully benefit from college recruits as pretrained recruits, we recommend pursuing the new policies for classification and training that are being developed as part of Sea Warrior and the Revolution in Training.

College recruiting during economic booms

During the late 1990s, recruiting was very difficult for all the Services—not because of increased college enrollments but because of very low unemployment rates and increasing wages in the civilian economy, especially for HSDGs. Future changes in the economy will continue to affect recruiting; in particular, if the (relative or absolute) pay received by those with high school degrees increases, the Navy will face tougher recruiting times than it does today. If this occurs, the extent to which college recruits represent a cost-effective alternative will depend on the wages and benefits available to them in the civilian market. If wages of high school graduates rise relative to those of college graduates, the college market may be the place to turn. However, if the college wage premium increases, attracting college recruits may be even more difficult than attracting HSDGs. In this case, other strategies should be pursued.

Appendix A: Excluded groups of college-educated Sailors

We excluded several groups of college-educated Sailors from the analysis because they did not fit the profile of interest.

The first group with college experience that we did not evaluate is traditional HSDG recruits who enter the Navy with no postsecondary education but pick up college credits or a degree while in the Service. According to reference [48], 18 percent of Sailors participated in Navy-sponsored voluntary education programs in FY97. Based on data from the Defense Manpower Data Center's 1999 Survey of Active Duty Personnel, [43] reports that enlistees in all four Services are likely to get additional education after joining. While 60 percent of survey respondents reported having had no more than a high school diploma at the time of enlistment, only 23 percent remained at that level at the time of the survey. This group of Sailors we excluded because they had not made any investments in college education before enlisting.

We also excluded a few other types of college recruits: nurses, because we considered them to be a unique group, and people with more than a BD, because only a few of these enlist each year. For example, in FY03, the numbers of accessions with Master's degrees, first professional certificates, and doctorates were 31, 3, and 0, respectively.

Appendix B: Additional information on BD recruits who transfer to the officer community

Throughout this research, we deleted observations on Bachelor's degree (BD) recruits who transferred from the enlisted ranks of the Navy to its officer community. We excluded these recruits from the analysis because we did not consider their behavior—either as Sailors or Officers—to be representative of BDs who remain in the enlisted force. However, if these Sailors become active-duty Officers and provide substantial productive service, ignoring their time as Officers underestimates their value to the larger Navy. So in this appendix, we provide supplementary descriptive data on BD-holders who become Officers, and we quantify the amount of time they spend in the Navy.

Characterizing BD officer transfers

Which BDs transferred?

In table 32, we present some basic demographic information for the BDs who did and did not transfer to the officer community. The data show that during our FY92-02 study period, the BD-holders who transferred had substantially higher AFQT scores, on average, than the BDs who remained in the enlisted community. BDs who transferred were also more likely than those who didn't transfer to be men and to be white; they were much less likely to be black.

When did transfer occur?

Table 33 shows data that capture the points at which transfers took place during BD-holders' careers. The top section of table 33 shows that the vast majority of BD-holders who transferred had already completed their initial skills training and attained a rating. The bottom section shows how BD transfers were distributed across years of enlisted service. The data show that most of these Sailors transferred during their second and third years of service.

Table 32. Demographic characteristics of BD recruits who did and did not transfer to the officer community[a]

	Transferred	Did not transfer
Average AFQT score	89.0	77.8
Group shares (%)		
Male	84.5	77.0
Married	11.5	14.9
White	77.1	63.7
Black	8.0	16.2
Hispanic	8.9	9.7
Other	6.0	10.4

a. Data pooled across fiscal years of accession, FY92-FY02.

Table 33. Rating status and years of service at time of transfer[a]

	Frequency	Share (%)
Status		
Not rated	34	6.8
Rated	463	93.2
Total	497	100.0
Year of service in which transfer occurred		
1st year	52	10.5
2nd year	194	39.0
3rd year	153	30.8
4th year	56	11.3
5th year	31	6.2
6th year	11	2.2
Total	497	100.0

a. Data pooled across fiscal years of accession, FY92-FY02.

From what ratings?

The training data reveal an interesting pattern in the transition from enlisted to Officer; those who make the transition are heavily concentrated in a few (enlisted) ratings. As shown in table 34, in seven different ratings, at least 2 percent of enlistees become Officers; within these ratings, the proportion of BDs who become Officers is generally between 15 and 30 percent (compared with 8 percent for all BDs).

Thus, a large proportion of the recruits in these ratings become Officers before fulfilling their enlisted obligations.

