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How Does Sea Duty Affect First-Term Reenlistment?: An Analysis Using Post-9/11 Data

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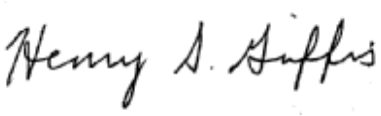

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Contents

Executive summary

Background

The Navy has recently implemented policies that may influence the relationship between sea duty and reenlistment. These policies include changing the sea pay table, transitioning toward a more sea-centric force, and modifying the Navy policy on the sea/shore rotation cycle (which was last modified in 2001). Concurrent with some of these changes, the reenlistment rates of Sailors rotating to shore and Sailors rotating to sea have converged. The Navy is interested in understanding what caused this convergence, and, to that end, Navy Military Personnel Plans and Policy Division (N13) asked the Center for Naval Analyses (CNA) to investigate how sea duty and deployments affect Sailor retention using data that span periods both before and after 2001.

Approach

Our approach to this tasking was to look at the effect of the following independent variables on first-term reenlistment:

1. Rotating to sea/shore
2. Expected time spent in second term on sea duty
3. Ship activities measured by months for those with any first-term sea duty experience
4. Number of deployment spells for those with any first-term sea duty experience.

We estimated the relationship between these variables and first-term reenlistment separately for Sailors according to their initial years of obligation (4, 5, or 6 years).

We present both unadjusted reenlistment rates and predicted reenlistment rates, which take into account the effect of monetary incentives, rating community, grade, years of service at decision, and Sailors' demographic characteristics on reenlistment. Our dataset includes observations on FY 1995 to FY 2004 first-term reenlistment decisions.

Findings

After adjusting for other factors, we find that expectations about the second term matter to Sailors who are making reenlistment decisions. Sailors are more likely to reenlist if they are rotating to shore than if they are rotating to sea. Although expectations about rotating to sea have a relatively large effect on reenlistment, marginal increases in the amount of time they expect to spend on sea duty in the second term do not have a large effect on reenlistment.

When we examine unadjusted reenlistment rates, we find that Sailors with initial obligations of 6 years who expect to rotate to sea at the beginning of their second term are more likely to reenlist than those rotating to shore. When we control for other factors, however, this relationship reverses. The difference between the unadjusted and adjusted reenlistment rates is mainly due to years of service at the decision point: Sailors who make a decision with relatively fewer years of service are more likely to reenlist and more likely to be classified as rotating to sea.

In addition, we examine the difference between the predicted reenlistment rate for Sailors rotating to shore and Sailors rotating to sea by fiscal year. For 4-year-obligation (4YO) and 5-year-obligation (5YO) Sailors those trends have converged since FY99. From FY99 to FY03, the predicted reenlistment rate for 6-year-obligation (6YO) Sailors rotating to sea was higher than for 6 YO Sailors rotating to shore. These shifts were not caused by changes in any of the factors we're able to control for in our model, such as demographic variables or monetary incentives.

Activities while on sea duty affect retention, especially since FY01. Both before and after FY01, increasing the number of deployment

spells decreases reenlistment for 4YO and 6YO Sailors, and the magnitude of these effects was larger since FY01.

Implications

We find that marginal changes will not have negative retention effects, but more significant changes may. Increases in sea duty could increase the number of deployment spells experienced during the first term, which we find has a negative effect on reenlistment rates. Further, despite the recent increase in to-sea retention rates, our to-shore retention estimates are still significantly higher than our to-sea estimates, particularly among 4YOs and 5YOs. Increases in sea duty lengths during the first term could significantly change the share of Sailors expecting to be on sea duty at the beginning of the second term, which we find has a negative effect on retention. Our estimates on rotating to sea or to shore are also relevant if shore duty attributes change. Our estimates suggest that Sailors prefer to be on shore duty at the start of the second term or at least to have a break from sea duty. This relationship may no longer hold with a change in shore duty attributes—for example, if shore billets become part of on-call or on-deck billets to supplement ship crewing.

Our findings indicate that Navy policies that either drastically increase sea duty (potentially under the 2006 sea/shore rotation policy) or significantly change the attributes of sea or shore duty (potentially from the alternative sea manning concepts) may negatively affect retention. However, the Navy could use compensation to address any negative retention effect. For example, two existing compensation tools—SRBs and AIP authority —could be used to target compensation toward specific skill sets and length of sea tours. These tools could be targeted to increase voluntary sea manning and sea assignment flexibility. Along with incentivizing Sailors to voluntarily provide more time at sea, by compensating for sea duty and increasing volunteerism, these tools are likely to increase retention. Further, SRBs are targeted specifically at the reenlistment decision point. Consequently, we recommend monitoring retention trends with any alternative sea manning concept pilot program or any major change in sea or shore duty attributes *and* using targeted compensation tools to address any negative retention effects.

Introduction

Throughout the 1990s, Sailors going to shore duty had higher first-term reenlistment rates than Sailors going to sea duty. One common anecdotal explanation for this relationship was that Sailors rotating to shore duty were more likely to reenlist because they expected shore duty to be less arduous than sea duty. In recent years, this gap has narrowed; over the past 3 years, personnel rotating to sea duty have had similar or higher reenlistment rates. It is unclear what caused this shift. The shift occurred around September 11, 2001, which began a period of increased deployment time and patriotism coupled with poorer civilian job opportunities. Concurrently, the Navy changed the sea pay table in order to increase retention. All of these changes could account for higher reenlistment rates among Sailors rotating to sea. In addition, during the same period, the Navy began to transition toward a more lean and technically able force in which Sailors spend more time at sea.

The Navy continues to propose and pilot policies that may influence preferences for sea duty and reenlistment. The Navy's current alternative sea manning concepts are being implemented to streamline Navy manning and increase readiness requirements. These programs increase surge capability by increasing the pool of ready personnel. This increases readiness through a more sea-intense, or at least sea-ready, Navy career. The effect is not limited to sea duty; shore billets may act as reserve billets to fill in manning gaps or to support missions [1, 2]. The Navy is also modifying the existing Navy policy on the sea/shore rotation cycle (which was last modified in 2001) to better meet the manning needs of the Navy.

For these reasons, N13 asked the Center for Naval Analyses to investigate how sea duty and deployments affect Sailor retention using data that span years both before and after 2001. This paper documents CNA's most recent analysis on the effect of sea duty on Sailors' retention decisions. Looking at Sailor's reenlistment decisions from 1995

through 2004, we address the main question of "What is the effect of sea duty on first-term reenlistment?" In addition to using more recent data than past analysis, in our models we control for both time spent during the first-term on ship activities and differences in expected military versus civilian compensation.

The paper is organized as follows. We first present a short background on sea duty and briefly discuss aspects of recent changes to policies concerning sea duty. We then summarize past research on the effect of sea duty and ship activities on reenlistment. After discussing the data used in our analysis, we present unadjusted sea duty and ship activity trends. Following a brief outline of our empirical methodology, we present our results. The results section focuses on our analysis of the effect of expected sea duty and ship activities on first-term reenlistment decisions. Since we find that significant changes in sea duty may negatively affect retention, we discuss different compensation tools that may be used to increase reenlistment.

Background

The Navy has long believed that Sailors view time on sea duty as more arduous than time on shore duty because of the longer work hours and time spent at sea.[1] Due to the arduous nature of sea duty, the Navy compensates Sailors on sea duty with sea pay and has set limits on ship activities.

The Navy compensates Sailors for the rigors of sea duty with higher pay while on sea duty,[2] taking into account cumulative time on sea duty as well as consecutive months on sea duty to determine sea pay. Career Sea Pay (CSP)[3] compensates Sailors for cumulative time on sea duty, and the Career Sea Pay Premium (CSPP)[4] compensates Sailors for consecutive months on sea duty. For Sailors at or above E-4, there is a large jump in CSP after completing 3 years of cumulative sea duty. In addition to the jump in CSP, these Sailors become eligible for the CSPP at this point. Both CSP and the CSPP are paid to Sailors who are on sea duty, regardless of whether they are deployed, under way, or in training—with the exception of crews of squadrons and most ship-based staffs who only receive sea pay while deployed at sea [3].

In the past, the Navy has tried to limit the arduousness of sea duty by constraining deployments to 6 months, restricting the turnaround ratio, and requiring units to spend at least 50 percent of the time in their homeport over a 5-year span [6].

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1. See [3] for a history of how the Navy viewed sea duty and sea pay. See [4] for a discussion of how many hours are spent working while at sea and how those hours are spent.
2. See [3] for a history of sea pay and pages 33–37 of [5] for a discussion of how sea pay fares as a compensation tool.
3. The CSP ranges from $50 to $620 per month.
4. The CSPP is $100 per month. It is paid to Sailors who have at least 36 months of consecutive sea duty.

Changes in sea-duty-related policies

During the time period examined in this research memorandum, a number of policies may have influenced the retention effect of sea duty. In addition, the Navy is continuing to move toward a sea-centric force and implement policies and practices that may affect the expectations of today's Sailors and the sea duty experiences of Sailors in the future. We discuss some of those policies next.

Sea pay

The 1996 Navy Homebasing Survey indicated that a positive relationship exists between sea pay and a Sailor's willingness to extend sea duty. Based on analysis of the survey, the Navy implemented changes in CSP and the CSPP effective in FY02 [7]. Before this, the most junior Sailors (E-1s through E-3s) did not receive sea pay, and Sailors above grade E-4 did not receive the CSPP after acquiring more than 5 years of cumulative sea duty. Also, the jump in CSP occurred after 5 years of cumulative duty. In FY02, the Navy moved the jump in CSP back to 3 years of cumulative duty in order to increase retention. Furthermore, the Navy changed the CSPP by allowing more senior Sailors to remain eligible for it. Finally, the Navy achieved greater flexibility with the FY01 National Defense Authorization Act because it allowed the Secretary of the Navy to set the individual CSP rates up to a maximum award of $750 per month [7].

