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20 displayed a pay elasticity in excess of 3, whereas personnel in the lower groups had an elasticity of approximately 1. Thus, pay increases improve the quality of the career force as well as increasing the number of personnel retained. Conversely, if Navy pay lags behind civilian earnings, the decline in retention is compounded by a decrease in quality. Upper mental group personnel seemed to be more sensitive to changes in the civilian unemployment rate as well.

There is a significant relationship between advancement and retention. The effect is stronger than that expected from the related pay increase. It seems to indicate that advancement can be an effective and selective retention tool.

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RETENTION AND CAREER FORCE QUALITY

Alan J. Marcus

CENTER FOR NAVAL ANALYSES

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RETENTION AND CAREER FORCE QUALITY

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ABSTRACT

Previous studies have examined the factors that influence first-term retention. This analysis expands on prior work to investigate the impact of these factors on retention and the quality of personnel retained. We find that the aggregate pay elasticity is approximately 2 (which is similar to that found in earlier analyses), but that this result masks substantial differences in the pay responsiveness of different personnel. Upper mental group personnel displayed a pay elasticity in excess of 3, whereas personnel in the lower groups had an elasticity of approximately 1. Thus, pay increases improve the quality of the career force as well as increasing the number of personnel retained. Conversely, if Navy pay lags behind civilian earnings, the decline in retention is compounded by a decrease in quality. Upper mental group personnel seemed to be more sensitive to changes in the civilian unemployment rate as well.

There is a significant relationship between advancement and retention. The effect is stronger than that expected from the related pay increase. It seems to indicate that advancement can be an effective and selective retention tool.

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INTRODUCTION

Since the inception of the All Volunteer Force (AVF), there has been a great deal of concern about the quality of enlisted personnel. Most of the debate and research on this issue has concentrated on the quality of incoming recruits. Surprisingly little attention has been devoted to the quality of careerists. Given that this issue is most often set in the context of the AVF vs. Draft debate, it is easy to understand why interest has centered on recruits rather than the career force. Nonetheless, it is vital to explore the issue of quality from the perspective of retention as well as accession.

The Navy has made substantial progress in eliminating its long-standing shortage of petty officers but, as the Navy grows toward the 600-ship force, increasing numbers of personnel will have to be retained to attain career force objectives. Previous research has made it clear that personnel can be retained in sufficient numbers if pay and personnel policies are used appropriately.

Will the Navy, however, be able to maintain the same level of personnel quality (or improve it) as it retains larger numbers of careerists? This is a question that has not been seriously explored. Growth in demand for personnel will be greatest in the most technical Navy jobs, which makes the issue of quality even more critical. We examined the question, and evaluated various policies that can be used to increase retention and the quality of personnel retained. Analysis is limited to the first reenlistment decision; continuing research will include subsequent decisions.

PREVIOUS RESEARCH

Numerous studies have explored the factors that influence first-term reenlistment. These factors can be categorized into three general areas: Navy policies, economic conditions, and individual characteristics of Navy enlisted personnel. We will review the general pattern of findings in each of these areas before discussing new approaches offered in this paper.

Pay

The Navy policy which has the greatest impact on retention is the level of pay. The two major components of Navy pay are Regular Military Compensation (RMC) and Selective Reenlistment Bonuses (SRB). There are numerous other special pays (Sea Pay, Proficiency Pay, etc.), but they comprise a small portion of total compensation and have not been considered in most of the work in this area.

Many analysts have studied the effect of pay on first-term reenlistment rates. The impact of pay is normally measured as an elasticity which measures the percentage change in reenlistment resulting from a

percentage change in pay. Estimates of the elasticity of reenlistment with respect to pay, with pay measured by RMC and SRB both separately and jointly for various years and data sets, have been remarkably consistent. Enns [1] reviewed more than a dozen studies of first-term reenlistment and found that the distribution of results is centered just above 2.0 and that virtually all the estimated elasticities have been between 1.0 and 3.0. Most studies have assumed that all Navy personnel exhibit the same pay response. Two recent studies [2, 3] allowed for varying response rates by estimating separate elasticities for different occupational groups. Both found that there were some differences between occupational groups but, in general, the estimates of pay responsiveness were quite close to those found in earlier work.

