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RESEARCH MEMORANDUM

RETENTION COSTS OF THE GI BILL AND THE DRAFT: NEW EVIDENCE FROM THE NAVY'S ENLISTED FORCE

James Thomason

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RETENTION COSTS OF THE GI BILL AND THE DRAFT: NEW EVIDENCE FROM THE NAVY'S ENLISTED FORCE

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ABSTRACT

Drawing upon new data from the Navy's enlisted force, this study estimates the effect on military reenlistment rates of several major policy variables: eligibility for the Vietnam-era GI Bill, draft-pressure at the original enlistment point, and the amount of formal training given to enlistees in their first term. These specific effects are all shown to be substantially adverse, even after controlling statistically for other key determinants of military retention.

TABLE OF CONTENTS

	<u>Page</u>
Introduction and Summary	1
Background	1
Data and Model	2
Results	3
Background and Approach	5
Background	5
Approach	6
Overall	6
Data	6
Model	6
Variables	7
Controls	11
Findings	15
Overall	15
GI Bill Eligibility	15
Draft Pressure	20
Training.....	21
Conclusions	22
References	24
Appendix A: Identifying the Personnel Eligible for the GI Bill	A-1 - A-3
Appendix B: Nonlinear Estimates	B-1 - B-3

INTRODUCTION AND SUMMARY

BACKGROUND

In recent years, the Department of Defense and the individual military services have enjoyed record levels of high-quality enlistments and reenlistments. But serious concerns are growing--in the media, in Congress, in the military departments, and elsewhere--that the All Volunteer Force (AVF) faces a severe trial and could fail altogether over the next decade. Two prospects threaten the AVF: a reviving economy, especially the specter of acute competition from the civilian sector for trained technical personnel [1]; and an unquestionably rapid decline in the number of potential recruits from the prime age group [2]. Given these impending problems, a fresh look at key factors affecting the supply of enlisted personnel can be useful.

One prescription is, of course, a draft. But, as earlier reports [3] have suggested and this memorandum will show, peacetime conscription would hurt retention and therefore is not as good a "buy" as is sometimes thought. Even more important, from a societal perspective a draft would only shift the burden of an adequate defense disproportionately to the draftees [4].

Within an AVF framework, such prospects put a premium on the optimal use of manpower dollars. Research has indicated that military manpower funds, at least Navy dollars, are far better spent retaining trained enlisted personnel than recruiting and training large numbers of new accessions [5]. At the same time, however, the services will always need new enlistees. So it will continue to be important to determine and implement the most efficient accession programs, no matter what the optimal mix of first-termers and careerists.

Considering future supply problems, a number of prominent observers of the AVF have argued over the last several years that the country should never have ended the Vietnam-era GI Bill. (Since 1 January 1977, new personnel entering U.S. military service have been able to participate in a contributory education fund called the Veterans Educational Assistance Program (VEAP), but they no longer qualify for Vietnam-era GI Bill educational benefits.)¹ These critics have proposed enactment of a

1. Congress passed a new version of this contributory educational incentive program that will go into effect 1 July 1985 and is being advertised as a new GI Bill in many press reports. It will be less costly to "buy into" than the VEAP; the enlistee will have to contribute only \$1,200 not \$2,700, to become eligible. It will also have higher maximum educational stipends (\$9,600 rather than \$8,100). But it will

new Bill as the best way to "salvage" the AVF--to attract the high-quality recruits they say the military services desperately need but sorely lack [6]. Considerable interest has been aroused in such an enlistment incentive, and over the last several years more than a dozen Congressional proposals have been introduced to reinstate the program [7].

Educational enlistment incentives like the GI Bill may be an intriguing concept, but just how well do they work? While enlistment bonuses do appear to be a useful device for the U.S. military to attract well-qualified recruits, bonuses specifically for education, such as the GI Bill, may not be particularly efficient for several reasons. First, despite numerous assertions by advocates of a GI Bill, there is no serious evidence that educational bonuses attract more valuable personnel to the military than does cash. Second, cash can be "targeted" at least as carefully as educational enlistment bonuses. Third, cash too can be offered on a deferred basis if such a device is deemed useful for attracting mature recruits. And cash bonuses may be spent on anything, including tuition payments, so they should generally be valued more highly and hence be a more efficient recruiting device than a nominally equivalent bonus that can be used only for education.

At a minimum, these considerations suggest that cash enlistment bonuses are no less efficient a recruiting device than educational bonuses. Furthermore, educational enlistment-bonus programs actually reward military personnel for leaving the service: they provide benefits comparable to a negative reenlistment bonus since they can only be fully used by a full-time civilian student. Cash enlistment bonuses have no significant structural weakness of this kind. Consequently, if other things are equal, cash is probably a more efficient recruiting device because educational enlistment bonuses are more likely to hurt reenlistment rates.

DATA AND MODEL

Until now, a comparison between cash and educational enlistment bonuses has relied almost entirely on theory. Several studies have estimated the effect of the Vietnam-era GI Bill on the supply of new recruits [8, 9, 10], but only in the last several years have enough data become available to assess systematically its effect on reenlistments. This memorandum presents the first large-scale empirical assessment of the GI Bill's reenlistment costs. It describes the findings from the Center for Naval Analyses' study of the reenlistment decisions of more

still be considerably less generous than the Vietnam-era GI Bill, which required no enlistee contribution and offered maximum benefits of more than \$15,000 in educational assistance.

than a quarter of a million Navy enlisted personnel from 1974 to 1982. A controlled comparison was made of the retention rates of those who joined before and those who joined after 31 December 1976, the last day recruits could join the services and still be eligible for Vietnam-era GI Bill educational benefits.

The study team used data supplied by the Defense Manpower Data Center (DMDC) and standard regression techniques to estimate a model that specifies reenlistment rates as a function of potential reenlistees' eligibility for GI Bill educational benefits. Other important components of the model include:

- The prevailing civilian unemployment rate at the individual's reenlistment decision point
- The potential reenlistee's expected relative military-to-civilian income over the reenlistment term being considered
- A proxy for the degree to which potential reenlistees in a given cohort were pressured by the draft to enlist in the first place
- The amount of in-service training individuals had received
- Selected demographic differences among potential reenlistees
- A measure designed to capture changes over time in reenlistment eligibility standards.