Table 34. Percentage of enlistees who become Officers, by rating and education level

	Percentage of		
Rating	Enlistees who become Officers	Enlistees who are BDs	BDs in these ratings who become Officers
ET_N	7.1	1.7	30.0
MM_N	5.7	1.2	32.3
EM_N	4.9	0.7	36.4
IS	2.6	5.0	23.9
CTM	2.4	4.1	15.0
MM	2.2	0.8	28.2
ET	2.1	2.3	22.4

Outcomes for Sailors who transfer to the officer community

Next, we present data on outcomes for all Sailors who transferred to the officer community and compare outcomes for BDs who transferred with outcomes of those with other education levels, especially high school diploma graduates (HSDGs). For this analysis, we used social security numbers to find the OMT records of all Sailors who were identified in the EMR as having transferred to the officer community; of the 3,297 enlisted personnel who were supposed to make the transfer, 3,131 were found on the OMT. Of these, 1,831 could be identified as becoming active Officers.

Likelihood of successful transition

The data on Officer transfers presented in the main text told how many recruits left the enlisted force with the intention of becoming Officers. Table 35 shows how many of these Sailors made the transition successfully. BD-holders were not only more likely than other Sailors to *intend* to be Officers but also more likely to actually become Officers. In particular, more than 90 percent of the BD transfers have

taken up active duty as Officers; in contrast, no more than half of the HSDG transfers have actually entered active duty.[92]

Table 35. Likelihood of transferring from the enlisted ranks and becoming an active-duty Officer, by education level[a]

	Percent of all accessions who		Percent of those who left enlisted who became Officers
Education level	Left enlisted to become Officers[b]	Became active-duty Officers	
HSDG	0.6	0.3	49.0
NWC	0.1	0.1	50.0
AD	0.7	0.5	75.0
BD	8.7	7.9	91.3

a. Data pooled across fiscal years of accession, FY92-FY02.
b. Sample sizes: HSDG = 2,722; NWCs = 16; AD = 24; BD = 497.

The difference between the outcomes of BDs and HSDGs undoubtedly stems, at least in part, from the fact that many HSDGs must go to college on the way to active duty as Officers, while BDs obviously need not. Indeed, about 50 percent of the HSDGs who could not be identified as active Officers left the enlisted ranks between FY99 and FY03 and, therefore, may not have completed their Bachelor's degrees as of the most recent snapshot from the OMT. Nonetheless, even when we look at HSDGs who left the enlisted ranks at least 5 years ago, more than one-third did not actually become active-duty Officers.

Continuation behavior

Among those who successfully transitioned to the officer community, college-degree-holders spent significantly more months as active-duty Officers than did HSDGs. Table 36 shows that, as of March 2004, ADs and BDs who transferred spent, on average, about 16 more months on active duty in the officer community.

92. The majority of ADs, and about half of NWCs, who enter the Officer Corps enter active duty, but these samples are extremely small (n = 18 for ADs, n = 8 for NWCs), so we use caution in interpreting the results.

Table 36. Time spent as Officers, by education level

Education level	Average months as an active-duty Officer	Expected months of total Navy service per enlisted recruit
HSDG	41.7	0.13
NWC	42.3	0.02
AD	58.6[a]	0.31
BD	58.4[a]	5.0

a. Indicates that months served by college recruits were significantly different from the average HSDG score with 99-percent confidence.

Table 36 also shows the impact on total time in the Service of combining transfer recruits' time as Officers with their time as Sailors. We calculate that the relatively high proportion of BDs transferring to the Officer Corps and their relatively long service there raise the total expected service of BD enlisted recruits by about 5 months. Similarly, despite their small numbers, AD transfers to the Officer Corps increase the expected length of ADs' service by about one-third of a month. In contrast, considering officer transfers increases the expected length of service for HSDGs and NWCs by only a minuscule amount.

Appendix C: Defining rating groups

The rating groups used in this study were defined based on the lengths of their A-school training pipelines: for each rating we calculated pipeline lengths based on the average total days under instruction (UI) in any A-school that started before the rate date for all FY98 accessions who attained that rating. Based on these UI totals, there are four rating groups:

- Ratings with **short** pipelines—60 days or fewer
- Ratings with **medium** pipelines—more than 60 days, but fewer than 100 days
- Ratings with **long** pipelines—100 days or more
- Ratings with **uncategorized** pipelines—ratings with pipelines that couldn't be measured using training data.

Overall, we categorized 134 promised ratings or programs and 86 ratings that could actually be achieved. Four promised programs were not categorized into any of the four groups: the general detail designations (AN, FN, and SN) and the Nuclear Field (NF). In the main text, we summarized assignment to these programs separately.

Promised ratings do not map directly to achieved ratings because some are actually general programs, or families of ratings, such as administrative (ADMN), electrical (ELCL), and engineering (ENGR). A recruit who is promised training in one of these programs can eventually be rated in a range of ratings. If all the likely achieved ratings for a promised rating program fell into the same pipeline category, the promised program was also placed in that category; if the likely achieved ratings fell into different pipeline categories, the promised program was considered uncategorized. Other promised and achieved ratings that were uncategorized were those that were no longer in use as of FY98 (i.e., Sailors who attained these ratings accessed before FY98). Table 37 lists the ratings in each group.