QOL

Although pay is the area of Navy policy that has been most studied, there are other policies that significantly influence first-term retention. They can be classed under the general rubric of Quality-of-Life (QOL) issues. In the main, we know very little about the effect of these factors on retention. One aspect of QOL that has been studied by CNA recently is the effect of sea duty on retention. For example, a 10 percent increase in expected time at sea was found to lead to a 3 percent decrease in the predicted retention rate [2]. Satisfaction with aspects of Navy jobs (such as training opportunities, ability to use one's skills and relations with supervisors) was found to positively relate to reenlistment intentions [4]. In addition, pay, time at sea, and the quality of Navy-provided housing were found to have significant effects on retention.

Economic Conditions

A major factor that influences retention is the state of the economy. Although the Navy has no control over this, it can plan future policy based on forecasts of economic trends. Levels of Navy pay can only be interpreted relative to civilian wages. When policy-makers consider the impact of a 5 percent increase in Navy pay, the actual effect depends on the size of the change relative to increases in civilian wages. The other major indicator of economic conditions is the national unemployment rate. Reenlistment rates are sensitive to the unemployment rate, increasing when the unemployment rate increases. There has been less analysis of the effect of unemployment on retention than of pay, but the effect is substantial. Estimates used by CBO [5] indicate an elasticity of .5 for first-term reenlistment. Although this elasticity is somewhat less than that found for pay, it is still significant. Translating this elasticity into actual changes in retention, a one percentage point decrease in the national unemployment rate leads to a three percentage point decrease in the reenlistment rate for first-term personnel. The unemployment rate is much more volatile than pay, so historically it has had a greater impact on retention.

Civilian wages and the unemployment rate are very good measures of the condition of the aggregate economy, but they may not be good proxies for the civilian opportunities facing enlisted personnel in specific occupations. Recent CNA research has indicated that occupation-specific measures of civilian job growth may be better indicators of civilian opportunities [6]. This approach requires a good match between civilian and Navy occupations (a difficult task in many instances), but has the advantage that forecasting employment opportunities is easier than predicting future wage and unemployment rates.

Individual Characteristics

Navy policies and the condition of the national economy affect all enlisted personnel. Individual characteristics also affect retention through their effects on civilian opportunities and on tastes for Navy life. They can be used to predict civilian opportunities and thus propensity to reenlist. Some analysts have used predicted civilian wages directly in estimates of retention. Individual characteristics can also be thought of as proxies for taste for Navy as opposed to civilian life. Researchers consistently find, for example, that married personnel are more likely to reenlist. Benefits such as housing allowances and health care are more valuable for married personnel, however, so marital status may reflect differences in Navy pay as much as differences in tastes.

Education and AFQT have an influence on retention. Results are somewhat mixed on the effects of these characteristics when they are included in addition to civilian opportunities but, in general, they correlate negatively with retention. Ignoring the indirect effect of these characteristics on retention, through the civilian opportunities available, these factors substantially decrease expected retention.

These findings are disturbing, because we have evidence that education and mental ability both have significant impacts on job performance. Past analyses indicate that the Navy is most likely to lose its most productive personnel at the first reenlistment point. In the rest of this paper, we will examine the relationship between performance and retention and evaluate policies that can be used to encourage higher retention among personnel who contribute the most to Navy readiness.

DATA

To analyze the relationship between retention and quality, we need a data set that contains not only retention and quality measures, such as education, AFQT, and Navy training, but also direct measures of individual productivity. A data set with these measuress has been constructed for this project. The base was the Enlisted Utilization Survey (EUS), conducted by Rand in 1974 to study the growth in productivity for first-term personnel in selected military occupational

specialties.* The EUS surveyed first-term enlisted personnel and their supervisors and includes supervisors' assessments of the productivity of individual enlisted men at several points during their first term. With the cooperation of Rand, we built a file of all Navy personnel in the survey year, and extended it through 1980 to assess their subsequent reenlistment choices and advancement histories. These unique data allow us to relate the reenlistment decisions of first-termers to their personal characteristics, to Navy policy parameters such as pay levels, and to direct measures of how well they perform at their duty stations.