RESULTS

The results of this analysis are striking. On average, personnel eligible for Vietnam-era GI Bill educational benefits were between 10 and 20 percent less likely to reenlist for a second term than comparable personnel not eligible for such benefits.¹ This effect is reasonably stable across different specifications of the model. It is a substantial adverse effect, but as is shown below, it is also about what would be expected based on the difference between the dollar value of the Vietnam-era GI bill educational benefit package and the dollar value of

1. In interpreting these results, the reader should be cautioned at the outset. Some part of this observed effect may be attributable to a higher taste for education among GI Bill eligibles than among non-eligibles in our sample. On the other hand, the total retention costs of reinstituting a GI Bill could be larger than those estimated here, because our model was designed to capture only the direct effects. See the section on findings for details.

the successor to the GI Bill, after adjusting for the historical usage rates of the two programs.

The focus of this report is the GI Bill, but several other results may also be of interest. Perhaps most important, draft-pressured Navy enlistees are significantly less likely to have reenlisted than comparable true volunteers.

BACKGROUND AND APPROACH

BACKGROUND

In 1944, Congress began funding what became a succession of veterans' educational benefits programs popularly known as the GI Bill. The primary stated purpose of these programs has been to compensate veterans for the disruption to their careers caused by the draft or at least by not purely voluntary wartime service. As administered over the last 40 years, these broad programs have helped millions of veterans of three major wars make the transition back to civilian life.

GI Bill educational benefit programs have been popular among veterans; in all, over 16 million veterans have participated in them. The latest program, the Vietnam-era version, took effect in June 1966. Like its predecessors, it offered almost all veterans a substantial tax-free stipend for educational purposes and associated living expenses if they enlisted or were drafted during the eligibility period of June 1955 to 31 December 1976. The total cash value of these benefits has been sizable. For example, it amounted to 9,300 discounted or 15,000 undiscounted FY 1982 dollars for an unmarried full-time student. Given the extent of these individual benefits, it is not surprising that the programs have been expensive. Direct outlays made between 1966 and 1982 under the Vietnam-era GI Bill totaled nearly \$40 billion for approximately 8 million veterans [11].

When the last U.S. draft ended in June 1973, the rationale for offering GI Bill benefits to new enlistees disappeared. Accordingly, Congress decided to stop entitling new recruits beginning in January 1977. New enlistees have been able to qualify for a much less lucrative contributory program, the Veterans Educational Assistance Program (VEAP). But very few Navy enlistees have chosen to participate in this successor program [12].

Three years after the GI Bill ended, the services all experienced significant recruiting difficulties. While the GI Bill had little if anything to do with those problems, the shortage of recruits spawned numerous proposals to revive a GI Bill. Indeed, some argued that a new Vietnam-era Bill, at least a targeted version, was needed to attract competent recruits to the AVF at all.

It is not, however, obvious that GI Bill educational benefits are the most efficient way to attract needed recruits. Cash enlistment bonuses are equally targetable and deferrable, and they have never been shown to be less useful in attracting high-quality recruits. At least in theory, they are also significantly less harmful to retention rates than educational enlistment incentives like the GI Bill. On the other hand, theoretical arguments about the adverse effects of a program on retention may look like mere speculation to GI Bill advocates.

This issue cannot be resolved by theory alone. It is still possible that a GI Bill will attract high-quality recruits who then decide to remain with the military. Until recently, however, it has not been feasible to examine this matter empirically. The remainder of this section describes CNA's seminal study of the issue.

APPROACH

Overall

To empirically estimate the effect of eligibility for the GI Bill on military retention rates, the study team obtained the newly available data from the Defense Manpower Data Center and adapted a model of retention behavior developed by Warner [13] and refined by Goldberg and Warner [14]. Regression analysis was used to systematically compare the retention rates of GI Bill eligibles and ineligibles at the first reenlistment decision point, controlling for other key factors. It also proved feasible to assess the effects on retention of several other significant factors, especially draft pressure at the enlistment point and in-service training.

Data

For each of the nine fiscal years between 1974 and 1982, DMDC provided data on the Navy enlisted personnel who reached their first reenlistment decision point (i.e., had less than 13 months of obligated service left in their first term of service) as of the start of the fiscal year. These personnel were further divided by rating and the year of service (LOS) they were in at the start of the given fiscal year. The unit of observation for this analysis is thus a group of Navy enlisted personnel in the same rating and same current year of service, all reaching their first reenlistment decision point in the same fiscal year.

In all, there are nine fiscal-year cohorts, 81 ratings, and four LOS categories per fiscal-year cohort, giving a potential maximum of 2,916 units of observation (324 in each of nine fiscal years). Not all 81 ratings had personnel reaching their first reenlistment decision point in each LOS category in each fiscal year, however. Three percent of the potential units of observation were empty, so the actual number of non-empty cells equals 2,842.

Model

To estimate the effect of GI Bill eligibility on first-term retention rates with these data, the observations were first divided into cells whose members enlisted before calendar year 1977 and those who enlisted during or after that year. Appendix A describes the procedure

in detail. The difference in retention rates of these two groups was then assessed in the context of a larger model of retention behavior.

The overall model used here expresses military retention rates as a function of the net perceived value to potential reenlistees of reenlisting versus leaving. Within this broad framework, a number of specific factors have been used before to capture the retention effects of individual differences and of differences in the larger economic context [15].

Figure 1 provides a visual impression of the relevance of at least two of the important control factors in our model. It shows trends through the 1970s and early 1980s for three key measures: Zone A (first reenlistment) rates, young-adult male unemployment rates, and military pay relative to civilian pay. The figure demonstrates the importance of controlling for other factors in estimating the retention effects of special interest here.

Variables

Table 1 describes the important variables in this analysis. The rest of this section provides specific information about each variable, including expectations about the relation of each to Navy first-term retention.