More sea-centric force

Current alternative sea manning concepts are being implemented to streamline Navy manning and increase readiness requirements. These programs increase surge capability by increasing the pool of ready personnel. This increases readiness through a more sea-intense, or at least sea-ready, Navy career. This is not limited to sea duty; shore billets may act as reserve billets to fill in manning gaps or to support missions [2]. For example, the Force Readiness Plan, introduced in 2003, included units maintaining higher levels of readiness during specific periods of the deployment so that they were ready to surge forward. In [1], the authors outline some of the rotational and optimal manning initiatives and experiments that may

have influenced Sailors' sea duty experiences, as well as other developing Navy strategies that may influence expectations over future sea duty.

Further, in 2006, the Navy modified the 2001 Navy policy on the sea/shore rotation cycle to better meet the manning needs of the Navy. The new policy changes the amount of time spent on sea duty differently across ratings. Under the new policy, Sailors in some ratings will be spending more time on sea duty than before, while Sailors in other ratings will be spending the same amount of time on sea duty. In a small number of ratings, Sailors will be spending less time on sea duty. The new sea/shore rotation rules won't be effective for Sailors rotating before February 2007, but Sailors can figure out how the new sea/shore rotation cycle is expected to influence their rating's future sea duty levels.

Literature review

Following initial training, the typical Sailor is assigned to sea duty, during which she or he has on average one deployment.[5, 6] The conventional wisdom is that Sailors have a relative preference for shore duty over sea duty, stemming in part from the Navy's commonly held belief that Sailors perceive sea duty as arduous.[7] This is clearly recognized by the Navy, as illustrated in SECNAV Instruction 7220.77D, which states that Career Sea pay is designed to recognize "the greater than normal rigors of sea duty, the arduous duty involved in long deployments, and the repetitive nature of assignment to such duty."

Sea pay has traditionally been a compensation tool for the arduous nature of sea duty and more recently has been used to improve sea/shore balance, reduce turnover, and increase readiness [8]. Research has shown that sea pay does have a positive relationship with completion of prescribed sea tour and extension of sea duty [7, 8]. It has also been found to have a positive and significant effect on reenlistment, so it is one compensation tool that could be used to offset any negative retention effects of sea duty (see [9] for a survey of studies).[8]

Following sea duty, the typical Sailor is assigned to shore duty. While studies have found a positive relationship between first-term sea duty and reenlistment behavior (e.g., see [10]), it has been hypothesized

5. Initial training includes bootcamp and may also include A-school and C-school training.

6. Seabees and aviators follow a different path, more similar to Marines and Air Force, respectively.

7. See [3] for a history of how the Navy viewed sea duty and sea pay. See [4] for a discussion of how many hours are spent working while at sea and how those hours are spent.

8. Sea pay is not the only compensation tool, however. See [5] for a discussion of how different compensation tools influence retention.

that this is reflecting a Sailor's expected rotation to shore duty more than a preference for sea over shore duty. A Sailor who experiences relatively less sea duty in the first term than similar Sailors may expect to experience relatively more sea duty in the second term.

Several researchers have found that expectations about future sea duty are an influencing factor on reenlistment decisions. Shiells and McMahon [11] looked at 1983–1991 first-term reenlistment decisions and found that expected sea duty had a small but negative effect on retention. Hansen and Wenger [12], using FY87–FY99 data, found that expectations about future sea duty are an influencing factor on first-term reenlistment decisions. However, neither [11] nor [12] accounts for specific sea duty experiences during the first term.

We include first-term sea duty experiences in our analysis because Sailors' expected preference for future sea duty may be shaped by their first-term shipboard activities. Hosek and Totten [13, 14] present a theoretical learning model on deployments in which past deployments allow servicemembers to learn not only about their preferences for deploying but also about the probability of future deployments. Their model can be generalized to apply to any of the activities undertaken while on sea duty. Before a Sailor experiences any of these activities, she or he has expectations about how the attributes of these activities will affect her or him. An experience with these activities allows the Sailor to update those expectations, either positively or negatively. Experiencing these activities may also give Sailors information on the mix of these activities that they can expect in future sea duty if they reenlist.

Researchers have found that number and/or length of deployments positively affected retention when deployments were of moderate length [6, 13–15], even though very long deployments negatively affected retention [16]. While researchers have found that deployments have both positive and negative effects according to the deployment length, time spent under way but not deployed has consistently been found to decrease retention [6, 16]. It is unfortunate that these studies were conducted on pre-9/11 data, when, as noted in [17], "the pace and nature of deployments were different than they are today."

Data

For our analysis, we wanted a data set with information before and after September 2001 on Sailor's first-term reenlistment decisions, demographic characteristics, first-term military career, financial considerations, first-term sea duty experiences, expected sea duty experiences, and first-term ship activities. To meet these requirements, we used a number of military and civilian data sources.

Our primary data source was the Enlisted Master Files, from which we constructed a data set by month of first reenlistment decisions for Zone A Sailors from FY95 through FY04.[9] We categorize a Sailor as reenlisting if he or she extends or reenlists for at least 36 months. We restricted our sample to Sailors who completed at least 2 years of service and were rated at the decision point.[10] In line with recent research, we include those who reach their initial obligation but are ineligible to reenlist [6, 12]. We exclude Sailors in Nuclear or Submarine ratings, as well as Training and Administration of Reserves, Temporary Active Duty Sailors, and Sailors with prior service. We also exclude Sailors younger than 18 and older than 40. For descriptions of the variables in our data set, see appendix A.

9. We eliminated observations of Sailors who accessed before FY89 and Sailors with unknown education codes. We exclude observations with time in current paygrade longer than initial months of obligated service and longer than length of service at decision date.

10. We restrict our focus to Zone A Sailors and then focus on separations that occur at the first reenlistment point. We include Sailors with at least 2 years of service. Examining Sailors with 4-year initial obligations we got quantitatively the same results when looking at 4YOs with 2 or 4 years of service at the first reenlistment decision point.

Measuring sea duty

From the Enlisted Master Files, we developed two measures of sea duty. The first measure of expected sea duty is a dummy variable indicating whether the Sailor will go to sea or shore duty 12 months from the reenlistment decision point. This variable is estimated from a Sailor's decision date and point in a sea tour. Based on the prescribed sea and shore tour lengths, we estimate whether a Sailor will be rotating within the next 12 months. If a Sailor is determined to not be rotating in the next 12 months, we classify that Sailor as staying in his or her existing tour. The second variable estimated is expected time spent on sea duty during the second term. These variables are based on sea duty experienced by similar Sailors in Zone B, where similar Sailors are defined as those of the same rating and paygrade at the first reenlistment decision point who expect to go to the same type of duty (either sea or shore.)[11]

Measuring ship activities

Our primary data source for any shipboard activity is the Ship Employment History. It is based on Unit Identification Codes (UICs) and includes the amount of time a ship was deployed, under way, in overhaul, or in a training mission. By UIC, we matched the Ship Employment History with the Enlisted Master Files. We measure ship activities, such as deployment, at the unit level. Hosek and Totten [13, 14] found that individual-level measures of deployment in the Navy are very similar to unit-level measures of deployment. We created deployment variables that captured the number of deployment spells and overall time spent on deployments (months deployed). In addition to deployments, we constructed variables of time spent in overhaul, under way but not deployed, and in training. In this context, training is a ship-specific—not a Sailor-specific—activity.

11. In addition, we created the following first-term sea duty measures: (1) whether a Sailor did or didn't have sea duty during the first term and (2) time spent on sea duty. For time spent on sea duty during the first term, we examine the proportion of non-training-related time in the fleet on sea duty. The results when looking at first-term sea duty, as opposed to expected sea duty, are in appendix F.

Measuring financial considerations

To capture the influence of monetary incentives on reenlistment, we merged in Bureau of Labor Statistics state unemployment rates by Sailor's home state and developed an annualized cost of leaving (ACOL) variable. ACOL captures the differences between expected financial compensation in the military and the civilian labor market.[12] To create the ACOL variable, we needed information on expected military and civilian earnings. We constructed expected military compensation using the military pay tables and data from the Enlisted Master Files. Expected civilian compensation was constructed using the Panel Study of Income Dynamics (PSID). For the most part, we follow how Hansen and Wenger constructed their ACOL framework, as described in [12, 19].[13] We diverge from the approach in [12, 19] in two important ways. First, we include sea pay (both CSP and CSPP) in our measure of military pay. Second, we include women in our analysis.

We used the PSID, as opposed to the March Current Population Survey (CPS), to obtain measures of civilian wages and the relationship to race, education level, and years of work experience. The PSID asks participants about their level of work experience, whereas the more commonly used CPS does not. The CPS includes age and education level, which can be used to proxy for years of work experience. However, if we suspect that members of our sample may temporarily leave the labor market, perhaps to care for a child, the level of work experience is a more precise measure of labor supply than proxying for it using age and education level. A drawback to using the PSID is that it has a smaller sample size than the March CPS. For instance, the 2001 March CPS interviewed 64,944 households, while the 2001 PSID interviewed 7,406 households.

12. Reference [18] provides a thorough discussion of the ACOL measure.

13. Studies on the discount rate of enlisted personnel summarized in [18] range from 4 to 17 percent. However, the authors of the more recent study [20] estimated discount rates ranging from 26 to 37 percent. We used a 20-percent discount rate as did the authors of [12] in their baseline reenlistment model.

Populations

We created three separate data sets for the following populations: Sailors with 4-year, 5 -year, and 6-year initial obligations (see table 1).

Table 1. Sample sizes

Sample description	4YOs with 2 years' service	5YOs with 2 years' service	6YOs with 2 years' service
Full sample	154,091	34,000	32,892
No. of Sailors with some sea duty experience	137,499	27,184	29,825
No. of Sailors with some shipboard experience	93,979	10,543	23,089

For our data sets, table 2 shows the different experiences of Sailors with any sea duty experience and the subset of those with ship experience. Further descriptive statistics for each of our populations are in tables 9 through 11 of appendix C.