These data do have limitations. We observe only a sample of all Navy personnel in a subset of Navy ratings. The ratings we do observe, however, cover a wide spectrum of skills and include ratings that comprise more than half of all Navy personnel. The sample size is more than adequate to study first-term reenlistment, but becomes too small to successfully analyze retention at subsequent reenlistment points. Table 1 displays the ratings and the number of personnel observed in each category along with the mean reenlistment rate for each rating.**

Personnel in the EUS survey were matched to the annual Navy Enlisted Master Record (EMR) and followed until they made a decision to either leave the Navy or reenlist. Personnel who extended were not counted as making a decision until they made a reenlistment decision. Data on an individual were collected at the time of the decision. To create a fairly homogeneous data set, personnel in the nuclear power program, who have six-year initial obligations and consistently high bonuses, were excluded. There were substantial changes in the MS rating during the sample years, so it was also dropped from the data set. Preliminary analysis indicated that the AD rating was somewhat different from the others. It was excluded, although including it did not change any qualitative results. Table 2 displays the variables collected for each person and their mean values.

PRODUCTIVITY AND RETENTION

The first question of interest is whether or not the productivity of enlisted personnel at their Navy jobs is related to expected retention rates. In this section we will use direct observations on productivity as well as other measures of personnel quality which are good proxies for ability. Logit analysis is used to estimate the effect of personnel characteristics and Navy policies on predicted reenlistment decisions. Logit analysis is preferable to ordinary least squares regression techniques when analyzing discrete choices, such as a

---

* See [7] for a detailed description of the EUS data.
** The data did not distinguish eligibles from ineligibles, so the reenlistment rate is calculated as the number of reenlistments over everyone reaching EAOS.

TABLE 1

RATINGS AVAILABLE FOR ANALYSIS

Non-nuclear Ratings	N	Reenlistment Rate
Aviation Machinist's Mate (AD)	41	.293
Aviation Electrician's Mate (AE)	19	.158
Electrician's Mate (EM)	392	.110
Electronics Technician (ET)	291	.089
Machinist's Mate (MM)	309	.152
Mess Management Specialist (MS)	197	.310
Radioman (RM)	219	.210
Nuclear Ratings (NEC)		
EM (3354)	178	.157
ET (3353)	168	.083
MM (3355)	244	.131

TABLE 2

INDEPENDENT VARIABLES

Variable	Mean
HSDG (=1 if High School Diploma Graduate)	.87
GED (=1 if received GED)	.05
AGE (Age at entry into Navy)	19.2
NW (=1 if race not white)	.05
AFQT	71.6
PG3 (=1 if paygrade E-3)	.11
PG4	.53
PG5	.34
PG6	.02
MULT (SRB multiple at time of reenlistment decision)	3.01
UER (Aggregate Unemloyment Rate at time of reenlistment decision)	6.92
MIL2CIV (Pay index at time of decision = RMC (E-4, LOS4, family size=3)/CPI	.547
EXTEND (=1 if extended prior to reenlistment decision)	.10
FY 74 (=1 if decision made in FY 74)	.002
FY 75	.084
FY 76	.121
FY 77	.422
FY 78	.295
FY 79	.056
FY 80	.020
PR4 (Supervisor's assessment of productivity at LOS4 relative to a fully qualified specialist = 100)	89.6

reenlistment decision, but the qualitative and quantitative results are usually similar.

In the data available for this study, it is impossible to accurately determine if an individual is ineligible to reenlist. This is not a serious problem, since the number of ineligibles is quite small. During the period of time covered by our analysis, personnel who had not made E-4 were not normally eligible for reenlistment. To reduce the problem caused by the eligibility question, the data analysis was limited to personnel in paygrade E-4 or above.

As a first step, logit analysis using the observed productivity measure and no other demographic information was tried. These results are shown in table 3. Because the period of time in our sample is quite short, there were no substantial changes in either the measure of RMC relative to civilian pay or the unemployment rate, so a second specification was also employed. In the second specification, dummy variables for each of the sample years were included to account for changes in the national economy and Navy pay. Results from each of these specifications are included throughout the paper, but the choice of models does not substantially change any results.