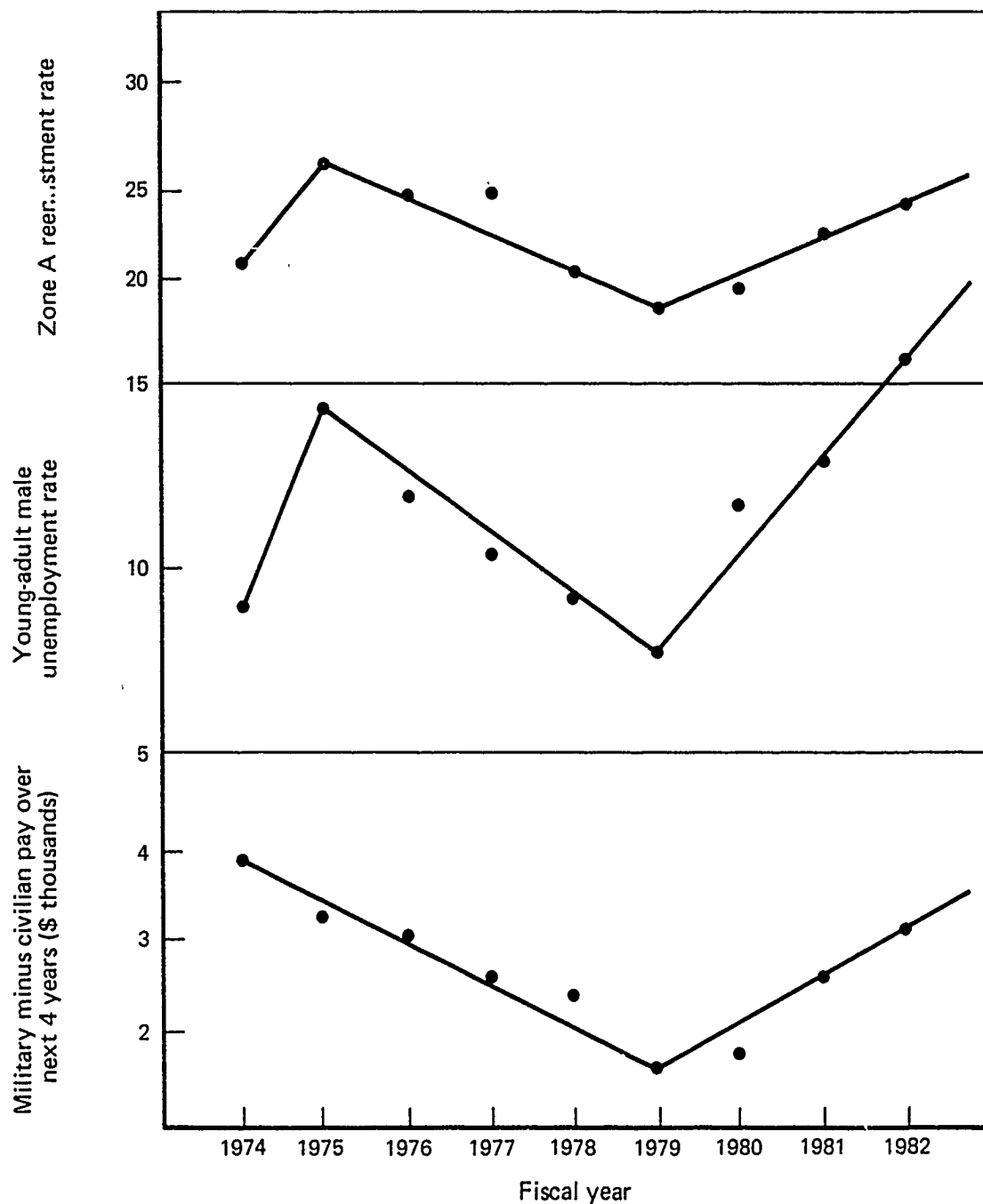


FIG. 1: NAVY RETENTION, UNEMPLOYMENT, AND PAY

TABLE 1

VARIABLE DESCRIPTIONS

PREEN	The fraction of a cell's members who reenlisted (or extended for 36 or more months).
GIBILL	A dummy variable used to distinguish cells whose members were eligible for GI Bill (Chapter 34) benefits (GIBILL=1) from those not eligible (GIBILL=0).
DRAFTP	A variable used to index the relative amount of draft pressure cell members might have been subject to: the ratio of total U.S. draftees in a given enlistment year to the total number of non-prior service Navy accessions in that year.
TRAIN	Mean number of days of rating-specific ("A"-school) training received by those entering the rating in 1981.
UR2024	The prevailing unemployment rate (in percentage points) for 20- to 24-year-old males during the cell members' reenlistment decision year.
PAYDIFF	The present discounted value of the difference between the sailor's total expected future income over the next 4 years from reenlisting and from leaving the service (in FY 1980 dollars).
SEADUTY	The average probability that reenlistees will go on sea duty in their next term.
MGI&II	Fraction of cell members in mental group II or above.
EDUC	Mean number of years of pre-service education attained by cell members.
MARR	Fraction of cell members identified as married by the start of their reenlistment decision year.
RACE	Fraction of cell members identified as non-Caucasian.
REELG	A Navy-wide proxy for first-term (Zone A) reenlistment eligibility standards: the percentage of first-term survivors declared ineligible to reenlist at the end of active obligated service (EAOS) point in each given fiscal year.

TABLE 1 (Continued)

LOS Dummy variables that divide sample members by their current year of service (3, 4, 5, or 6) as of the start of their first reenlistment decision year. Members are assigned a score of 1 on the length of service (LOS) category they fall into and a score of 0 on the others.

Sources of data: Reenlistment and LOS data from DMDC. Data on mental group, educational level, marital status, race, and sea duty from the Navy's Enlisted Master Records. Training data from the Chief of Naval Education and Training. Reenlistment eligibility standards data from [16]. GI Bill variable structure described in appendix A. Draft totals derived from official OSD records; non-prior service Navy accession totals from Navy Recruiting Command files. Unemployment rates from the Bureau of Labor Statistics, Unemployment and Earnings, table A-3, selected years. Pay indices described more fully below and in [14].