Table 2. Sea duty and deployment statistics[a]

Variable	Any sea duty experience sample[b]			Sea duty experience on a ship sub-sample[c]		
	4YO Sailors	5 YO Sailors	6 YO Sailors	4YO Sailors	5 YO Sailors	6 YO Sailors
	Proportion or mean	Proportion or mean	Proportion or mean	Proportion or mean	Proportion or mean	Proportion or mean
Reenlistment rate	33.9	46.3	47.3	32.2	47.9	47.1
Sea duty experience						
Months on sea duty	37.2 (10.4)	37.7 (12.8)	38.3 (13.6)	38.8 (9.1)	39.0 (12.3)	39.6 (13.0)
Proportion with ship experience	68.3	38.8	77.4	100	100	100
Ship experience						
Proportion with one deployment	28.2	15.5	32	41.2	39.9	41.3
Proportion with two or more deployments	35.3	20.1	38.9	51.7	51.9	50.3
Average months deployed	7.9 (9.9)	4.4 (8.3)	8.0 (9.1)	11.5 (10.1)	11.3 (10.0)	10.4 (9.0)
Average months under way, not deployed	3.7 (3.7)	2.1 (3.4)	4.8 (4.1)	5.5 (3.2)	5.4 (3.4)	6.2 (3.6)
Average months in training	3.1 (3.1)	1.8 (2.9)	3.8 (3.3)	4.6 (2.7)	4.5 (2.9)	5.0 (2.9)
Average months in overhaul	1.2 (3.9)	0.6 (2.9)	1.3 (4.0)	1.7 (4.6)	1.6 (4.6)	1.7 (4.5)
Number of observations	137,499	27,184	29,825	93,979	10,543	23,089

a. The standard deviation for the variables measuring months on sea duty; average months deployed; average months under way, not deployed; average months in training; and average months in overhaul are in parentheses.
b. Includes Sailors with any sea duty experience prior to their first reenlistment decision.
c. Sailors with any sea duty experience in the first term, who also were attached to a ship.

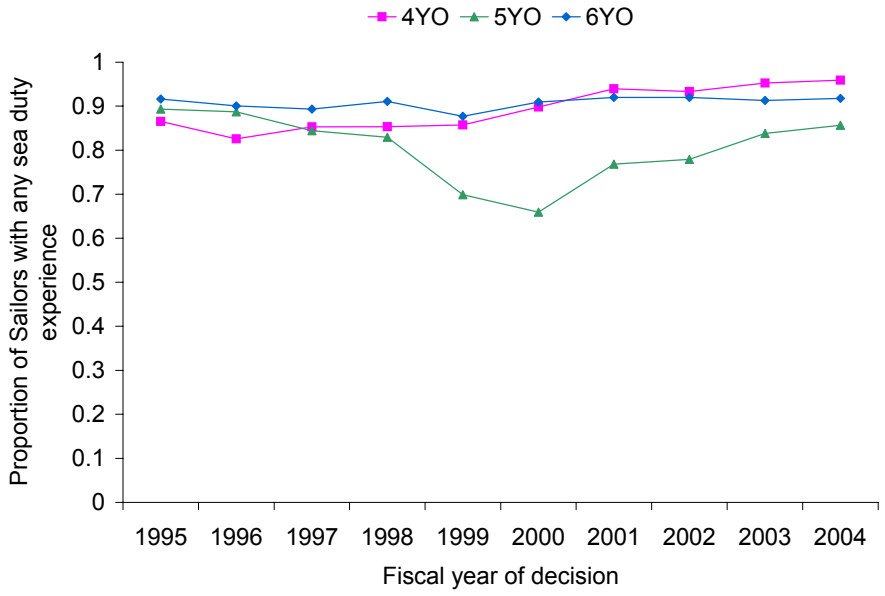
Sea duty trends

In this section, we present an overview of unadjusted sea duty and ship activity experience, and reenlistment trends. In a later section of the paper, we'll present similar reenlistment trends, based on statistical models that adjust for a Sailor's demographic and military characteristics as well as economic factors.

First term sea duty trends

The vast majority of first-term Sailors with at least a 4-year obligation spend some time on sea duty before their first reenlistment decision. The trends between FY95 and FY04 do vary by years of initial obligation (see figure 1).

Figure 1. Proportion of Sailors with any sea duty experience as of first reenlistment decision, by initial years of obligation



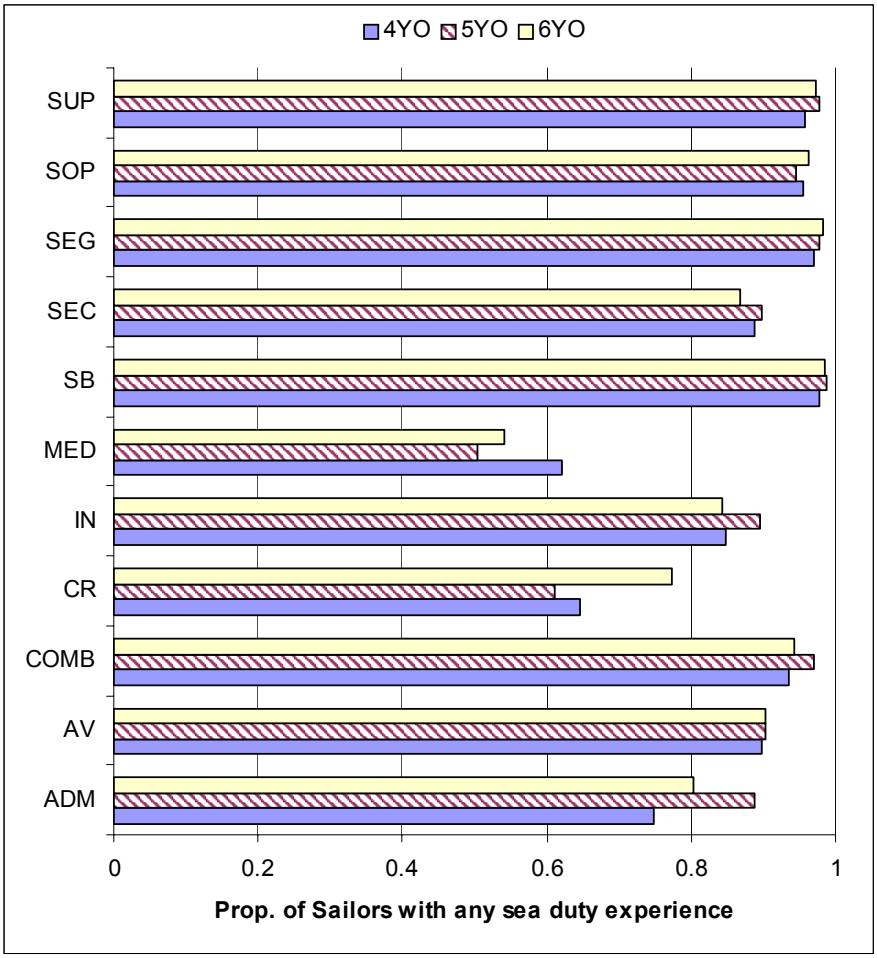
Approximately 90 percent of Sailors with a 6-year initial obligation have experienced sea duty before their first reenlistment decision, and this percentage has not changed drastically over time.[14] There has been a shift toward sea duty experience among Sailors with initial obligations of 4 years since FY96. In FY96, 82.6 percent of 4YO Sailors experienced some sea duty before their reenlistment decision. By FY04, this had reached 95.9 percent. The percentage of 5YO Sailors who experience sea duty before their first-term reenlistment decision trended downward from FY95 until FY00, when it began to trend upward. One possible explanation for this difference is that the distribution of ratings differs among Sailors with different initial obligations. Sailors with 5-year obligations are disproportionately found in the Medical Care rating community (see table 3), and the proportion of Sailors experiencing some sea duty before their first-term reenlistment decision in this rating community increased from 39.7 percent in 2000 to 63.3 percent in 2004. See figure 2 for sea duty experiences broken down by rating community.

Table 3. Distribution of Sailors among ratings, by initial obligation length

Rating community	4 YOs	5 YOs	6 YOs
Admin. Service Support (ADM)	6.3%	4.7%	1.3%
Aviation Maintenance and Ground Support (AV)	32.3%	24.1%	7.0%
Surface Combat Systems (COMB)	5.5%	2.6%	47.7%
Cryptology (CR)	4.3%	3.4%	7.2%
Intelligence (IN)	1.1%	0.3%	0.4%
Medical Care (MED)	5.5%	29.8%	7.0%
Seabee (SB)	0.5%	15.5%	0.8%
Security (SEC)	0.4%	0.2%	0.2%
Surface Engineering (SEG)	17.7%	5.1%	19.1%
Surface Operations (SOP)	17.7%	9.0%	8.4%
Support (SUP)	8.7%	5.3%	1.1%
Total observations	154,264	34,018	32,904

14. From FY95 to FY04, the percentage of first-term 6YOs who reached their first reenlistment decisions with any sea duty varied from a low of 87.7 percent in FY99 to a high of 92 percent in FY02—a 4.3-percent change.

Figure 2. Proportion of Sailors with any sea duty experience as of first reenlistment decision, by initial years of obligation and rating community



First-term sea duty and reenlistment rates

Raw averages suggest that the amount of time spent on sea duty influences reenlistment for at least some Sailors. Sailors with 6-year initial obligations have spent fewer months, on average, on sea duty since 1999 while also reenlisting at higher rates. In 1999, Sailors with 6-year initial obligations making first-term reenlistment decisions had spent 36 months on sea duty and reenlisted at a rate of 47 percent; by 2003,

the average time spent on sea duty had dropped to 30 months while reenlistment had increased to 66 percent (see figures 3 and 4). However, the amount of time available to be on sea duty likely was influenced by the increase in reenlistment rates—many 6YOs allowed to reenlist 2 or more years before reaching the 6-year point. In 1999, the average LOS at the first-term reenlistment point was 4.9 years, which decreased to 4.3 years in 2003. In contrast, 4- and 5-year obligors with sea duty experience have had higher reenlistment rates, yet average number of months experienced on sea duty has remained relatively constant.