Table 37. Individual ratings promised and achieved by rating group

Short		Medium		Long		Uncategorized	
Promised	Achieved	Promised	Achieved	Promised	Achieved	Promised	Achieved
ABE	ABE	AG	AG	AC	AC	AIR	
ABF	ABF	BU	BU	AE	AE	AIRC	
ABH	ABH	CONT		AEC		AIRR	
AD	AD	CTA	CTA	AECF		BT	
ADMN		CTO	CTO	AS	AS	CT1	BT
AK	AK	DC	DC	AT	AT	CT2	
AM	AM	DS	DS	AV	AW	DIV	
AME	AME	ELCT		AW			
AMH	AMH	EO	EO	CM	CM	DP	DM
AMS	AMS	HCMB		CTI	CTI	ENGR	DP
AO	AO	HT	HT	CTM	CTM	EOD	
AORD		IT		CTT	CTT	FS	
AZ	AZ	JO	JO	EA	EA	IM	
	BM	LI	LI	ELCL		LLE	IM
BMA		MM	MM	EM	EM		
CE	CE	MMS		EN	EN	ML	LN
CT*		MN	MN	ET	ET	OM	ML
CTR	CTR	OS	OS	ETS		OPCM	OM
DK	DK	PH	PH	EW	EW	OTA	
DT	DT	RM	RM	FC	FC	OTM	OTA
MA	MA	RMS		FT	FT	PM	OTM
MCHA		STG	STG	FTG	FTG	SAE	PM
MS	MS	SW	SW	GM	GM	SPE	
MSS		TM	TM		GMG	SS	
NAV		TMS			GMM	ST1	
PC	PC	UT	UT	GSE	GSE	ST2	
PN	PN			GSM	GSM	ST3	
PR	PR			HM	HM	ST4	
QM	QM			IC	IC	ST5	
QMS				ICS		ST7	
RP	RP			IS	IS	ST9	
SH	SH			MED		WT	
SK	SK			MR	MR		
SKS				MT	MT		
SM	SM			MU	MU		
SPSV				ORDN			
ST6				SEC			
ST8				SECF			
YN	YN			STS	STS		
YNS				SWS			

Appendix D: Top 10 promised and achieved ratings by education level

In this appendix, we provide detail on ratings promised and achieved beyond what is provided in the text. These data are provided to demonstrate that recruits with college degrees are not clustered in only a few specific ratings.[93] However, other than the tendency for all types of recruits to be assigned to the Navy's most populated ratings, college-degree-holders do enter slightly different ratings than other recruits.

Table 38 shows the top 10 non-Gendet ratings promised to recruits in each education group and the extent to which recruits in each group are clustered in the top 10. The data show that overall, top-10 concentration was higher for ADs and BDs than for other recruits. This largely reflects education-specific differences in the rates at which recruits were promised school guarantees; for HSDGs and NWCs, the three general detail designations were among the top four promised rating programs. The data also show the extent to which each group of college recruits' rating assignments differ from HSDGs' assignments. First, over the study period, the three most populated ratings for HSDGs and for the Navy as a whole were HM, NF, and AEC; these were also the top three for college-degree-holders. NWCs are not eligible for NF; therefore, the top three ratings for NWCs are the Navy's first, second, and fourth most populated ratings.

Beyond the most populated ratings, divergence from HSDG assignments increased with education level. NWCs were promised largely

93. For example, it is frequently hypothesized that a large portion of BD recruits must enter the musician rating (MU), which is not available to Officers. The data in table 38 show that, while many who attained the MU rating are indeed BD holders, very few of the rated BD-holders are rated in MU.

the same ratings or programs as HSDGs, while ADs and BDs were promised a different set of programs. In general, the data reflect the patterns seen in the rating group shares, showing that HSDGs and NWCs were more likely to be promised short-pipeline ratings, while ADs and BDs were more likely to be promised long-pipeline ratings.

Table 38. Top 10 non-Gendet promised ratings, by education level

HSDG		NWC		AD		BD[a]	
Rating promised	Share of accessions (%)	Rating promised	Share of accessions (%)	Rating promised	Share of accessions (%)	Rating promised	Share of accessions (%)
NF[b]	**6.7**	**HM**	**5.1**	**HM**	**8.7**	**HM**	**9.3**
HM	**6.1**	**AEC**	**3.4**	**NF**	**8.7**	**NF**	**8.0**
AEC	**3.7**	**MS**	**3.1**	**AEC**	**6.2**	**AEC**	**5.8**
AT	**2.3**	**AT**	**2.1**	**AT**	**4.1**	**CTI**	**3.1**
MS[c]	**2.2**	**AO**	**2.0**	**OS**	**1.8**	**MU**	**2.6**
OS	**2.2**	**MM**	**1.6**	**RM**	**1.7**	**CT***	**2.4**
RM[d]	**1.6**	**AD**	**1.6**	**MS**	**1.5**	**IS**	**2.3**
MM	**1.6**	**EN**	**1.4**	**IC**	**1.5**	**AT**	**2.3**
AO	**1.5**	**OS**	**1.4**	**AE**	**1.3**	**RM**	**2.0**
AD	**1.4**	**HT**	**1.3**	**ET**	**1.3**	**PN**	**1.9**
Total	29.3	Total	22.9	Total	36.7	Total	39.8

a. Data on BDs do not include Sailors who transferred to the officer community.
b. Blue shading shows that the indicated rating is in the long-pipeline group.
c. Red shading shows that the indicated rating is in the medium-pipeline group.
d. Yellow shading shows that the indicated rating is in the short-pipeline group.