TABLE 3

ESTIMATES OF REENLISTMENT PROBABILITY

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-3.10	--	--	-14.60	--	--
PR4	.0010	(0.5)	[.0001]	.0007	(0.4)	[.0001]
MULT	.14	(1.3)	[.018]	.17	(1.6)	[.022]
UER	--	--	--	.25	(2.2)	[.032]
RMC	--	--	--	18.88	(2.0)	[2.37]
EXTEND	.96	(3.6)	[.119]	.90	(3.5)	[.113]
x^2	46.3	--	--	37.7	--	--
$(P\|\bar{x})$	.144	--	--	.147	--	--

[a]The equation estimated also included year and rating dummies.

As can be seen in table 3, the effect of productivity on retention is estimated to be positive, although quite small. An individual who is ten percent more productive than the average enlisted man is estimated to have a reenlistment probability that is .1 percentage point higher. The finding is encouraging, but it is a weak result. When a more complete model was used, this effect essentially disappeared. This is not altogether surprising when one considers that there are pulls in both directions. Individuals who are more productive at Navy jobs are likely to have characteristics that make them more productive in the civilian economy, and thus more valuable to civilian employers as well. Another possibility is that our measures of productivity are imprecise, which will tend to bias our estimates of the effect of productivity on retention toward zero.

These results suggest that direct measurements of productivity are not helpful in explaining retention. Therefore, the alternative approach chosen is to use individual characteristics as proxies for performance. We will use two types of proxies for productivity on the job. The first type includes measures of individual mental ability, specifically AFQT score, and civilian education. Table 4 displays regression estimates of the effect of these characteristics on our measure of Navy job performance. Again, the relationship between personal characteristics and observed productivity are weak although they have the correct signs.

TABLE 4

ESTIMATES OF INDIVIDUAL PRODUCTIVITY

Variable[a]	Coefficient	(t)
Constant	31.3	--
HSDG	1.58	(0.3)
GED	1.70	(0.2)
AGE	2.79	(3.2)
NW	-8.04	(1.3)
AFQT	.045	(0.6)
R^2 = .017		
Mean DV 89.8		

[a]Dummy variables representing Navy ratings were also included in the equation.

An alternative measure of Navy performance is advancement. As was seen in table 2, the majority of personnel reach paygrade E-4 by the end of their first term, but a substantial proportion reach paygrade E-5. In table 5, a regression of the probability of reaching paygrade E-5 is shown. Not only do the measures of personnel quality enter more strongly than before, but observed productivity is also highly correlated with advancement.* In the rest of this paper, reenlistment will be estimated as a function of these proxies for productivity, rather than using the direct measure.

TABLE 5

ESTIMATES OF THE PROBABILITY OF REACHING E-5
BEFORE FIRST-REENLISTMENT DECISION

Variable[a]	Coefficient	(t)
Constant	.061	--
HSG	.031	(0.7)
GED	.00	(0.0)
AGE	.024	(2.8)
NW	.032	(0.5)
AFQT	.0023	(3.3)
PR4	.0016	(5.7)

R^2 = .136
Mean Probability .36

[a]Dummy variables representing Navy ratings and decision year were also included in the equation.

* It is interesting to note that age at entry is positive and significant in both of these equations. Previous research has noted that entry age is negatively correlated with early attrition [8] and this finding suggests that age restrictions for enlistment is a topic that bears further investigation.

RETENTION ESTIMATES

In this section, we estimate the probability of reenlisting based on personal characteristics, paygrade, SRB level in the rating, unemployment rate, and an index of military pay. Results are presented in table 6. It is difficult to interpret the logit coefficients directly, so the partial derivatives of the reenlistment probability with respect to the independent variables evaluated at the mean reenlistment probability are also included. For example, possessing a high school diploma leads to a predicted reenlistment rate 6.2 percentage points lower than that of a non-graduate. There is very little difference between the model that uses annual dummy variables to describe time series variation, and the model that includes the unemployment rate and the pay index. To avoid redundant calculations, we will discuss the results from the model using pay and unemployment, although both sets of results will be presented.

The effects of individual characteristics are reasonable and consistent with previous findings. High school graduates and GEDs are less likely that nongraduates to reenlist. Nonwhites are more likely to remain in the Navy, as are personnel who enlist the Navy at a later age, reinforcing the earlier findings on the importance of entry age. The coefficient on AFQT is small and insignificant. We expected a negative coefficient on AFQT reflecting higher potential civilian earnings, and have no ready explanation for this insignificant finding.