Reenlistment Rates

As noted above, each unit of observation consists of Navy enlisted personnel in a given rating and current year of service who, at the start of the given fiscal year, have less than 13 months left until the end of their first term. Thus, they are going to be making some decision about reenlistment during that fiscal year. Their choice is viewed here as dichotomous: the person either does or does not reenlist. In short, the dependent variable focused on is a reenlistment rate, specifically the percentage of personnel who decided to extend their end of active obligated service (EAOS) by 36 or more months. This is the variable to be explained. Figure 1 displayed trends in this index.¹

GI Bill Eligibility

To assess the effect of GI Bill eligibility on first-term retention rates, a GI Bill dummy variable was used, which assigned a score of 1 to cells whose members enlisted before 1977 and a score of 0 to all other cells. Appendix A describes the procedure used to divide eligibles from ineligibles. The hypothesis is that the relationship between this variable and retention will be negative; GI Bill eligibles will have lower retention rates than ineligibles, other things equal.

1. Appendix B offers results using a nonlinear (logistic) version of the dependent variable. The estimates are similar to those in table 4. The main text focuses on the simpler and more familiar of the measures.

Draft Pressure

A second variable of interest is draft pressure at the enlistment point. Many who enlisted in the Navy during the draft era were true volunteers, but some would not have done so except that they believed they would otherwise be drafted into the Army and considered an Army tour less attractive than a Navy tour. Draft-pressured or draft-induced volunteers of this sort are usually assumed to have a lower taste for military service than true volunteers. Hence, they are also assumed to be less likely to reenlist.

The amount of draft pressure in a given enlistment year is equal to the ratio of total U.S. military inductees in that year to the total number of Navy accessions without prior military service in that same year. An inverse relationship is expected between retention rates and the degree of draft pressure at the enlistment point.

Training

The relationship between retention and the amount of formal training that personnel receive while in the service is also of interest. The hypothesis is that the greater the amount of training that is transferable to the civilian sector, the higher the market value of the sailor, and hence the lower the reenlistment probability. Ideally, a measure of the civilian wages personnel making a reenlistment decision could expect if they left the service would capture the market value of in-service training received. But to the extent the civilian wage measure used here does not fully reflect differences in training, a variable measuring the amount of formal specialized training received may at least improve our ability to account for important differences in estimating the effects on retention of the GI Bill and the draft.

Controls

To estimate properly the effects on retention of GI Bill eligibility and draft pressure, we controlled for a number of factors in our model. As noted, statistical controls were built in for the prevailing young-adult unemployment rate and for the difference between prospective military income from reenlisting and likely future civilian income from leaving. The model also measures differences across cells in several other policy and demographic factors: the likelihood that cell members will be assigned to sea duty if they reenlist; the fraction of each cell with high general aptitude; the mean years of pre-service education attained by cell members; the fraction of the cell identified as married as of the start of the reenlistment decision year; the fraction of cell members identified as non-Caucasian; prevailing Zone A reenlistment eligibility standards; the cell members' current year of service at the start of the fiscal year in which the reenlistment choice is made.

Our expectations about the relationships between each of these control variables and reenlistment rates are as follows. We expect a direct, positive relationship between reenlistment rates and the prevailing unemployment rate: when there are relatively few alternative job possibilities, people try to keep their jobs. The overall young-adult male unemployment rate should capture pertinent aggregate differences in the national market over time.

Numerous analyses of the supply of new recruits as well as of careerists show that pay matters [17]. The specific pay variable used here was developed by Goldberg and Warner.¹ We expect a positive relationship between higher relative military pay and retention.

We also generally expect people to prefer the comfort of a job or assignment on land to one at sea. This preference probably is not as strong on average for Navy enlisted personnel as for the general population. But we still expect it to be prevalent among first-term enlisted personnel as they make reenlistment choices. Thus, the more likely an assignment at sea in the next term, the less likely we expect a reenlistment to be, other things equal.

Previous work [14] suggests an inverse relationship between Navy reenlistment rates and high mental aptitude and a similar relationship between retention and pre-service educational level. One explanation for these observed effects is that more of those with lower aptitude or less education may leave the service before the EAOS point. Another reason may be that the civilian wage opportunities for such individuals are better than for others but are not fully captured by the pay variables in previous models.

Married sailors are known to reenlist at appreciably higher average rates than otherwise comparable sailors [1, 18]. Explanations for this difference include relatively more aversion to risk among married sailors and the fact that the military explicitly pays them more than it pays otherwise comparable single sailors. For both reasons we expect higher proportions of singles to leave if other things are equal. Though

1. This variable equals $M_R - C$. M_R represents the annualized value of the potential reenlistee's prospective military compensation (Selective Reenlistment Bonus plus projected Regular Military Compensation) over the time horizon of a reenlistment (4 years chosen as representative), discounted at a 20-percent rate.

C represents similarly discounted, projected, average annualized earnings (over the same 4-year time horizon) for an individual leaving the service--with estimated civilian earnings based upon adjusted age-earning profiles from the Current Population Survey. For details see [14].

we have yet to see a full explanation for this difference in retention behavior, the effect has been strong enough in past empirical analysis to warrant a control variable for marriage in this model.

Previous research has also shown [14, 18] that non-Caucasians who reach the reenlistment decision point are more likely to reenlist in the Navy than otherwise comparable individuals. The most likely explanation for this finding would appear to be lower civilian wage opportunities for non-Caucasians than for otherwise comparable Caucasians. Even though the pay variable is structured to adjust for such a differential in the civilian sector, inclusion of a "race" variable should still help control for any residual associated wage differences.

To probe the possible effect of changes in reenlistment eligibility standards on retention, we have also included a variable that, for each fiscal year, measures the percentage of all first-term enlistees who reached their first reenlistment decision year but were then declared ineligible to reenlist [16]. We expect that the higher the fraction declared ineligible at this point, the lower the reenlistment rate, as defined here. On the other hand, because the ineligibility measure is computed Navy-wide and not for individual ratings, our expectations for this variable are not especially high.