As with rating promised, we can look at the top 10 ratings achieved by Sailors in each education group, as well as the extent to which Sailors in each group are clustered in the top 10. For each education group, table 39 shows the 10 Navy occupations in which Sailors were most frequently rated during the study period. The data on ratings achieved tell essentially the same story as did the data on ratings promised: College-degree-holders were more concentrated in their top 10 ratings than were HSDGs,[94] recruits of all types were likely to attain the

94. The differences between HSDGs and college recruits are smaller for rating achieved than for rating promised because the differences in being given a school guarantee are not relevant for rating achieved.

Navy's most populated ratings, and differences between college recruits and HSDGs increased with education level. Finally, these data also confirm that college-degree-holders were more likely than HSDGs to attain long-pipeline ratings.

Table 39. Top 10 ratings achieved for rated Sailors, by education level

HSDG		NWC		AD		BD[a]	
Rating achieved	Share of rated Sailors (%)	Rating achieved	Share of rated Sailors (%)	Rating achieved	Share of rated Sailors (%)	Rating achieved	Share of rated Sailors (%)
HM[b]	**8.2**	**HM**	**7.8**	**HM**	**10.9**	**HM**	**10.8**
MM[c]	**7.1**	**MS**	**5.2**	**ET**	**8.7**	**ET**	**7.3**
ET	**4.8**	**AT**	**4.2**	**AT**	**6.6**	**CTI**	**4.9**
EM	**4.1**	**MM**	**4.1**	**MM**	**5.6**	**MM**	**4.2**
AT	**4.1**	**AO**	**3.9**	**EM**	**4.1**	**AT**	**4.1**
OS	**3.7**	**ET**	**3.7**	**RM**	**3.2**	**RM**	**4.1**
RM	**3.5**	**RM**	**3.0**	**FC**	**2.8**	**MU**	**3.5**
MS[d]	**3.4**	**OS**	**2.9**	**AE**	**2.7**	**YN**	**3.3**
AO	**2.9**	**AD**	**2.8**	**OS**	**2.6**	**PN**	**3.2**
AD	**2.7**	**BM**	**2.6**	**SK**	**2.3**	**EM**	**3.1**
Total	44.5		40.1		49.5		48.5

a. Data on BDs do not include Sailors who transferred to the officer community.
b. Blue shading shows that the indicated rating is in the long-pipeline group.
c. Red shading shows that the indicated rating is in the medium-pipeline group.
d. Yellow shading shows that the indicated rating is in the short-pipeline group.

Finally, under the "rating achieved" heading, we also looked at the education mix of Sailors in each rating to see if there were certain ratings in which college recruits were overrepresented during the study period. Table 40 lists the ratings in which at least one group of college recruits makes up a disproportionately high share. The first three columns of the table show each college group's shares of the total number of Sailors who attained the specified ratings. Thus, the data in these columns show the type of ratings that might be considered to have had high demand for Sailors with college skills. The data in the second group of three columns show the shares of rated Sailors from each education group that was rated in the specified rating. Thus, the data in these columns show the extent to which Sailors of each type were concentrated in the ratings in which they have disproportionately many assignments.

Table 40. Ratings in which at least one group of college recruits has a disproportionately high share[a]

Rating	Share of all who achieved specified rating (%)			Rating-specific share of Sailors achieving a rating (%)		
	NWC	AD	BD	NWC	AD	BD[b]
All who achieved any rating	**2.2**	**0.7**	**1.2**	**100.0**	**100.0**	**100.0**
Short pipeline						
CTR = Cryptologic technician, collection			2.8			2.2
PN = Personnelman		1.3	3.0		2.0	2.8
SH = Ship's serviceman	4.0			2.1		
TOTAL				2.1	2.0	5.0
Medium pipeline						
DS = Data systems technician	5.6	2.4		0.4	0.5	
HT = Hull maintenance technician	4.1			2.0		
JO = Journalist		2.1	8.3		0.6	1.4
LI = Lithographer		1.7	3.0		0.2	0.2
MN = Mineman	4.8			0.5		
PH = Photographer's mate		1.3	3.2		0.6	0.9
SW = Steelworker	4.9			0.7		
TOTAL				3.6	1.9	2.5
Long pipeline						
EA = Engineering aid		5.4	2.7		0.9	0.3
CTI = Cryptologic technician, interpreter			11.6			4.9
CTM = Cryptologic tech., maintenance			3.4			1.4
IS = Intelligence specialist			4.5			3.2
MU = Musician			27.5		0.3	3.3
TOTAL				0.0	1.2	13.1
Total for all ratings				5.7	5.1	20.6

a. For this table, "disproportionate" representation is loosely defined as 2 or mores times the specified group's share of all who achieved any rating.
b. Data on BDs do not include Sailors who transferred to the officer community.