Figure 3. Reenlistment rate among Sailors with any sea duty experience during the first term, by fiscal year of reenlistment decision and initial obligation length

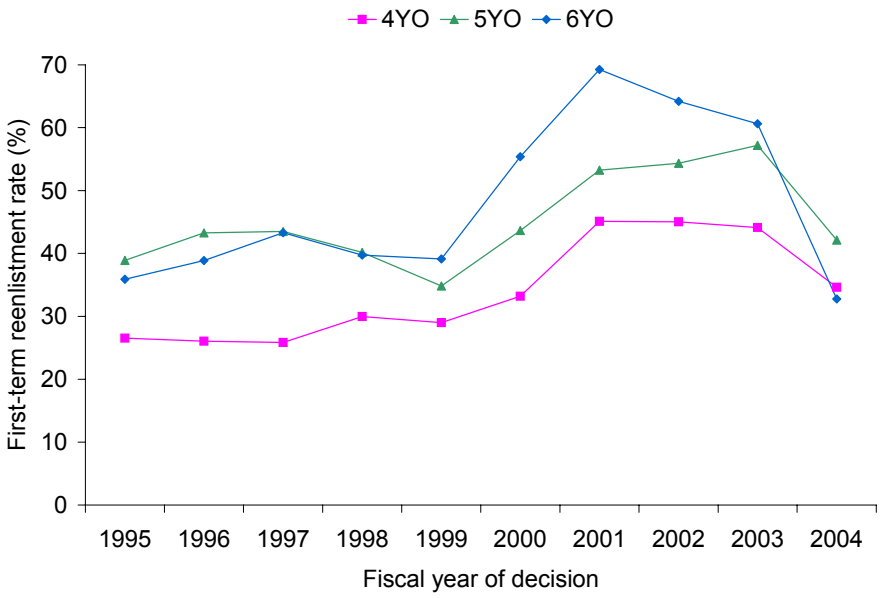
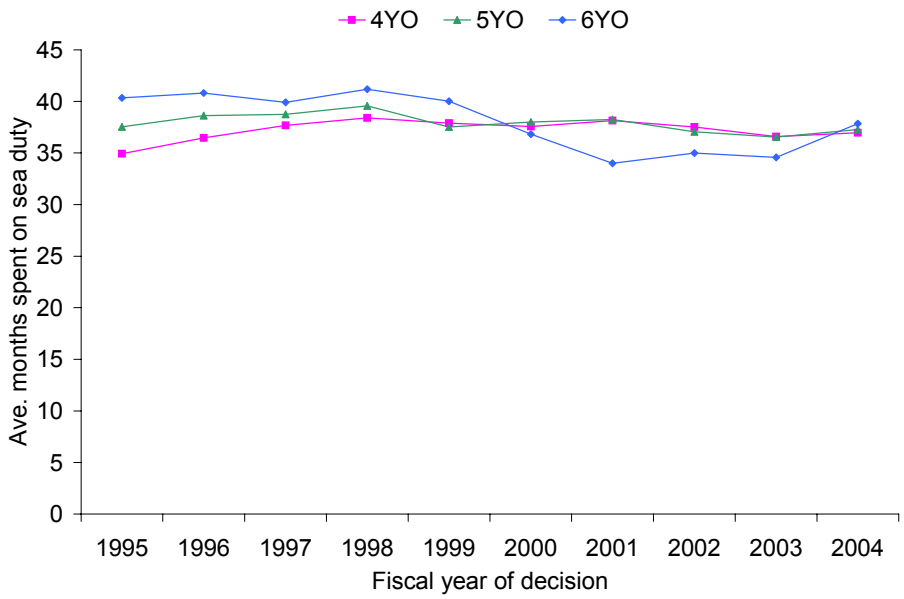


Figure 4. Average number of months spent on sea duty for Sailors with sea duty experience, by fiscal year of reenlistment decision and initial obligation length

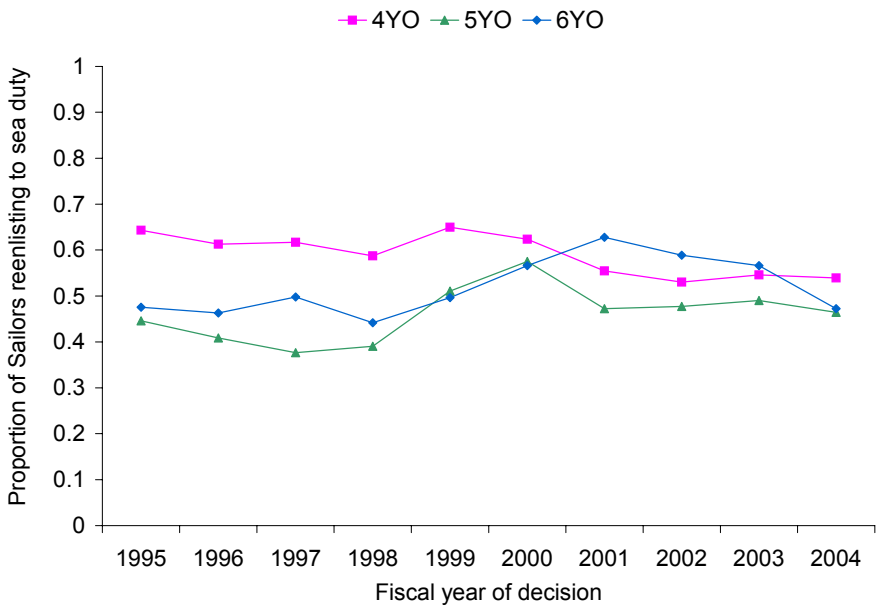


Expected sea duty and reenlistment trends

We measure expected sea duty with a variable indicating whether Sailors are expected to be on sea or shore duty 12 months after their reenlistment decision. Sailors who are expected to be on sea duty 12 months after their reenlistment decision are referred to as "rotating to sea." The term "rotating to sea" encompasses those expected to remain on sea duty and those expected to rotate from shore duty to sea duty. This variable is estimated from a Sailor's decision date and point in a sea tour and is similar to that used by [12].

About 60 percent of 4YO Sailors, 48 percent of 5YO Sailors, and 52 percent of 6YO Sailors are categorized as rotating to sea. Between FY99 and FY02, the reenlistment rate for 4YOs rotating to sea steadily decreased. Then in FY03 and FY04, the reenlistment rate started to increase slightly. For 5YOs, there was a trend upward in the reenlistment rate between FY98 and FY00, a large drop between FY00 and FY01, and a slight trend upward between FY01 and FY03. For 6YOs, the reenlistment rate for Sailors rotating to sea trended upward between FY98 and FY01 and downward after that (see figure 5).

Figure 5. Proportion of Sailors reenlisting to sea duty, by fiscal year of reenlistment decision and initial years of obligation



If we aggregate 4-, 5-, and 6-year obligors together, we see that in FY99 and FY00 the reenlistment rates of those rotating to shore versus those rotating to sea were approximately the same (see figure 6). From FY01through FY03, those rotating to sea actually reenlisted at a higher rate than those rotating to shore. But if we separate the data by initial obligation length, we see that the difference between the reenlistment rate of those rotating to shore and those rotating to sea varies by initial years of obligation. The difference is negative for most of the time period for 5- and 6-year obligors, indicating that the reenlistment rate was higher for those reenlisting to sea than for those reenlisting to shore, while it is positive for most of the time period for 4-year obligors (see figure 7).

Figure 6. First-term reenlistment rate of Sailors reenlisting to shore versus to sea

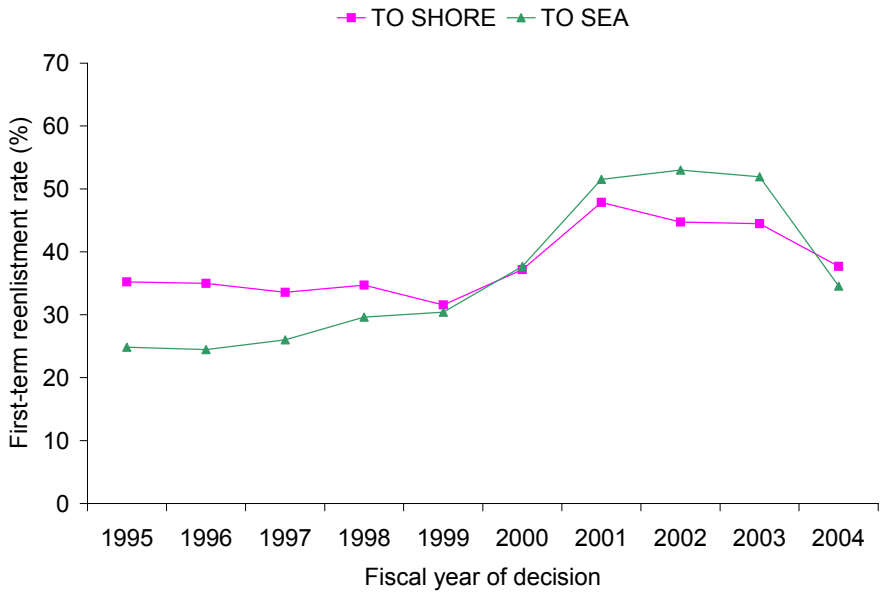
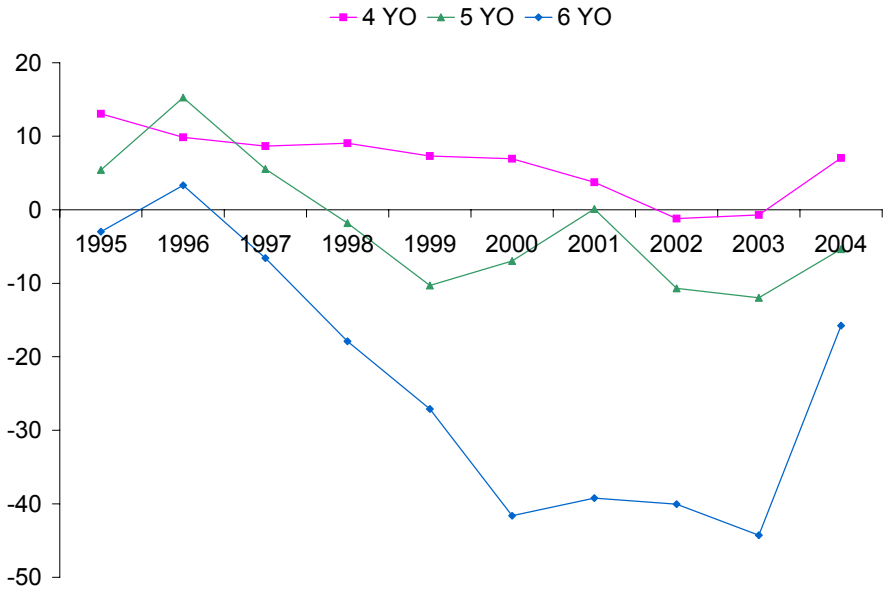