Lastly, following Goldberg and Warner [14], the model includes several dummy variables (LOS 4, LOS 5, LOS 6) to capture any differences in retention associated with different initial contract lengths among first-term enlisted personnel.

Table 2 provides mean values for most of these variables, first by fiscal year, then for the AVF cases, and finally for the whole period 1974-82.

TABLE 2

VARIABLE MEANS^a

		Averages across cells by FY of reenlistment decision point												
		1974	1975	1976	1977	1978	1979	1980	1981	1982	AVF	1974-82		
PREEN		.23	.27	.27	.26	.22	.19	.21	.24	.27	.22	.24		
TRAIN ^b		111.6	111.6	111.6	111.6	111.6	111.6	111.6	111.6	111.6	111.6	111.6		
UR2024		8.7	14.3	12.0	10.7	9.1	8.6	12.5	13.1	16.0	11.9	11.7		
PAYDIFF		3863	3309	3149	2797	2591	1833	1957	2913	3310	2580	2858		
SEADUTY		.45	.45	.46	.47	.46	.45	.45	.45	.45	.46	.46		
EDUC ^c		12.2	12.1	12.0	11.9	12.0	12.0	11.9	11.3	11.3	11.7	11.9		
MARR		.47	.49	.45	.35	.39	.33	.21	.23	.23	.27	.35		
RACE		.17	.16	.15	.16	.16	.07	.15	.14	.14	.13	.16		
MGI&II		.74	.79	.86	.84	.80	.65	.79	.80	.80	.77	.79		
REELG		12	16	17	9	9	8	6	7	8	8	10		

a. Fiscal year (and overall, 1974-82) means represent simple averages across cells whose members faced a reenlistment decision in that fiscal year. "AVF" averages, by contrast, refer to averages across cells whose members enlisted after the draft era, i.e., LOS-3s since FY 1976, LOS-4s since FY 1977, LOS-5s since FY 1978, and LOS-6s since FY 1979.

b. This variable was computed by rating and LOS for a typical fiscal year, and this value was applied to all fiscal years in the sample.

c. Some demographic data for particular years may be only approximations, but these were the best numbers available from the Enlisted Master Records.

FINDINGS

OVERALL

Table 3 summarizes our key expectations and presents the most basic findings--the direction and statistical significance of the retention effects. Overall, the results lend considerable support to our expectations. The most important factors from prior retention analyses perform in the expected directions, as do the three factors of special interest here: GI Bill eligibility, draft pressure at the enlistment point, and in-service training. All factors in the model relate consistently to retention in the expected directions at statistically significant levels except for mental aptitude and reenlistment eligibility standards. This same pattern holds whether we estimate the model using all observations (FY 1974-84), using only cells whose members enlisted after the draft ended ("AVF cases"), or using a logistic (nonlinear) version of the dependent variable (see appendix B).

The magnitudes of these effects are also of interest. They are shown in table 4. Using the regression coefficients in the first two columns of the table in conjunction with the relevant mean, we have calculated the implied elasticities of retention with respect to the variables in the model; the elasticities are shown in the last two columns of the table.¹

Overall, these findings seem reasonably consistent with retention elasticities that have been estimated in the past. The estimated pay elasticities are fairly low, but this may be so because they are overall (not occupation-specific) and because a variable for training is included in the model. It is reassuring that the pay elasticity is higher for the AVF cases than for the sample as a whole: we expect a mix of draft-induced and true volunteers to be less responsive to given pay changes than true volunteers, other things equal.

GI BILL ELIGIBILITY

To estimate the effect of GI Bill eligibility on the retention rate, we have assumed that it equals the proportion that the GI Bill

1. The elasticity of the retention rate R with respect to the explanatory variable X_i may be viewed as the percentage change in retention due to a 1-percent change in a given explanatory variable, i.e., the regression coefficient associated with X_i (dR/dX_i) multiplied by the ratio of X_i to R at the point where the elasticity is evaluated. Most elasticities in table 4 were evaluated at the means of the respective variables, such that the elasticity of R with respect to X_i equals $b_i(\bar{X}_i/\bar{R})$. Exceptions are noted in the table.

TABLE 3

NAVY ZONE A REENLISTMENTS:
EXPECTATIONS AND FINDINGS

<u>Variable</u>	<u>Expected</u>	<u>Observed (1974-82)</u>	<u>Observed (AVF cases)</u>	<u>Expected and observed agree?</u>
GIBILL	-	-	-	Yes
DRAFTP	-	-	NA	Yes
TRAIN	-	-	-	Yes
UR2024	+	+	+	Yes
PAYDIFF	+	+	+	Yes
LEADUTY	-	-	-	Yes
EDUC	-	-	-	Yes
MARR	+	+	+	Yes
RACE	+	+	+	Yes
GI&II	-	- ^a	- ^a	Weakly
REELG	-	- ^a	+ ^a	Weakly
LOS 4	?	+ ^a	+	NA
5	?	+	+	NA
6	?	+ ^a	+ ^a	NA

a. Not statistically significant at the 99-percent confidence level.

NA: Not applicable.

TABLE 4
NAVY ZONE A REENLISTMENTS
REGRESSION ESTIMATES AND ELASTICITIES^a

<u>Variable</u>	<u>Regression coefficients</u>		<u>Elasticities</u>	
	<u>1974-82</u>	<u>AVF cases</u>	<u>1974-82</u>	<u>AVF cases</u>
GIBILL	-0.042 (11.55)	-0.035 (8.77)	-0.18 ^b	-0.17 ^b
DRAFTP	-0.048 (21.8)	NA	-0.27 ^c	NA
TRAIN	-0.0001 (6.31)	-0.0001 (4.99)	-0.05	-0.05
UR2024	+0.008 (11.68)	+0.007 (6.11)	0.38	0.37
PAYDIFF	+0.000012 (15.90)	+0.000018 (19.25)	0.72 ^d	1.11 ^d
SEADUTY	-0.106 (18.40)	-0.138 (18.44)	-0.20	-0.29
EDUC	-0.011 (19.69)	-0.011 (17.24)	-0.54	-0.58
MARR	+0.191 (12.31)	+0.148 (7.24)	0.28	0.18
RACE	+0.230 (17.79)	+0.266 (16.5)	0.15	0.16
MGI&II	-0.001 (0.23)	+0.006 (0.94)	-0.003	0.02
REELG	-0.001 (1.61)	+0.001 (1.27)	-0.042	0.035
LOS 4	+0.010 (2.07)	+0.024 (4.34)	NA	NA
LOS 5	+0.068 (9.45)	+0.072 (8.67)	NA	NA