Beginning with NWCs, the data show that they were overrepresented in short- and medium-pipeline ratings only, and these ratings appear to be best characterized as requiring general or vocational skills. Overrepresentation of Sailors with ADs was fairly evenly spread across rating groups, with a slightly lower concentration in long-pipeline ratings. The ratings in which ADs were overrepresented appear to be those in which college-acquired skills, such as language or musical

training, might be especially valued. Finally, Sailors with BDs were in the same types of ratings as ADs, but they were overrepresented in more ratings and their overrepresentation was more concentrated in long-pipeline ratings.

Overall, the numbers of NWCs and ADs who attained ratings in which college recruits were overrepresented were quite small, indicating that members of these groups were not being targeted to fill specific ratings. In contrast, about 21 percent of BDs were in ratings in which they were overrepresented. This indicates that, to a larger degree, BD-holders either chose or were chosen to be in specific ratings might use their already accumulated skills.

Appendix E: Regression results for continuation models

Table 41 lists the explanatory variables used in the continuation models, along with their possible values and the left-out categories if appropriate. Regression results for the 12-, 48-, and 84-month continuation models are presented in table 42 for HSDGs; table 43 for NWCs; table 44 for ADs; and table 45 for BDs.

Table 41. Explanatory variables in continuation models

Variable	Variable range/values	Left-out category
AFQT score	31 to 99	-na-
AFQT squared	961 to 9,801	-na-
Gender	Male, female	Female
Race	White, Black, Hispanic, Other/unknown	White
Marital status	Single, married	married
Age	17 to 37	-na-
Age squared	289 to 1,369	-na-
FY of accession	FY92-Dec02 for 12-month continuation; FY92-Dec00 for 48-month continuation; FY92-Dec97 for 84-month continuation	FY92
Number of months in DEP[a]	0-15 months	-na-
Ship month[a]	Oct., Nov., Dec., or Jan. (OND J); Feb., Mar., Apr., or May (FMAM); Jun., Jul., Aug., or Sep. (JJAS)	JJAS
Accession waiver	Need waiver, don't need waiver	Need waiver
Rating promised	None, short,[b] medium, long, uncategorized	None

a. Only in 12-month model.
b. For the continuation models, Gendets were removed from the short-pipeline group.

Table 42. HSDG models									
	12-month continuation			48-month continuation			84-month continuation		
Variable	Coefficient	Std. Error	z	Coefficient	Std. Error	z	Coefficient	Std. Error	z
AFQT	0.000	0.001	0.13	-0.005	0.001	-3.86	-0.007	0.002	-3.57
AFQT squared	0.000	0.000	6.34	0.000	0.000	7.82	0.000	0.000	5.75
Male	0.112	0.010	11.23	0.031	0.009	3.37	0.107	0.014	7.47
Black	0.331	0.010	31.65	0.318	0.009	33.56	0.713	0.014	52.54
Hispanic	0.398	0.013	31.71	0.351	0.011	31.73	0.360	0.017	21.78
Other race	0.441	0.017	26.64	0.524	0.015	34.62	0.820	0.022	37.43
Single	-0.243	0.021	-11.6	-0.254	0.019	-13.62	-0.362	0.025	-14.67
Age	-0.020	0.015	-1.39	-0.035	0.014	-2.54	-0.002	0.019	-0.11
Age squared	0.000	0.000	-0.44	0.001	0.000	2.7	0.001	0.000	1.94
FY of accession = 1993	-0.159	0.016	-9.7	0.064	0.013	5.05	0.012	0.016	0.73
FY of accession = 1994	-0.104	0.017	-6.07	-0.056	0.013	-4.25	0.016	0.017	0.95
FY of accession = 1995	-0.158	0.018	-8.97	0.035	0.014	2.56	0.072	0.017	4.24
FY of accession = 1996	-0.156	0.018	-8.76	0.166	0.014	12.08	0.309	0.016	18.83
FY of accession = 1997	-0.284	0.017	-16.44	0.327	0.014	24.05	0.428	0.025	17.16
FY of accession = 1998	-0.279	0.018	-15.73	0.427	0.014	30.5	--	--	--
FY of accession = 1999	-0.235	0.018	-13.05	0.451	0.014	32	--	--	--
FY of accession = 2000	-0.047	0.018	-2.56	0.397	0.029	13.55	--	--	--
FY of accession = 2001	0.057	0.019	3.04	--	--	--	--	--	--
FY of accession = 2002	0.286	0.021	13.97	--	--	--	--	--	--
Number of months in DEP	0.043	0.001	35.95	--	--	--	--	--	--
Shipped in Oct, Nov, Dec, or Jan	-0.063	0.010	-6.58	--	--	--	--	--	--
Shipped in Feb, Mar, Apr, or May	-0.102	0.010	-10.38	--	--	--	--	--	--
No accession waivier	0.223	0.009	25.23	0.278	0.008	34.58	0.166	0.012	13.35
Promised a short-pipeline rating	0.040	0.012	3.39	0.775	0.011	71.53	0.543	0.016	33.69
Promised a medium-pipeline rating	0.068	0.014	5.02	0.748	0.012	63.02	0.516	0.018	28.68
Promised a long-pipeline rating	0.117	0.012	9.96	0.996	0.010	97.41	0.734	0.015	49.19
Promised an uncategorized rating	0.036	0.016	2.28	0.881	0.014	61.38	0.648	0.020	31.73
Constant	1.421	0.176	8.07	-0.447	0.161	-2.77	-2.186	0.231	-9.45
Sample size		476,182			365,303			247,614	
Log likelihood		-220,958.3			-239,733.9			-120,193.3	
LR chi2(X)		9,256.8			26,624.9			9,087.3	
Psuedo R2		0.02121			0.0526			0.0364	