The effect of a one-level increase in the bonus multiple is to raise the reenlistment rate by 2 percentage points. Translating this into a pay elasticity yields an estimated elasticity of 2.1.* This results confirms the findings of numerous other studies. An alternative pay elasticity estimate can be derived from the coefficient on the pay index. This elasticity estimate equals 9.5, which is unreasonably high. The unemployment elasticity equals 1.8, which is also substantially higher than that found in earlier work. These results are probably due to the very short time series available in the data and should be interpreted very cautiously.

The effect of paygrade on retention is dramatic. The predicted reenlistment rate for an individual at paygrade E-5 is almost 9 percentage points, more than 50 percent higher than for an individual at paygrade E-4. Table 7 shows the pay levels associated with these paygrades. Note than an E-5 earns only 5 percent more than an E-4. If the only effect of advancement on retention was a result of the increase in pay, it would imply a pay elasticity of more than 10. Clearly, the

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* During the years observed, SRB was paid in annual installations. A one level increase in SRB can, therefore, be treated as an additional month of base pay and the resulting change in pay is converted into a percentage pay increase.

TABLE 6

ESTIMATES OF REENLISTMENT EQUATIONS

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-5.94	--	--	-20.61	--	--
HSG	-.62	(2.0)	[-.068]	-.55	(1.8)	[-.062]
GED	-.37	(0.8)	[-.041]	-.34	(0.7)	[-.038]
AGE	.12	(2.1)	[.013]	.11	(2.0)	[.012]
NW	1.45	(4.2)	[.159]	1.44	(4.3)	[.161]
AFQT	.0025	(0.4)	[.0003]	.0012	(0.2)	[.0001]
PG5	.83	(4.4)	[.090]	.79	(4.2)	[.088]
PG6	1.28	(2.2)	[.140]	1.25	(2.3)	[.139]
MULT	.15	(1.2)	[.016]	.18	(1.6)	[.020]
UER	--	--	--	.36	(2.9)	[.040]
MIL2CIV	--	--	--	24.50	(2.4)	[2.74]
EXTEND	.98	(3.5)	[.107]	.92	(3.3)	[.102]
x^2	99.7	--	--	88.2	--	--
N	1103	--	--	1103	--	--
$(P\|\bar{x})$	.125	--	--	.128	--	--

[a]Dummy variables representing Navy ratings and decision year were also included.

effect of advancement to E-5 on retention is stronger than what would be expected from the increase in pay.* This suggests that advancement may be an effective retention tool, a point which will be considered later.

TABLE 7

MONTHLY RMC AT LOS4, FY 1978

Paygrade	RMC	Pay Index (E4 = 1.00)
E-3[a]	$815	.92
E-4	889	1.00
E-5	930	1.05
E-6	1021	1.15

[a]The calculation of RMC depends on the number of dependents. These values assume the individual is married and has one child.

The comparable pay elasticity for advancement from paygrade E-5 to paygrade E-6 is just over 2, suggesting that there is little additional effect beyond that of pay for this advancement. There are so few individuals at paygrade E-6 during the first term, however, that this result should be treated cautiously.

RETENTION AND QUALITY

To this point, the analysis of retention has not differed dramatically from that conducted by many others. We have included a direct measure of productivity in our estimates of retention, but it had no significant impact on retention. The only result that differs from those of earlier analysts is the treatment of advancement as an explanatory variable. The obvious question to ask about retention is, how do the economic variables such as pay and SRB levels affect the quality of the career force? It is to this issue that we turn next.

* Some caution is required in the interpretation of these findings. Individuals who intend to reenlist may be more likely to make an effort to reach PG5 by EAOS. As a result of this reverse causality, the coefficient on PG5 probably overstates the policy impact of an increase in the advancement rate on retention.

The work presented so far assumes that the effect of pay, as measured by the pay elasticity, is identical for all individuals. This type of model predicts that as pay is increased the Navy will retain more personnel, but the quality distribution of personnel will remain essentially constant. If, on the other hand, the responsiveness to pay is different for individuals with differing characteristics, then changes in pay or in the national economy may have a significant impact on the quality of the career force retained.