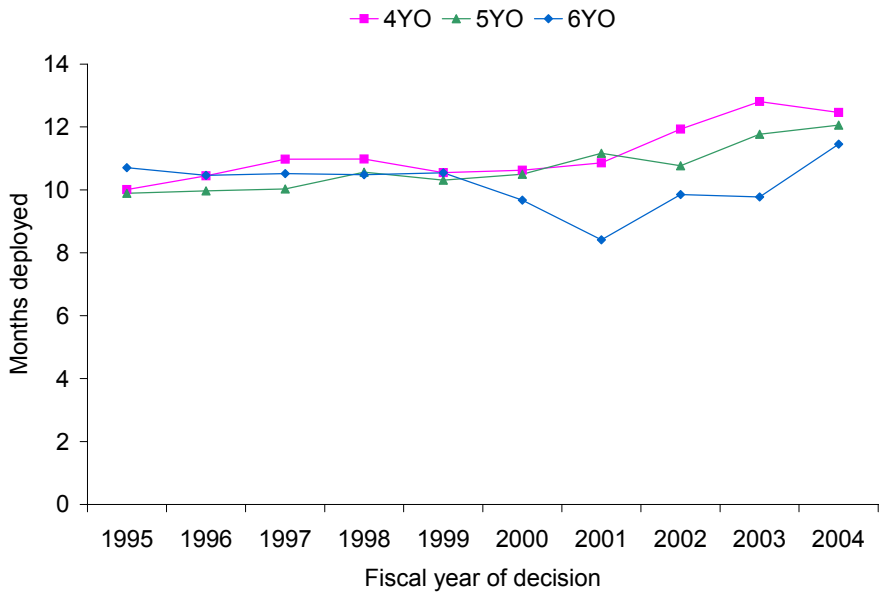
Figure 7. Difference of first-term reenlistment rate of Sailors reenlisting to shore and first-term reenlistment rate of Sailors reenlisting to sea, by initial obligation length



First-term ship activity trends

How time is spent while on sea duty also differs by years of initial obligation. Figure 8 shows the average amount of time spent deployed among Sailors with any ship experience. Before 1999, the trend of total time spent deployed during the first term was similar among 4YOs, 5YOs, and 6YOs. In 2000, the trends by obligation length diverged, with 6YOs experiencing fewer months deployed. Time spent under way has trended downward as of 2001 for 4YOs and 5YOs and upward for 6YOs, while time on ship-specific training has trended downward for 4YOs and upward for 5YO and 6YO Sailors. In the same time period, time spent in overhaul has been trending upward for 4YO and 5YO Sailors and trending downward for 6YOs (see figures 9 through 11).[15]

Figure 8. For Sailors with ship experience: Average months spent deployed, by initial years of obligation and FY of decision



15. Figure 8 shows the estimates for Sailors with any ship experience. For the less general sample of Sailors with any ship experience who are not submarine or nuclear qualified at the fleet, the trends are the same.

Figure 9. For Sailors with ship experience: Average months spent under way, by initial years of obligation and FY of decision

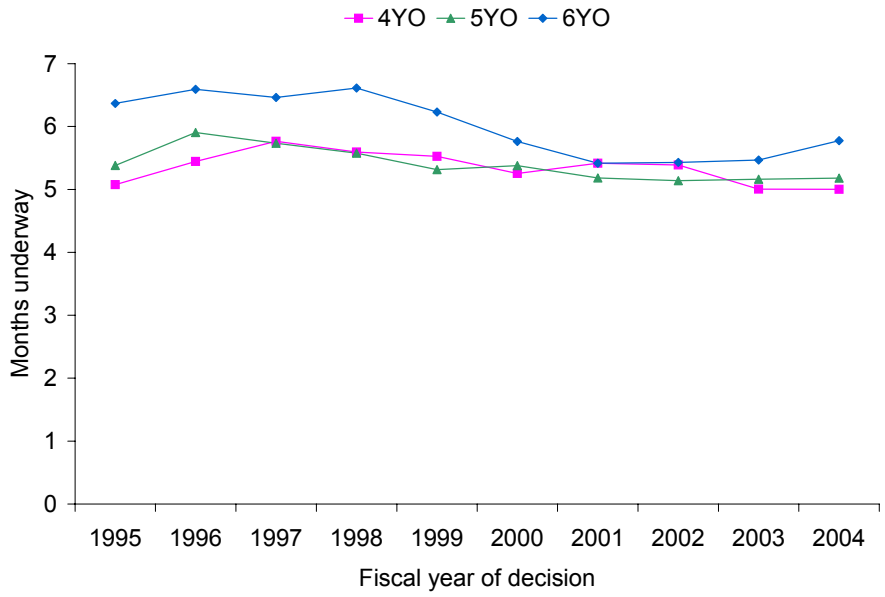


Figure 10. For Sailors with ship experience: Average months spent in ship-specific training, by initial years of obligation and FY of decision

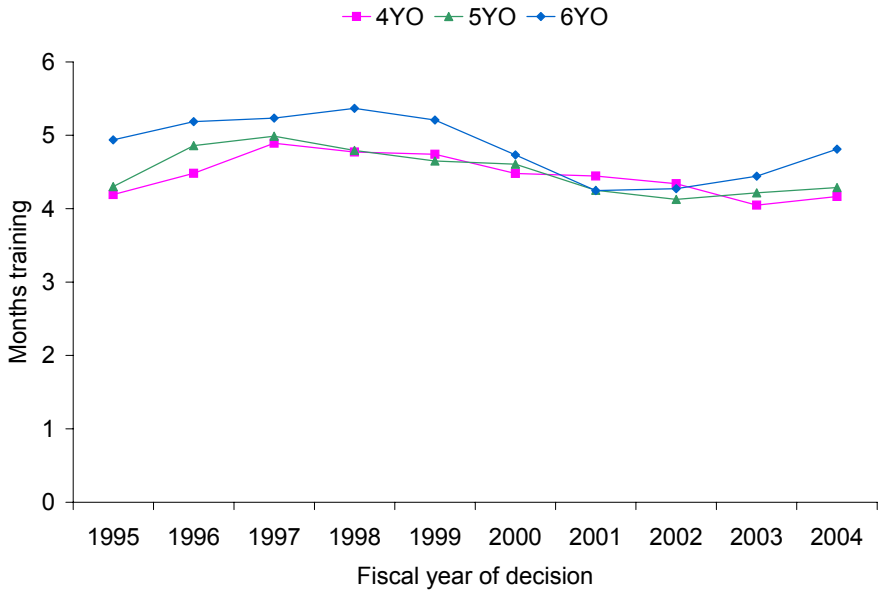
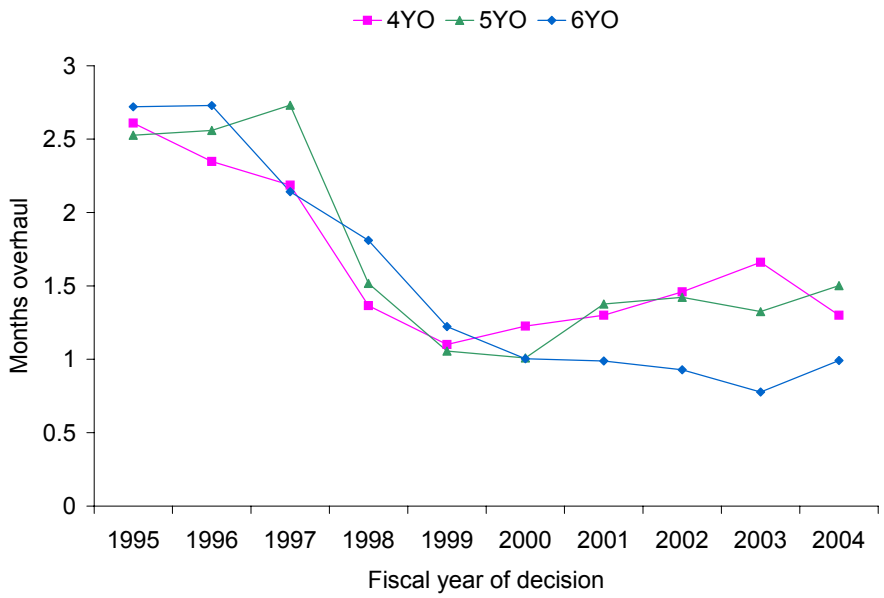


Figure 11. For Sailors with ship experience: Average months spent in overhaul, by initial years of obligation and FY of decision



Model specifications

In our statistical analysis, we look at the effect of sea duty and ship activities, measured in different ways, on reenlistment behavior, controlling for other factors. The dependent variable is whether the Zone A Sailor who reached the first-term reenlistment point reenlisted or extended. Since this is a discrete choice, we use a logistic model to estimate our parameters (see appendix D for details).