Table 43. NWC models									
	12-month continuation			48-month continuation			84-month continuation		
Variable	Coefficient	Std. Error	z	Coefficient	Std. Error	z	Coefficient	Std. Error	z
AFQT	-0.009	0.008	-1.14	-0.007	0.009	-0.82	-0.037	0.014	-2.66
AFQT squared	0.000	0.000	2.53	0.000	0.000	1.81	0.000	0.000	2.98
Male	0.090	0.054	1.67	0.020	0.064	0.31	-0.058	0.101	-0.58
Black	0.390	0.051	7.71	0.159	0.063	2.53	0.320	0.101	3.15
Hispanic	0.471	0.058	8.14	0.455	0.064	7.11	0.649	0.097	6.72
Other race	0.317	0.078	4.05	0.428	0.093	4.62	0.744	0.149	4.99
Single	-0.309	0.072	-4.31	-0.337	0.076	-4.46	-0.413	0.108	-3.82
Age	0.135	0.053	2.54	0.402	0.065	6.22	0.281	0.103	2.73
Age squared	-0.003	0.001	-2.44	-0.008	0.001	-5.68	-0.005	0.002	-2.3
FY of accession = 1993	0.055	0.095	0.58	0.235	0.089	2.63	0.145	0.117	1.24
FY of accession = 1994	-0.196	0.095	-2.06	0.070	0.092	0.76	0.074	0.121	0.61
FY of accession = 1995	0.023	0.100	0.23	0.179	0.093	1.92	0.011	0.123	0.09
FY of accession = 1996	-0.139	0.100	-1.39	0.217	0.095	2.29	0.327	0.118	2.77
FY of accession = 1997	-0.097	0.102	-0.96	0.348	0.095	3.64	0.168	0.175	0.96
FY of accession = 1998	-0.368	0.101	-3.63	0.325	0.097	3.33	--	--	--
FY of accession = 1999	-0.151	0.099	-1.53	0.491	0.093	5.3	--	--	--
FY of accession = 2000	0.018	0.090	0.2	0.333	0.134	2.48	--	--	--
FY of accession = 2001	0.126	0.088	1.43	--	--	--	--	--	--
FY of accession = 2002	0.402	0.092	4.37	--	--	--	--	--	--
Number of months in DEP	0.040	0.008	5.07	--	--	--	--	--	--
Shipped in Oct, Nov, Dec, or Jan	-0.118	0.050	-2.38	--	--	--	--	--	--
Shipped in Feb, Mar, Apr, or May	-0.157	0.047	-3.35	--	--	--	--	--	--
No accession waivier	0.155	0.042	3.67	0.148	0.049	3.04	0.091	0.078	1.17
Promised a short-pipeline rating	-0.041	0.055	-0.74	0.474	0.068	7.02	0.376	0.109	3.44
Promised a medium-pipeline rating	0.105	0.069	1.53	0.564	0.079	7.17	0.689	0.122	5.65
Promised a long-pipeline rating	0.090	0.062	1.45	0.810	0.069	11.76	0.764	0.107	7.15
Promised an uncategorized rating	0.107	0.083	1.28	0.662	0.097	6.79	0.631	0.149	4.24
Constant	-0.819	0.677	-1.21	-6.136	0.822	-7.47	-4.822	1.321	-3.65
Sample size		13,922			8,627			5,763	
Log likelihood		-8,006.3			-5,461.1			-2,468.0	
LR chi2(X)		375.0			586.8			229.8	
Psuedo R2		0.0229			0.051			0.0445	