High quality personnel are more valuable to civilian employers and are likely to command higher civilian salaries. This will make them less likely to remain in the Navy after their first term. An increase in RMC or in SRB levels makes the Navy more competitive for these individuals and should lead to increased reenlistment rates. At the same time, these increases in pay will also attract more individuals from the lower skill groups and may not lead to any overall increase in the quality of the career force. The effects of pay on quality depends crucially on the pay responsiveness of individuals with different characteristics.

We stratified the personnel in our data by measures of quality and estimated separate reenlistment equations. There were too few individuals who were not high school graduates to stratify on that variable, so we stratified the data by mental group (MG). The results presented in table 6 include all individuals making a first reenlistment decision. Reenlistment estimates for personnel in MG I-IIIL, MGI-IIIU, MGI-II and MGIII are presented in tables A-1 through A-4 respectively. Summary calculations of the implied reenlistment elasticities are displayed in table 8.

TABLE 8

REENLISTMENT ELASTICITIES

	(1) All	(2) MGI-IIIL	(3) MGI-IIIU	(4) MGI-II	(5) MGIII
Pay (calculated from SRB)	2.2	2.8	3.1	4.1	1.1
Unemployment	1.8	2.0	2.7	2.7	1.4

These results indicate that there are substantial differences in the impact of pay and unemployment across mental groups. In general, changes in Navy pay have the largest impact for the best people. Conversely, if pay declines the Navy will experience the greatest losses for those personnel whom it most values.

Examining the pay elasticities derived from the SRB variable, we find that the estimates depend significantly on which group of personnel we look at. For the full sample of individuals making a reenlistment decision, we find an elasticity of 2.2, which is comparable to that found in numerous other studies. This overall result, however, masks some important differences. Individuals in MGIII have an elasticity of 1.1 (column 5) which is substantially lower than the average. At the other end of the distribution, personnel in the top two mental groups (column 4) are much more sensitive to pay. These results imply that a 5-percent pay increase will lead to a 20-percent increase in expected reenlistment rates for personnel in the top mental groups, while only increasing reenlistment rates by about 5-percent for the rest of the first-term personnel.

The alternative estimates of pay elasticities, derived from the coefficient on an aggregate pay index, are unreasonably high again, but the pattern of results tells the same story. The estimates of responsiveness to the unemployment rate are consistent with those on pay. Although the differences across groups are not quite as large as for pay, they imply that as the unemployment rate declines from its extremely high levels of the early 1980s, the people who are the most valuable to the Navy will be more likely to return to the civilian sector at the end of their first term.*

Table 9 displays the mental group distribution of the personnel in our sample who have reached the end of their first term. In table 10 we show the results of simulated changes in SRB levels on the quality mix after the first reenlistment point. Simulated changes were estimated using elasticities from table 8 to derive changes in the reenlistment rates displayed in table 9. These new reenlistment rates were multiplied by the sample proportions shown in table 9 to arrive at a second-term distribution. As can be seen, there are substantial changes in the distribution when the average SRB level changes. Comparing a one-level increase to a one-level decrease we observe a 10 percentage point difference in the proportion of careerists in the top two mental groups. Although the pay elasticity based on the RMC coefficient was unreasonable, we think that the SRB elasticity accurately reflects the relative pay responsiveness of different personnel categories and can be used to simulate changes in RMC as well. The estimated effects of the civilian unemployment rate are larger than those found in earlier studies, and we decided not to use these findings to predict changes in the quality mix for changes in the unemployment rate. It seems clear

* Studies of recruit supply (see [9], for example) also indicate that upper mental group high school graduates are the recruits who are most sensitive to economic conditions. If the unemployment rate drops (or Navy pay lags behind the civilian sector) then not only are the best people more likely to leave but also the pool reaching the first reenlistment point will have a lower average quality mix.