In four separate regressions, estimated for each of our three populations (Sailors with 4-, 5-, and 6-year initial obligations), we look at the effect of the following main independent covariates:[16]

1. Rotating to sea/shore
2. Expected time spent in second term on sea duty
3. Ship activities measured by months for those with any first-term sea duty experience
4. Number of deployment spells for those with any first-term sea duty experience.

We first look at two proxies for expected sea duty and determine whether first-term reenlistment is influenced by those expectations.[17] For both (1) the rotating to sea/shore within 12 months of the reenlistment decision and (2) the expected amount of time a Sailor will spend on sea duty models, we control for Sailor's ship activity experiences during the first term by including covariates of months spent deployed, under way and not deployed, or in overhaul.

16. Appendix D lists the other covariates included in each model. In appendix E, we present regression results when looking at the effect of first-term sea duty, as opposed to expected sea duty, on retention.

17. Another way to specify expected sea duty is the sea/shore ratio, which Shiells and McMahon used in [11].

We're also interested in the effect of ship activity experiences on first-term reenlistment. Of those Sailors who had any sea duty experience in the first-term decision, we use our rotating-to-sea model to estimate the effect of ship activities on first-term reenlistment. We looked at two different sets of regressions that account for the total time spent on ship activities as measured in months and the number of deployment spells.

In all of our models, we include the following demographic variables: AFQT, race/ethnicity, educational credentials, gender, age at accession, marital status, and number of dependents. To account for available time to spend on sea duty and on a ship, we control for years of completed service at the reenlistment decision point in our analysis. Our ACOL measure accounts for the effect of expected military versus civilian earnings, where military earnings include expected basic pay, BAH, BAS, SRB, and sea pay. In addition to the ACOL variable, our economic variables include home state unemployment rate. Our military career variables include rating community and rank since there could be differences in unobservable characteristics (such as pay elasticity) between these groups.[18] For instance, Goldberg and Warner [21] find that pay elasticity differs among Sailors according to ratings. We account for any changes in reenlistment rates due to time invariant factors that permanently affect all Sailors' reenlistment decisions equally by including fiscal year decision date fixed effects. For a list of the variables included in each regression model, see appendices D and E.

18. Unfortunately, we're unable to examine all Sailor and time-at-sea characteristics. For example, an unobserved characteristic of Sailors could be an increased number of Sailors with a higher sense of patriotic duty, and an unobserved characteristic of sea duty that influenced Sailors' preference for sea duty could be the perception of deployments as more critical to national defense than in the past.

Effect of sea duty on reenlistment decisions

In this section, we examine how expected sea duty and first-term ship activities influence reenlistment decisions. A Sailor who experiences relatively more sea duty in the first term than similar Sailors may expect to experience relatively less sea duty in the second term. Thus, we expect that estimating the effect of sea duty on retention using first-term sea duty experiences is just proxying for Sailors' expectations over sea duty in the second term. While we find a positive relationship between actual first-term sea duty and retention (see appendix F), we believe that this is reflecting a Sailor's expected rotation to shore duty more than a preference for sea over shore duty.[19] For this reason, we focus on the effect of expected sea duty on reenlistment decisions. In addition to expected sea duty, we control for and examine the effect of first-term sea duty experiences in our analysis because Sailors' preference for future sea duty may be shaped by their first-term shipboard activities.

We present some of our results in terms of predicted reenlistment rates or changes in the predicted reenlistment rate. These predicted reenlistment rates are calculated using coefficient estimates in our logistic regressions.[20] These regressions hold all other factors constant except for the independent variable of interest when estimating the effect of that variable. For our predictions, we change the variable of interest for all Sailors in our sample. For instance, when we are interested in the effect of expected sea duty on reenlistment, we predict the reenlistment rate if all Sailors in our sample expected to

19. When looking at Sailors with 4-year initial obligations who spent over 25 percent of their time on sea duty, we find that the Sailors with the highest reenlistment rates were among the Sailors who spent the maximum amount of time on sea duty.

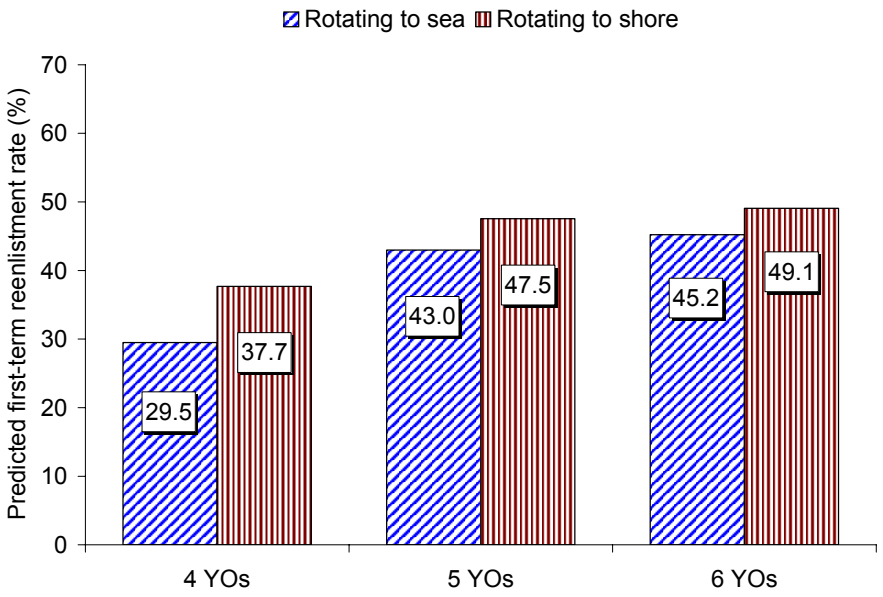
20. See appendix D for a discussion of the logistic regression and a list of the coefficients in our logistic regressions. See appendix E for logistic regression results.

rotate to shore duty and compare it with the reenlistment rate if all Sailors in our sample expected to rotate to sea duty.

Expected second-term sea duty and reenlistment: Rotating to sea versus rotating to shore

Sailors have a preference for being on shore duty after their first reenlistment decision. 4YO Sailors who expect to reenlist to sea duty are predicted to have lower reenlistment rates (by 8.2 percentage points) than those who expect to reenlist to shore duty (see figure 12). The difference between the predicted reenlistment rate between those reenlisting to shore versus those reenlisting to sea is slightly lower for 5YO and 6YO Sailors. The difference is 4.5 percentage points for 5YO Sailors and 3.9 percentage points for 6YO Sailors.

Figure 12. Predicted first-term reenlistment rates by rotating to sea or to shore, by initial obligation length



Our estimates are in line with those of the authors of [11 and 12], who find that sea duty has a negative effect on retention for first-term Sailors. In fact, if we take a weighted average of our results, we find that an expected sea tour decreases reenlistment, relative to an

expected shore tour, by 7 percentage points (or 17 percent), which mirrors the results of Hansen and Wenger [12] who estimate that an expected sea tour decreases reenlistment, relative to an expected shore tour, by 6 percentage points (or 17 percent).

The difference between the to-sea and to-shore logistic regression results for 6YOs are opposite of what we saw with unadjusted sample reenlistment rates. The unadjusted to-sea and to-shore reenlistment rates are 29.5 and 37.7 for 4YOs,[21] 44.8 and 46.0 for 5YOs, and 56.6 and 37.1 for 6YOs for the sample used in our logistic regressions.[22] The difference between the unadjusted and adjusted reenlistment rates is mainly due to years of service at decision. Without holding all else constant, we find that 6YOs rotating to sea are more likely to reenlist. When we account for numbers of years of service at the decision point, we predict that 6YOs who are rotating to sea have lower reenlistment rates than those Sailors rotating to shore. This is because Sailors who make a decision with relatively fewer years of service are more likely to reenlist, and they are more likely to be classified as rotating to sea.

Predicted reenlistment rates by fiscal year of decision

Until 1999, Sailors going to shore duty were more likely to reenlist than Sailors rotating to sea duty at the end of the second term. Since 1999, this gap has narrowed and in some cases personnel rotating to sea duty have had similar or higher reenlistment rates. We saw this to be the case when looking at unadjusted trends (see figure 6), and it is true holding constant all other covariates, such as first-term ship activity experiences, years of service at decision, and military-civilian expected pay streams.[23] Figures 13 through 15 show, for each of our samples, by fiscal year of decision the predicted to-shore and to-sea reenlistment rate.

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21. The unadjusted and adjusted reenlistment rates for 4YOs are only slightly different. The unadjusted (adjusted) to-sea and to-shore reenlistment rates are 29.51 (29.48) and 37.75 (37.68), respectively.