Table 44. AD models									
	12-month continuation			48-month continuation			84-month continuation		
Variable	Coefficient	Std. Error	z	Coefficient	Std. Error	z	Coefficient	Std. Error	z
AFQT	0.018	0.018	0.96	-0.003	0.017	-0.16	-0.019	0.022	-0.86
AFQT squared	0.000	0.000	-0.73	0.000	0.000	0.37	0.000	0.000	1.25
Male	0.111	0.111	1.01	-0.018	0.099	-0.18	0.060	0.135	0.45
Black	0.292	0.151	1.94	0.450	0.135	3.33	0.558	0.173	3.23
Hispanic	-0.112	0.147	-0.76	-0.052	0.136	-0.38	0.163	0.193	0.84
Other race	0.331	0.174	1.89	0.504	0.168	3	0.582	0.219	2.65
Single	-0.463	0.159	-2.92	-0.338	0.134	-2.53	-0.644	0.158	-4.09
Age	0.034	0.150	0.23	0.146	0.134	1.09	0.040	0.176	0.23
Age squared	-0.002	0.003	-0.68	-0.003	0.003	-1.28	0.000	0.003	-0.14
FY of accession = 1993	-0.019	0.209	-0.09	0.058	0.149	0.39	0.136	0.165	0.82
FY of accession = 1994	-0.048	0.214	-0.22	-0.128	0.154	-0.83	-0.300	0.180	-1.67
FY of accession = 1995	-0.069	0.217	-0.32	-0.163	0.157	-1.04	0.202	0.173	1.17
FY of accession = 1996	0.299	0.235	1.27	0.125	0.161	0.78	-0.004	0.175	-0.02
FY of accession = 1997	-0.008	0.220	-0.03	0.321	0.161	1.99	0.254	0.265	0.96
FY of accession = 1998	-0.391	0.223	-1.76	0.039	0.172	0.23	--	--	--
FY of accession = 1999	-0.154	0.228	-0.68	0.114	0.170	0.67	--	--	--
FY of accession = 2000	-0.075	0.221	-0.34	0.155	0.299	0.52	--	--	--
FY of accession = 2001	-0.226	0.231	-0.98	--	--	--	--	--	--
FY of accession = 2002	0.305	0.234	1.3	--	--	--	--	--	--
Number of months in DEP	0.091	0.020	4.5	--	--	--	--	--	--
Shipped in Oct, Nov, Dec, or Jan	-0.062	0.119	-0.52	--	--	--	--	--	--
Shipped in Feb, Mar, Apr, or May	0.049	0.113	0.43	--	--	--	--	--	--
No accession waivier	0.113	0.101	1.12	0.059	0.088	0.67	0.312	0.121	2.58
Promised a short-pipeline rating	0.049	0.160	0.3	0.726	0.143	5.09	0.673	0.185	3.65
Promised a medium-pipeline rating	-0.056	0.168	-0.33	0.788	0.147	5.38	0.572	0.194	2.94
Promised a long-pipeline rating	0.212	0.140	1.51	1.080	0.117	9.2	0.569	0.154	3.7
Promised an uncategorized rating	0.327	0.210	1.56	0.635	0.178	3.56	0.300	0.240	1.25
Constant	1.164	2.033	0.57	-1.731	1.791	-0.97	-1.686	2.383	-0.71
Sample size		3,553			2,682			1,851	
Log likelihood		-1,516.7			-1,712.1			-1,035.0	
LR chi2(X)		109.1			181.9			81.7	
Psuedo R2		0.0347			0.0505			0.038	