TABLE 9

MENTAL GROUP DISTRIBUTION AND MEAN REENLISTMENT

MG	Percent	Mean reenlistment (percent)
I	1.8	10.0
II	38.3	14.9
IIIU	19.0	15.2
IIIL	30.6	14.8
IVA	6.3	13.0
IVB-V	4.1	26.7
Total	100.1	15.2

TABLE 10

SIMULATED EFFECTS OF PAY ON QUALITY

SRB change	Second-term MG distribution (percent)				Overall increase (percent)
	MGI-II	MGIII-V	MGI-IIIU	MGIIIL-5	
0	38.8	61.2	57.8	42.2	--
+1	42.6	57.4	60.8	39.2	13
-1	33.9	66.1	54.0	46.0	-13

that if the unemployment rate declines, the resulting decrease in reenlistment will be greatest for the upper mental groups. When these unemployment estimates are refined in further research, it will be possible to analyze what types of pay policies can be used to offset this decline.

CONCLUSIONS

We examined the factors that influence first-term reenlistment. Although this topic has been analyzed many times, there are sufficient unexplored issues to warrant further research. Our results both support the findings of earlier research and provide new insights into the determinants of reenlistment.

Our results reconfirm the standard rule of thumb that the appropriate pay elasticity for predicting aggregate first-term reenlistment is about 2. However, this standard result disguises some important differences within the first-term force. Before returning to this point, some ancillary results are presented.

Two other findings of note emerged. First, age at entry has a significant positive impact on performance, as measured both by direct observations on productivity and by its effect on advancement probability. Age also influenced the probability of reenlisting in a positive direction. These facts, combined with earlier findings on the effect of entry age on early attrition suggest that enlistment restrictions for young recruits are a policy worth investigating.

The second finding concerns the importance of advancement to the reenlistment decision. The impact of advancement to E-5 on retention was very large. The associated pay increase is relatively small, which suggests that advancement is an efficient retention tool. Advancement is a well targeted policy: the Navy advances those individuals who are the most valuable to it. If a decision were made to increase the advancement rate in certain undermanned ratings for example, the individuals who would benefit are those who are the most productive. This would raise the reenlistment rate for the people that the Navy most wants to keep. An increase in the SRB level, on the other hand, would benefit everyone in that rating. Clearly, it is unreasonable to advance everyone in a rating, but our results suggest that a policy of faster advancement in undermanned ratings can have a substantial impact on retention and one which is directly targeted at the best people.

Our main interest is the effect of Navy policies and economic conditions on retention and quality. We examined the impact of initiatives to enhance retention on the quality of the career force. We found that the most productive personnel (defined in this case by mental group) were the ones most sensitive to changes in economic conditions. General pay increases or SRB increases for specific ratings not only induce more retention but do so disproportionately for the best

people. Conversely, if Navy pay lags behind the civilian sector, the resulting manpower shortages will be concentrated among the best people.

Projections of requirements for personnel to man future fleet indicate that the average skill levels will have to increase. Failure to keep pace with the civilian economy will not only lead to shortfalls in manning levels, but will have even greater effects on the skill levels of the force--with potentially serious consequences on readiness.

RESEARCH AGENDA

This analysis was based on a fairly limited number of Navy ratings. We intend to expand it to cover a much larger set of ratings to be certain that our results can be generalized. In addition, similar research will be conducted on later reenlistment decisions. If the same problem of losing the most able personnel when pay is too low persists at later decision points, the consequences for readiness become even more significant. Past research on retention has concentrated on personnel quantity without substantial consideration of the quality of those retained. Our research is a first step in an attempt to link these issues.

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APPENDIX A

ESTIMATES OF REENLISTMENT EQUATIONS

TABLE A-1

ESTIMATES OF REENLISTMENT EQUATIONS
(MGI-IIIL)

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-6.57	--	--	-21.93	--	--
HSG	-.59	(1.7)	[-.062]	-.52	(1.5)	[-.055]
GED	-.58	(1.0)	[-.061]	-.58	(1.0)	[-.061]
AGE	.12	(2.0)	[.012]	.11	(1.9)	[.012]
NW	1.79	(4.7)	[.188]	1.77	(4.7)	[.188]
AFQT	.0071	(0.9)	[.0007]	.0061	(0.8)	[.0007]
PG5	.81	(4.1)	[.085]	.78	(3.9)	[.083]
PG6	1.24	(2.1)	[.130]	1.19	(2.1)	[.126]
MULT	.18	(1.4)	[.019]	.23	(1.9)	[.025]
UER	--	--	--	.40	(3.0)	[.043]
MIL2CIV	--	--	--	25.16	(2.4)	[2.68]
EXTEND	1.00	(3.4)	[.105]	.94	(3.2)	[.100]
N	1007	--	--	1007	--	--
$(P\|\bar{x})$	.119	--	--	.121	--	--
x^2	100.4	--	--	88.4	--	--

[a]Dummy variables representing Navy ratings and decision year were also included.