TABLE 4 (Continued)

Variable	Regression coefficients		Elasticities	
	1974-82	AVF cases	1974-82	AVF cases
LOS 6	+0.013 (1.92)	-0.006 (0.79)	NA	NA
Constant	+0.203 (19.6)	+0.185 (9.48)	NA	NA
N	2842	1736	NA	NA
F-statistic	1974.51	1639.52	NA	NA

- The coefficients are derived from a regression model that weights observations by cell size to correct for heteroskedasticity. The parenthesized values are the absolute values of the t-statistics.
- These values are not true elasticities. They are best thought of as the proportional changes in the reenlistment rate associated with GI Bill eligibility (compared to GI Bill non-eligibility).
- This value is not a true elasticity. It is best thought of as the proportional change in the reenlistment rate associated with the mean level of draft pressure during the draft years in which members of this sample enlisted.
- These pay elasticities represent the percentage effect upon retention of a 1-percent change in the mean level of overall projected military compensation ($\bar{M}_R$) of potential reenlistees in this sample, not the mean of the PAYDIFF variable itself ($\bar{M}_R - \bar{C}$).

coefficient represents of the estimated retention rate when the GI Bill dummy equals zero and other explanatory variables are at their means. For the overall set of cases, we estimate that GI Bill eligibility reduced an average individual's probability of reenlisting by approximately 18 percent. The comparable estimated reduction among AVF cases is 17 percent.

There are several reasons these estimates may be smaller than the true adverse effect. First, there was no way to cleanly distinguish all GI Bill eligibles from ineligibles in these data. (See appendix A.) The effect of this difficulty is to reduce the difference that would otherwise be observed. Second, even though VEAP usage rates have been low, GI Bill ineligibles in our sample were eligible for those post-service educational benefits. For both these reasons, we have probably

underestimated the retention rate of true ineligible and therefore underestimated the adverse effect on retention of GI Bill eligibility.

On the other hand, there are also several reasons this estimate may be larger than the true adverse effect. One is the potential selectivity problem mentioned in the introduction. Second, the nonlinear estimates presented in appendix B are weaker, although they are still quite strong (they imply a 12-percent reduction in retention due to GI Bill eligibility). Third, our estimates may be picking up fiscal-year effects from 1981 and 1982. Although we have controlled explicitly for the effects of perhaps the most salient changes in FY 1981 and 1982 relative to other years in this sample (unemployment rates and relative pay), it is possible that other factors associated with these two years are still biasing the estimates.

With these qualifications, we can still use this estimate to calculate the minimum additional compensation that the Navy would need to offer to offset the apparent adverse effects on retention of GI Bill eligibility. Assuming an overall pay elasticity of approximately 2 with respect to Zone A retention (the average in other work with this basic model), second-term pay would need to be increased by 1/2 of 1 percent to compensate for each 1-percent drop in Zone A retention associated with GI Bill eligibility.¹ Assuming a 15-percent drop in retention due to GI Bill eligibility, the Navy would need to increase real, discounted second-term pay by about 7.5 percent to compensate.

Some observers may find this a surprisingly large effect. Considering that the annualized cash value of these educational benefits was about 18 percent of prospective, annualized military pay in FY 1982 for the average potential Zone A reenlistee still eligible for them, the size of this effect may be less surprising. In these terms we might even wonder why the observed effect is not larger. After all, a change of 18 percent in military compensation might be expected to induce a 36-percent change in retention rates, given a pay elasticity of about 2, other things equal.

There is one primary reason that the effect of the GI Bill on retention observed here will not be precisely equal to what would be expected from a nominally equivalent reduction in pay. GI Bill educational benefits are not valued as highly as the cash equivalent by the average Navy enlistee. Only about half of eligible veterans used most of their benefits, so we should probably not expect the GI Bill to have more than about half the impact on retention rates that an equivalent

1. Our estimated pay elasticity is probably biased downward due to inclusion of an in-service training variable in the model. Runs done without the training variable show the pay elasticity to be close to 2.

reduction in monetary compensation would have. In this light it is interesting that the GI Bill eligibility effect we have observed is roughly half what would be expected if average military compensation were reduced by the nominally equivalent annualized cash value of GI Bill education benefits (and we assume a Zone A pay elasticity of 2).

These are initial, exploratory findings. They are based upon data from only one service, and only several years of reenlistment behavior of GI Bill ineligible. Not every conceivably relevant "third variable" has been controlled for. Yet the results are strong and clearcut in direction and statistical significance and are approximately what an observer might anticipate on theoretical grounds.¹ Although still tentative, these findings could have policy implications.

DRAFT PRESSURE

A second relation of interest here is the effect of draft pressure at the enlistment point upon reenlistment rates. Theory suggests that draft-induced volunteers are less likely to stay in the service than true volunteers, other things equal. Our results support this expectation. There is little relevant theory, however, as to the likely size of the relative retention rates of draft-induced versus true volunteers. Nonetheless, our findings suggest that draft pressure exerts a sizable adverse effect on retention rates.

In particular, the regression results in table 4 imply that, other things equal, individuals who enlisted in the Navy during the draft era were 27 percent less likely on average to reenlist than individuals who volunteered during the AVF.² This is only part of the story. To determine the relative reenlistment rates of draft-induced versus true volunteers, other things equal, we need to know the fraction of individuals in the draft-pressured cells in our sample who were actually "draft-induced."