Table 45. BD models									
	12-month continuation			48-month continuation			84-month continuation		
Variable	Coefficient	Std. Error	z	Coefficient	Std. Error	z	Coefficient	Std. Error	z
AFQT	-0.020	0.017	-1.14	-0.006	0.015	-0.41	-0.011	0.022	-0.5
AFQT squared	0.000	0.000	1.35	0.000	0.000	0.74	0.000	0.000	0.48
Male	-0.078	0.098	-0.8	0.016	0.081	0.2	-0.080	0.118	-0.68
Black	0.039	0.119	0.33	0.041	0.102	0.41	0.097	0.151	0.64
Hispanic	-0.121	0.137	-0.88	0.168	0.125	1.35	-0.037	0.188	-0.2
Other race	-0.210	0.136	-1.55	0.042	0.136	0.31	0.270	0.205	1.32
Single	-0.628	0.137	-4.57	-0.436	0.111	-3.93	-0.607	0.133	-4.57
Age	0.014	0.158	0.09	0.251	0.139	1.8	0.259	0.213	1.22
Age squared	-0.002	0.003	-0.63	-0.005	0.003	-2.04	-0.004	0.004	-1.11
FY of accession = 1993	0.256	0.182	1.4	0.034	0.124	0.27	-0.031	0.145	-0.22
FY of accession = 1994	-0.125	0.171	-0.73	-0.053	0.124	-0.43	-0.418	0.156	-2.69
FY of accession = 1995	-0.078	0.180	-0.44	-0.187	0.129	-1.46	-0.136	0.154	-0.89
FY of accession = 1996	-0.103	0.183	-0.56	0.099	0.134	0.74	-0.023	0.154	-0.15
FY of accession = 1997	-0.113	0.179	-0.63	0.327	0.133	2.45	0.440	0.204	2.16
FY of accession = 1998	-0.240	0.180	-1.33	0.202	0.137	1.47	--	--	--
FY of accession = 1999	-0.091	0.184	-0.5	0.276	0.137	2.01	--	--	--
FY of accession = 2000	0.183	0.204	0.9	0.264	0.325	0.81	--	--	--
FY of accession = 2001	0.234	0.203	1.15	--	--	--	--	--	--
FY of accession = 2002	0.609	0.201	3.03	--	--	--	--	--	--
Number of months in DEP	0.071	0.017	4.05	--	--	--	--	--	--
Shipped in Oct, Nov, Dec, or Jan	0.026	0.103	0.25	--	--	--	--	--	--
Shipped in Feb, Mar, Apr, or May	-0.072	0.098	-0.74	--	--	--	--	--	--
No accession waivier	0.190	0.087	2.18	0.151	0.074	2.03	-0.046	0.107	-0.43
Promised a short-pipeline rating	0.115	0.145	0.79	0.686	0.123	5.59	0.200	0.176	1.14
Promised a medium-pipeline rating	-0.009	0.150	-0.06	0.527	0.120	4.39	0.349	0.176	1.99
Promised a long-pipeline rating	0.099	0.124	0.8	0.886	0.099	8.92	0.396	0.141	2.81
Promised an uncategorized rating	0.191	0.166	1.15	0.935	0.131	7.15	0.217	0.178	1.22
Constant	3.366	2.237	1.5	-2.933	1.949	-1.51	-4.259	2.998	-1.42
Sample size		5,238			4,004			2,759	
Log likelihood		-2,128.5			-2,564.9			-1,389.6	
LR chi2(X)		155.0			203.8			61.0	
Psuedo R2		0.0351			0.3082			0.0215	

Appendix F: Regression results for time in fleet

Table 46 presents results from the linear regression model used to estimate the effect of education level on time in the fleet, holding constant fiscal year of accession and first rating achieved. We show coefficients and standard errors for education level only; the 10 fiscal year dummies and 86 rating dummies were included only as control variables.

Table 46. Linear regression results for time in fleet[a]

Variable	Coefficient	Standard error	t
NWC	-0.090	0.191	-0.47
AD	0.450	0.374	1.20
BD	-2.632	0.311	-8.47

a. Number of observations = 498,537.
$F(99,498437) = 3,721.38$.
$R^2 = 0.4249$.

Appendix G: Logit results for fast advancement

Tables 47 and 48 present results from logit models used to estimate the effect of education level on likelihood of fast advancement to pay-grades E5 and E6, holding constant fiscal year of accession.

Table 47. Logit results for fast advancement from E4 to E5[a]

Variable	Coefficient	Odds ratio	Standard error	z
NWC	0.0356	1.04	0.072	0.49
AD	-0.077	0.93	0.091	-0.84
BD	**0.230****	**1.26**	**0.066**	**3.49**
1993	-0.012	0.99	0.049	-0.23
1994	0.073	1.08	0.050	1.47
1995	0.353**	1.42	0.048	7.43
1996	0.413**	1.51	0.045	9.13
1997	0.639**	1.89	0.043	14.96
1998	0.752**	2.12	0.042	17.76
1999	0.891**	2.44	0.043	20.79
2000	1.170**	3.22	0.046	25.65
2001	1.591**	4.91	0.059	26.94
2002	2.071**	7.93	0.173	11.94
Constant	-2.614	--	0.035	-74.73

Number of observations = 114,773

Log likelihood = 1987.84

$\chi^2(13) = 0.0000$

Pseudo $R^2 = 0.025$

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

Table 48. Logit results for fast advancement from E5 to E6[a]

Variable	Coefficient	Odds ratio	Standard error	z
NWC	**0.3360***	**1.40**	**0.1677**	**2.00**
AD	-0.216	0.81	0.197	-1.10
BD	-0.416*	0.66	0.170	-2.45
1993	0.454**	1.57	0.092	4.96
1994	0.657**	1.93	0.094	6.98
1995	1.224**	3.40	0.090	13.66
1996	1.867**	6.47	0.084	22.11
1997	2.468**	11.80	0.086	28.64
1998	2.792**	16.32	0.097	28.70
1999	4.215**	67.68	0.207	20.41
2000	3.967	52.81	1.234	3.22
Constant	-3.058	--	0.070	-43.53

Number of observations = 20,624

Log likelihood = 2,204.56

$\chi^2(13) = 0.0000$

Pseudo $R^2 = 0.132$

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

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