22. See figure 6 for the unadjusted to-sea and to-shore reenlistment rates over time.

23. See appendices D and E for a list of the covariates included in the model.

Figure 13. Predicted first-term reenlistment rates for 4YOs, by rotating to sea or to shore and FY of decision

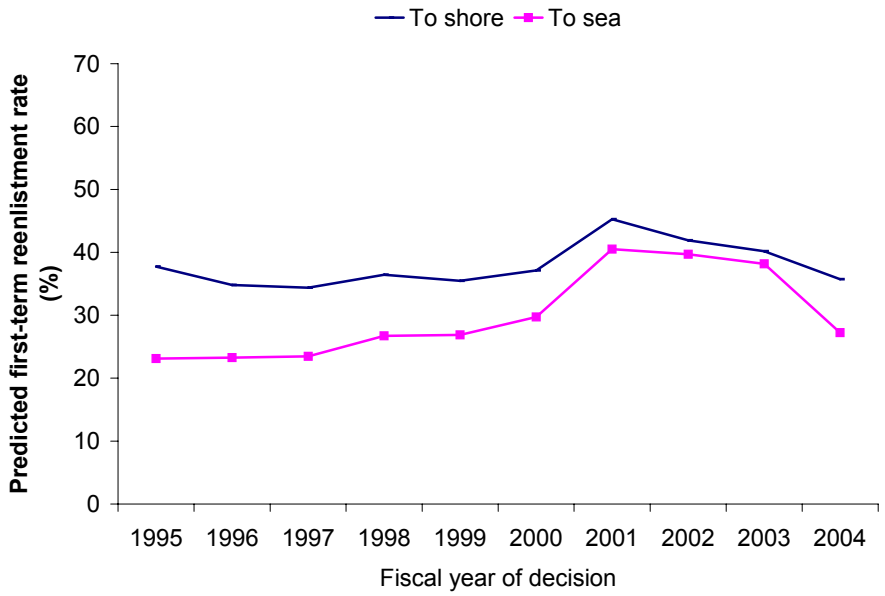


Figure 14. Predicted first-term reenlistment rates for 5YOs, by rotating to sea or to shore and FY of decision

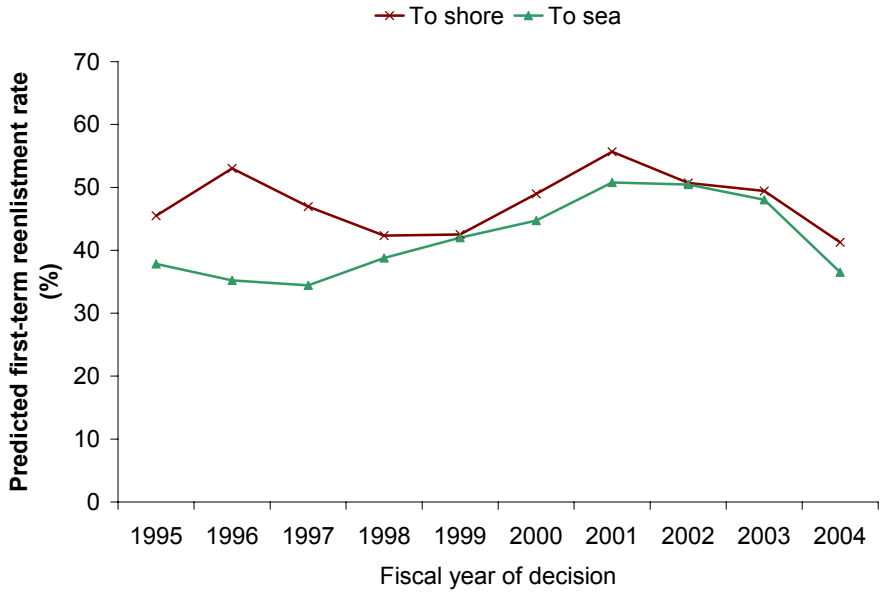
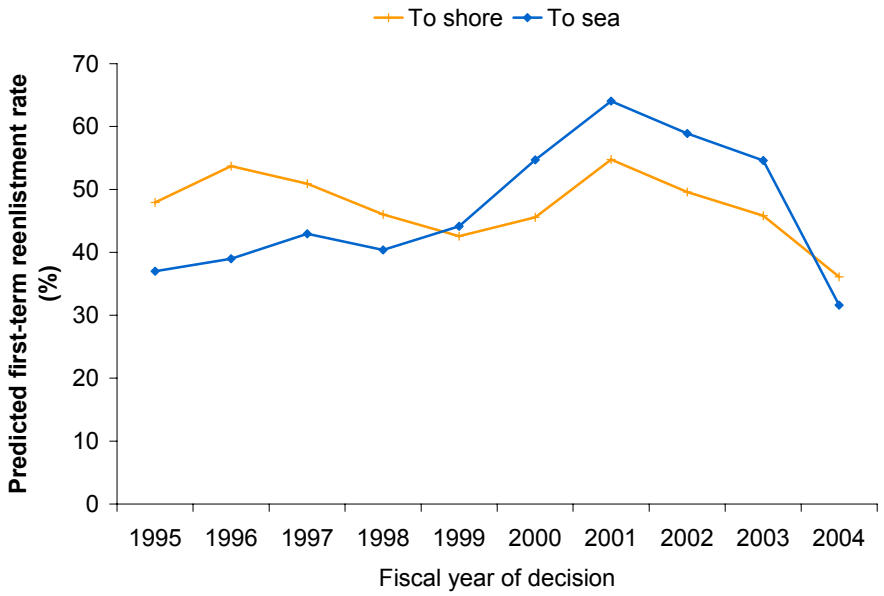


Figure 15. Predicted first-term reenlistment rates for 6YOs, by rotating to sea or to shore and FY of decision



For 4YOs, those Sailors rotating to shore are more likely to reenlist than Sailors rotating to sea; however, that difference has steadily decreased since 1995 and has only increased in 2004 (see figure 13). For Sailors making decisions in 2003, those rotating to shore had reenlistment rates that were 2 percentage points higher than Sailors rotating to sea. In 2004, that difference had increased to 8.5 percentage points.

The reenlistment rate for 5YOs has followed a similar pattern in that the difference between the reenlistment rate of Sailors rotating to sea has increased to be more consistent with the reenlistment rate of Sailors rotating to shore (see figure 14). However, there has been a small increase in the difference for Sailors making decisions in FY04. For Sailors making decisions in 2003, those rotating to shore had reenlistment rates that were 1.4 percentage points higher than Sailors rotating to sea. In 2004, that difference had increased to 4.8 percentage points.

Of our three samples, the greatest change in the difference between reenlistment rates of Sailors rotating to shore versus rotating to sea

has been among 6-year initial obligors (see figure 15). We find that Sailors rotating to sea who made decisions in FY99 through FY03 had higher reenlistment rates than Sailors rotating to shore. For FY00 through FY03, those rotating to sea are estimated as having reenlistment rates that are 9 percentage points higher than Sailors rotating to shore.

The shift in the rotating-to-sea versus rotating-to-shore reenlistment rates shown in figures 13 through 15 was not caused by any of the factors we control for in our models. So we know that the shift was not a factor, for example, of changes in the racial composition of Sailors making reenlistment decisions or differences in the unemployment rate. In addition, the ACOL variable in our model accounts for expected sea pay, so the recent changes in sea pay cannot explain this shift.

However, even though our models account for months spent on ship activities, such as deployments, they do not capture the effects of the types of deployments Sailors experienced following FY99 and, more specifically, following September 2001. For example, the deployments following September 2001 may have been perceived by the Sailors as more mission centric. Further, our models cannot capture any changes over time in Sailors' perceptions of sea duty that may stem, for example, from an increased sense of patriotic duty or changes in Navy policy that influence different Sailors. In recent years, the Navy has been moving toward a more lean and technically able force that includes sea manning concepts intended to streamline manning and increase readiness requirements. Our regressions include fiscal year fixed effects to account for time invariant factors, such as Navy policies, that permanently affect all Sailors' reenlistment decisions. However, the changes in sea manning policies may have had different effects on the sea duty experiences or expectations of different Sailors. For example, Sailors *within* the rating communities controlled for in the model may have been influenced differently by changes in sea manning policies.

Expected second-term sea duty and reenlistment: Length of second-term sea duty

To mimic how a change in sea duty policy changes expectations of time spent on sea duty, we look at the effect of an increase in the expected amount of time spent on sea duty during the second term. Any change in sea duty can potentially affect reenlistment behavior through the direct effect of changing amount of time spent on sea duty and through the secondary effect of a change in expected sea pay. We account for both effects in our model.

25-percent increase in expected time spent on sea duty

Sailors are less likely to reenlist if expected time spent on sea duty during the second term increases. For 4YOs, a 25-percent increase in expected sea duty—which is approximately 5.4 months over a 4-year second term—decreases reenlistment by 2.2 percentage points. For 5YOs (6YOs), a 25-percent increase in expected sea duty—about 4 (5.8) months—decreases reenlistment by 0.99 (1.1) percentage points.

When looking at all Sailors, we find that an increase in expected sea duty decreases reenlistment rates; however, when we look just at those Sailors who expect to rotate to sea, we find that an increase in expected sea duty has no effect or increases reenlistment rates. For 4YOs rotating to sea, a 25-percent increase in expected sea duty during the second term increases reenlistment rates by 1.4 percentage points. For 5YOs and 6YOs rotating to sea, there is no effect of an increase in expected months on sea duty during the second term. (Note: We find that a 10-percent increase in time on sea duty—approximately 2 more months—decreased reenlistment for 4YOs by 0.90 percentage point. The corresponding result for both 5YOs and 6YOs is 0.40 percentage point. When we restrict our sample to only Sailors rotating to sea, we find that expected sea duty increases reenlistment by 0.50 percentage point for 4YOs and that it has no statistically significant effect for 5YOs and 6YOs.)

The fact that our findings change when we look at Sailors expecting to rotate to sea suggests that these results are driven by the to-sea/to-shore effect. For that reason, we control for rotating to sea when estimating the effect of ship activities on retention.

First-term ship activities

To estimate the effect of first-term ship activities on reenlistment, we modify our rotating-to-sea model to include only those 4YOs, 5YOs, and 6YOs with any sea duty experience and look separately at two measures of ship activity. Among these Sailors, we examine how time spent away from home—as measured in months and in number of spells—influenced reenlistment.

The effect of a marginal increase in ship activities[24]

Time spent deployed during the first term

For 4YOs, the number of months spent deployed has a small negative effect on reenlistment.[25] A 1-month increase in months in the first-term spent deployed is estimated to decrease first-term 4YO reenlistment by 0.02 percentage point, or just 0.07 percent.[26]

For 5YOs and 6YOs, the number of months spent deployed does not have a statistically significant effect on reenlistment. Thus, we predict that a marginal increase in the number of months that 5YOs and 6YOs spend deployed in the first term will *not* have a negative effect on reenlistment behavior.