1. A potential indirect retention cost of the GI Bill enlistment incentive, not explored here, may be to attract larger numbers of higher mental group and educational level recruits than a comparable cash reenlistment bonus. Although this may be viewed as a benefit during the first term, such recruits tend to leave at higher rates at the end of the first term, too.

2. The mean value of the draft pressure variable for cells whose members enlisted during draft-era years represented in our sample was 1.3. The estimated reenlistment rate at the means of all other variables when the draft pressure variable equaled zero was .23. And the regression coefficient associated with DRAFTP was -.048. Accordingly, $(1.3)(.048)/.23$ equals .27. Multiplying by 100, this represents a 27-percent reduction in the base reenlistment rate.

We have no precise information of this sort, unfortunately, but the Department of Defense has estimated that between one-quarter and one-third of Navy first-term enlisted personnel during the late 1960s and early 1970s were draft-induced [19]. We can use that range here to at least illustrate the implications of our results.

Recall that our regression equation indicates that, on average, draft-era Navy enlistees were only 73 percent as likely to reenlist as otherwise comparable AVF-era enlistees. Yet if only one-quarter of these draft-era enlistees were actually draft-induced, then the reenlistment rate of draft-induced enlistees must be much less than 73 percent that of otherwise comparable true volunteers. Indeed, if one-quarter of the draft-era cell members in this sample were actually draft-induced, and if draft-era cell members were on average 73 percent as likely to reenlist as otherwise comparable true volunteers, then virtually none of the draft-induced enlistees could have reenlisted (assuming that $73 = X(.25) + 100(.75)$, X must have been just about zero). If one-third of the draft-era cell members in this sample were actually draft-induced, we estimate that the reenlistment rates of draft-induced enlistees were less than one-tenth those of otherwise comparable true volunteers.

Whatever the precise fraction who were draft-induced, the difference in reenlistment rates of true and draft-induced volunteers implied by our empirical estimates is striking. The difference is as large as any ever identified, including the estimates of the Gates Commission [20].

TRAINING

Our analysis reveals that the more formal, in-service training sailors receive in their first term, the less likely they are to reenlist. The elasticities in table 4 show the size of the estimated effect. For each 20 days of training potential reenlistees got beyond the mean, they were 1 percent less likely to reenlist. This effect is observed even after controlling for differences across sample cells with respect to a number of other variables, including mental group, pre-service educational level, and pay. This preliminary analysis shows that in-service training does affect reenlistment rates of Navy personnel in the expected direction.

CONCLUSIONS

In this study we have estimated empirically the effect on military reenlistment behavior of several major policy variables, most particularly eligibility for the most recent version of the GI Bill and draft pressure at the enlistment point. The analysis must be considered tentative as it is based on data from only one service. But the specific effects are all shown to be substantially adverse and to persist after controlling for other key determinants of retention, including pay, unemployment rates, and demographic differences.

These could be useful findings. For example, the debate over how the services may best attract high-quality recruits is beginning to quicken again--with the prospect of budgetary constraints on DOD, an improving civilian economy, and a shrinking pool of high-quality, combat-eligible recruits. Over the next few years there are likely to be numerous advocates of a new Vietnam-era GI Bill to "save" the AVF. But the evidence in this report casts major doubts on the value to DOD of any such program. Most pointedly, since GI Bill benefits have never been shown to be a more powerful enlistment incentive for high-quality enlistees than cash, the evidence presented here implies strongly that a new GI Bill would be a significantly less efficient recruiting tool than a comparable amount of cash. If, therefore, the issue is how to spend a given dollar, and if DOD must choose between educational and cash enlistment bonuses, the evidence here suggests that DOD would get a superior return from the latter--due to the hidden costs from reduced retention rates induced by educational enlistment bonuses such as the GI Bill.

Beyond these findings, some other results could also be of value to manpower planners and other AVF observers. Here, for example, is evidence that the draft hurts retention rates significantly, even in a service that does not draft. These results are in accordance with theoretical expectations but are more extreme than those of most earlier analyses. The main practical implication is that the service is deprived of the full benefits of the training resources it invested in these draft-induced volunteers during their first term, an issue explored at greater length in [3].

Finally, these initial estimates of the adverse effect on reenlistment rates of first-term training may also be of interest to planners trying to improve the structure of reenlistment bonuses. More research is needed here, but this finding agrees with the results of another recent assessment [1]. Although the measurement approaches in [1] were different, the results and basic implications are similar.

These analyses suggest there is value in continuing to improve the models of the supply of careerists in all the services. Good training and experience are expensive. The more the services know about these factors, the better able they will be to design policies to retain the most valuable personnel.

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APPENDIX A

IDENTIFYING THE PERSONNEL ELIGIBLE FOR
THE GI BILL

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IDENTIFYING THE PERSONNEL ELIGIBLE FOR THE GI BILL

To be eligible for full (Vietnam-era) GI Bill benefits as a veteran, individuals must have joined a U.S. military service before 1 January 1977, they must have served for at least 18 months on active duty, and they must have left under honorable circumstances. Eligibles need not have begun active duty before 1977, but they must have at least signed a contract before then.

Personnel in our data set all had served at least 18 months on active duty, and only a very small percentage would receive any discharge other than honorable. Therefore, separating GI Bill eligibles from ineligibles merely involved distinguishing those who joined before 1977 from others, a conceptually trivial task and for the most part easy in practice. Complications arose, however, in approximately 10 percent of the cases because the units of observation were organized by active-duty service dates and fiscal years, not contract dates and calendar years. We therefore had to make some judgement calls. Table A-1 provides the main basis for those decisions: it depicts earliest and latest initial active-duty service dates of all sample members. Table A-1 shows, first, that most cells in the sample contain only individuals who joined before 1977. In fact, all but six cells--those in the bottom left corner of the table--fall into this category. We therefore assumed for these analyses that all but these six cells contained only GI Bill eligibles.