TABLE A-2

ESTIMATES OF REENLISTMENT EQUATIONS
(MGI-IIIU)

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-6.53	--	--	--	--	--
HSG	-1.08	(2.4)	[-.112]	-1.03	(2.3)	[-.108]
GED	-1.85	(2.1)	[-.193]	-1.79	(2.1)	[-.188]
AGE	.109	(1.5)	[.011]	.10	(1.3)	[.010]
NW	.95	(1.7)	[.099]	.97	(1.7)	[.102]
AFQT	.002	(0.0)	[.0000]	.002	(0.1)	[.0002]
PG5	.66	(2.6)	[.069]	.66	(2.7)	[.070]
PG6	1.49	(2.4)	[.156]	1.36	(2.3)	[.143]
MULT	.29	(1.9)	[.031]	.26	(1.9)	[.027]
UER	--	--	--	.56	(3.5)	[.059]
MIL2CIV	--	--	--	30.23	(2.6)	[3.178]
EXTEND	1.22	(3.3)	[.127]	1.16	(3.2)	[.122]
N	652	--	--	652	--	--
$(P\|\bar{x})$	-	(.118)	--	--	(.119)	--
x^2	61.7	--	--	56.2	--	--

[a]Dummy variables representing Navy ratings and decision year were also included.

TABLE A-3

ESTIMATES OF REENLISTMENT EQUATIONS
(MGI-II)

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-10.99	--	--	-26.98	--	--
HSG	-.27	(0.4)	[-.028]	-.22	(0.3)	[-.023]
GED	-1.02	(0.8)	[-.104]	-1.07	(0.8)	[-.113]
AGE	.03	(0.3)	[.003]	.01	(0.1)	[.001]
NW	1.25	(1.7)	[.127]	1.22	(1.7)	[.129]
AFQT	.05	(1.6)	[.005]	.05	(1.5)	[.005]
PG5	.27	(0.9)	[.027]	.32	(1.1)	[.034]
PG6	.99	(1.4)	[.101]	.93	(1.4)	[.099]
MULT	.50	(2.4)	[.051]	.33	(2.1)	[.035]
UER	--	--	--	.54	(2.8)	[.057]
RMC	--	--	--	28.67	(2.2)	[3.03]
EXTEND	1.29	(2.8)	[.132]	1.24	(2.8)	[.131]
N	442	--	--	442	--	--
$(P\|\bar{x})$	.115	--	--	.120	--	--
x^2	42.3	--	--	34.7	--	--

[a]Dummy variables representing Navy ratings and decision year were also included.

TABLE A-4

ESTIMATES OF REENLISTMENT EQUATIONS
(MGIIIU, MGIIIL)

Variable[a]	Coeff	(t)	[Partial]	Coeff	(t)	[Partial]
Constant	-5.24	--	--	-18.75	--	--
HSG	-.73	(1.7)	[-.071]	-.64	(1.6)	[-.065]
GED	-.39	(0.6)	[-.038]	-.48	(0.7)	[-.049]
AGE	.15	(1.8)	[.014]	.14	(1.8)	[.015]
NW	2.18	(4.4)	[.214]	2.18	(4.6)	[.221]
AFQT	.011	(0.7)	[.001]	.007	(0.5)	[.001]
PG5	1.27	(4.6)	[.125]	1.18	(4.4)	[.119]
PG6	1.12	(0.9)	[.110]	1.12	(0.9)	[.114]
MULT	-.04	(0.2)	[-.004]	.10	(0.5)	[.010]
UER	--	--	--	.31	(1.5)	[.031]
MIL2CIV	--	--	--	20.58	(1.0)	[2.084]
EXTEND	.66	(1.6)	[.065]	.60	(1.5)	[.061]
N	565	--	--	565	--	--
$(P\|\bar{x})$	.110	--	--	.114	--	--
x^2	78.7	--	--	68.3	--	--

[a]Dummy variables representing Navy ratings and decision year were also included.