The table also shows that a few sets of cells contain members who all began active duty at least 9 months after the start of calendar year 1977: LOS-3s in FY 1981 and FY 1982, and LOS-4s in FY 1982. It seemed safe to assume that members of these cells were all ineligible. Although a few might have joined in 1976, they had to represent negligible fractions: in these LOS categories few if any enlistees would have been in the Delayed Entry Program (DEP) for as long as 9 months; average time in DEP was only about 3 months.

There were three problematic sets of cells in our sample, problematic because they were likely to contain significant fractions of both eligibles and ineligibles: specifically, LOS-3s in FY 1980, LOS-4s in FY 1981, and LOS-5s in FY 1982. Again, assuming an average time in DEP of 3 months, as many as half the members of each of these cells could have been eligibles, the other half ineligibles.

Given this, there were several options. We did not want to omit these ("mixed") cases altogether. Instead, we created two versions of a GI Bill dummy variable: one that treated these mixed cells as all GI Bill eligibles; a second that treated them all as ineligibles.

TABLE A-1
COMPOSITION OF SAMPLE DATA CELLS
BY ACTIVE DUTY SERVICE DATES (ADSDs)^a

Fiscal- year cohort	LOS 3		LOS 4		LOS 5		LOS 6	
	Earliest ADSD	Latest ADSD	Earliest ADSD	Latest ADSD	Earliest ADSD	Latest ADSD	Earliest ADSD	Latest ADSD
1974	6/70	6/71	6/69	6/70	6/68	6/69	6/67	6/68
1975	6/71	6/72	6/70	6/71	6/69	6/70	6/68	6/69
1976	6/72	6/73	6/71	6/72	6/70	6/71	6/69	6/70
1977	9/73	9/74	9/72	9/73	9/71	9/72	9/70	9/71
1978	9/74	9/75	9/73	9/74	9/72	9/73	9/71	9/72
1979	9/75	9/76	9/74	9/75	9/73	9/74	9/72	9/73
1980	9/76	9/77	9/75	9/76	9/74	9/75	9/73	9/74
1981	9/77	9/78	9/76	9/77	9/75	9/76	9/74	9/75
1982	9/78	9/79	9/77	9/78	9/76	9/77	9/75	9/76

a. Earliest and latest plausible ADSDs (month/year) for enlistees in specific LOS categories as of the first day of the respective fiscal (reenlistment decision) years into which these individuals were classified by DMDC.

Operationally, the first assumes that only LOS-3s in FY 1981 and 1982 and LOS-4s in FY 1982 are ineligible (GIBILL = 0), and that all other cells in the sample (and in table A-1) contain only eligibles (GIBILL = 1).

The second version, by contrast, assumes that LOS-3s in FY 1980, 1981, and 1982; LOS-4s in FY 1981 and 1982; and LOS-5s in FY 1982 are all ineligible (GIBILL = 0), and that all other cells in the sample are eligibles (GIBILL = 1).

The regression results were similar using either dummy. The first version is reported in the text. Results for the second version are available on request.

Although the "mixed" cells did not comprise a large fraction of the total, they seem sure to constitute a source of error in the estimates. Including them probably resulted in an underestimate of the effect of the GI Bill; a pure separation of eligibles from ineligible should result in a stronger effect. While the size of this underestimate may not be clear, the direction is. Future research, with a richer data set, can shed more light on the magnitudes involved.

APPENDIX B

NONLINEAR ESTIMATES

APPENDIX B

NONLINEAR ESTIMATES

This appendix provides estimates of the basic retention model using an alternative (logistic) form of the reenlistment rate. The dependent variable y equals $\ln \frac{R}{1-R}$, where R itself represents PREEN as defined in table 1 in the main text. Otherwise, the estimates in this appendix are based on the same variables and data cited in the main text (table 4).

The results are not identical, but the differences are not large. Inspection of table B-1 will reveal that the direction and significance of the estimated effects are the same as the linear results for all key variables. Table B-2 shows that the magnitudes of these estimates do not differ greatly from the linear results. Overall, a comparison of table 4 and table B-2 reveals a slightly weaker estimated retention effect of the GI Bill and a somewhat stronger set of estimated effects for draft pressure, in-service training, and pay in the logistic equation as compared with the strict linear model.

TABLE B-1

NAVY ZONE A REENLISTMENTS
BASIC NONLINEAR RESULTS

<u>Variable</u>	<u>1974-82</u>	<u>AVF Cases</u>
GIBILL	-	-
DRAFTP	-	NA
TRAIN	-	-
UR2024	+	+
PAYDIFF	+	+
SEADUTY	-	-
EDUC	-	-
MARR	+	+
RACE	+	+
MGI&II	- ^a	+ ^a
REELG	+ ^a	+ ^a
LOS 4	+ ^a	+
LOS 5	+	+
LCS 6	+	+ ^a

a. Not statistically significant at the 99-percent confidence level.

NA: Not applicable.

TABLE B-2

NAVY ZONE A REENLISTMENTS
REGRESSION ESTIMATES AND ELASTICITIES
FROM THE NONLINEAR MODEL

Variable	Regression coefficients		Elasticities ^a	
	1974-82	AVF cases	1974-82	AVF cases
GIBILL	-.176	-.143	-.134	-.11
DRAFTP	-.367	NA	-.363	NA
TRAIN	-.0013	-.0012	-.11	-.10
UR2024	.050	.041	.44	.37
PAYDIFF	.000124	.00016	1.35	1.68
SEADUTY	-.890	-1.023	.31	.37
EDUC	-.062	-.073	.56	.67
MARR	1.20	1.21	.32	.25
RACE	1.45	1.88	.18	.19
MGI&II	-.025	.097	.02	.06
REELG	.0006	.008	.005	.05
LOS 4	.031	.146	NA	NA
LOS 5	.437	.456	NA	NA
LOS 6	.301	.071	NA	NA
CONSTANT	-1.55	-1.63	NA	NA
N	2810	1704	NA	NA

a. Elasticities (and percentage changes) of the underlying retention rate R vis-a-vis the variables in this model were calculated in a manner strictly analogous to those in table 4, recognizing, however, that dR/dX_i equals $b_i(R)(1-R)$ when b_i is derived from this semi-log logistic model.

NA: Not applicable.