Time spent on other ship activities

The number of months spent in overhaul and in ship-specific training is statistically significant for 4YOs. Increasing the number of months by 1 month decreases reenlistment by 0.10 percentage point for 4YOs. Increasing the number of months spent in ship-specific training by 1 month decreases reenlistment by 0.95 percentage point for

24. As a reference to our regression results, table 2 presents summary statistics for shipboard experiences. The table includes the average number of months spent on each activity for those Sailors with some sea duty experience in the first term.

25. The estimates are statistically significant at the 6-percent level.

26. A 1-standard-deviation increase in months spent deployed—that is, 9.99 months—during the first term will decrease first-term reenlistment for 4YOs by 0.23 percentage point, or 0.7 percent.

4YOs. See the first part of table 4 for the effect of marginal changes in these ship activities, as measured by increases of 1 month and 1 standard deviation, on predicted reenlistment rates for 4YOs.

For 5YOs, increasing the other first-term ship activities by 1 month does *not* have a statistically significant effect on reenlistment. Thus, for 5YOs a marginal increase in time spent under way, not deployed, in overhaul, or in ship-specific training is predicted to have no effect on reenlistment rates.

The number of months spent under way, not deployed is statistically significant only for 6YOs; however, the effect is small. Increasing the number of months spent under way, not deployed by 1 month decreases reenlistment by 0.38 percentage point, or 0.8 percent. As with 4YOs, time spent on ship-specific training has a statistically significant effect for 6YOs. One additional month of ship-specific training is estimated to decrease reenlistment rates by 0.71 percentage point, or 1.52 percent. See the second part of table 4 for the effect of marginal changes in these ship activities, as measured by 1-month and 1-standard-deviation increases, on predicted reenlistment rates for 6YOs.

Table 4. Predicted reenlistment effect of a marginal increase in non-deployment ship activities for Sailors with 4-year and 6-year initial obligations

Ship activity	Effect of a 1-month increase		Effect of a 1-standard-deviation increase	
	Percentage-point change	Percentage change	Percentage-point change	Percentage change
Sailors with 4-year initial obligations[a]				
Overhaul[b]	-0.10	-0.30	-0.39	-1.16
Training[c]	-0.95	-2.85	-2.92	-8.72
Sailors with 6-year initial obligations[d]				
Under way, not deployed[e]	-0.38	-0.80	-1.53	-3.25
Training[f]	-0.71	-1.52	-2.32	-4.95

a. Only estimates that were statistically significant at the 1-percent level were included in this table. The effect of months spent under way, not deployed did not have a statistically significant effect on reenlistment.
b. One standard deviation in months spent in overhaul is 3.9 months.
c. One standard deviation in months spent in training is 3.1 months.
d. Only estimates that were statistically significant at the 1-percent level were included in this table. The effect of months spent in overhaul did not have a statistically significant effect on reenlistment.
e. One standard deviation in months spent in under way, not deployed is 4.06 months.
f. One standard deviation in months spent in training is 3.27 months.

The effect of the number of deployment spells on reenlistment

The deployment experience during the first term can change through an increase in time spent on deployments, examined in the last section, and/or through an increase in the number of deployment spells. We find that, for the most part, Sailors prefer fewer deployment spells during the first term.

Looking at those Sailors with some sea duty experience, table 5 lists the share of Sailors with different numbers of deployment spells during the first term by initial obligation. The majority of 5YOs have not completed any deployment spells in the first term, compared with 37 percent of 4YOs and 29 percent of 6YOs.

Table 5. Percentage of Sailors with some sea duty experience with each level of deployment in the first term

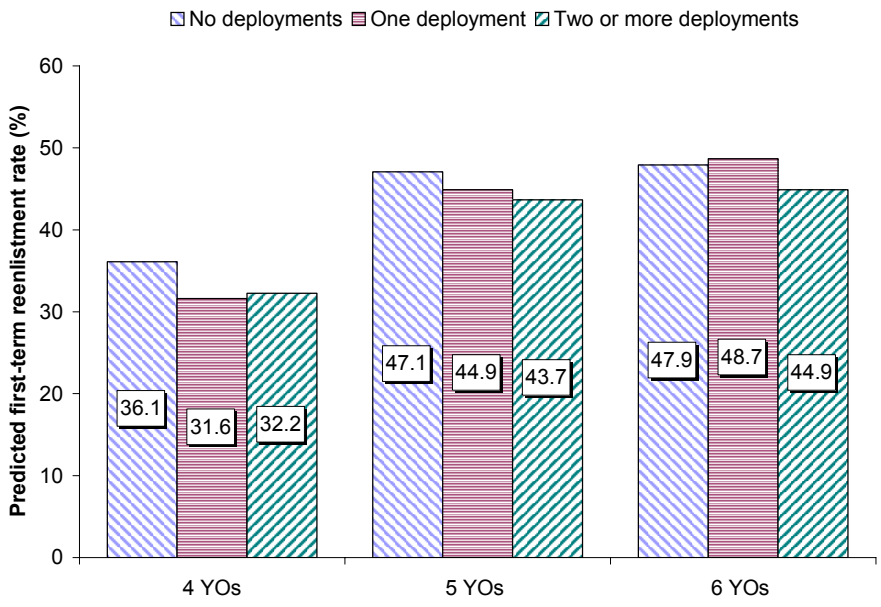
	4YOs with >= 2 years of service	5YOs with >= 2 years of service	6YOs with >= 2 years of service
No deployments	36.51%	64.42%	29.12%
One deployment	28.18%	15.46%	31.96%
Two plus deployments	35.31%	20.12%	38.92%
No. of observations in sample	137,499	27,184	29,825

In our deployment spell logistic regression, the dummy variables indicating one deployment spell and two plus deployment spells are both negative and statistically significant at the 1-percent level for the 4YO and 5YO samples. Only the dummy variable indicating two plus deployment spells is statistically significant at the 1-percent level for the 6YO sample.

Figure 16 shows the predicted reenlistment rates for this model if all Sailors with some sea duty in each sample had zero deployment spells, if all Sailors with some sea duty in each sample had one deployment spell, and if all Sailors with some sea duty in each sample had two plus deployment spells. For the 4YO and 5YO samples, we see the same

pattern. First-term reenlistment is highest when all Sailors have no deployment spells. For the 6YO sample, one deployment spell is not statistically different from no deployment spells; however, we predict that two deployment spells, compared with no deployment spells, would decrease reenlistment rates by 6 percent.

Figure 16. Predicted reenlistment rate by number of deployments during the first term, by initial years of service sample[a]



a. The differences between the predicted reenlistment rate for no deployments and the predicted reenlistment rates for one deployment and for two plus deployments are statistically significant at the 1-percent level for 4YO and 5YO Sailors. For 6YOs, only the difference between the predicted reenlistment rate for no deployments and the predicted reenlistment rate for two plus deployments is statistically significant at the 1-percent level.

Effect of deployment spells before and after September 2001

Since September 2001, the pace and type of deployments have changed.[27] Looking at FY95–FY00 versus FY01–FY04 first-term reenlistment decisions, we find that Sailors in the post 9/11 era were more

27. See [17] for a discussion of the pace of deployments under OIF/OEF and the effect of those deployments on servicemembers.

likely to reenlist but were less likely to reenlist in response to any deployment spells (see table 6). We looked at Sailors with any sea duty experience and estimated the change in predicted reenlistment rate if all Sailors experienced different numbers of deployment spells over the FY95–FY00 and FY01–FY04 periods. For both periods, we find that one or more deployment spell is statistically different than no deployments for 4YOs and only two or more deployment spells are statistically significant for 6YOs. For 5YOs, the reenlistment effect of deployment spells was only statistically significant for 5YO Sailors who made decisions after September 2001.

Further, the magnitude of the effect of deployments was larger for Sailors making decisions after September 2001. For 4YOs (5YOs) who made reenlistment decisions between FY96 and FY00, one deployment decreased reenlistment by 10 percent (0 percent) compared with 4YOs (5YOs) making decisions between FY01 and FY04 for whom one deployment decreased reenlistment rates by 13 percent (6 percent). For 6YOs, when compared with no deployments, having two or more deployments decreased reenlistment by 5 and 7 percent for the FY95–FY00 and FY01–FY04 periods, respectively.

Table 6. Predicted first-term reenlistment by number of deployments, holding all other covariates fixed[a]

	Predicted first-term reenlistment for FY95–FY00 sample, holding all other covariates fixed			Predicted first-term reenlistment for FY01–FY04 sample, holding all other covariates fixed		
Number of deployments	4YOs with >= 2 years of service	5YOs with >= 2 years of service	6YOs with >= 2 years of service	4YOs with >= 2 years of service	5YOs with >= 2 years of service	6YOs with >= 2 years of service
None	0.29	0.40	0.41	0.46	0.52	0.61
One	0.26***	0.40	0.42	0.40***	0.49***	0.61
Two or more	0.27***	0.41	0.39**	0.39***	0.46***	0.57***
Number of observations	78,125	11,436	18,713	55,198	14,949	9,547

a. *** indicates statistically significant difference from zero deployments at the 1-percent level, and ** indicates statistically significant difference from zero deployments at the 5-percent level.

Sea duty compensation

Our results suggest that significant shifts in the share of Sailors rotating to sea or increasing the number of deployment spells in the first term are likely to decrease the reenlistment rate. As the Navy moves toward a more sea-centric force, compensation tools could be used to minimize any corresponding negative retention effects.

Available compensation tools

If sea-centric initiatives or changes in the sea/shore rotation pattern negatively affect retention, an appropriate compensation tool will have to be flexible enough to target specific ratings and/or sea/shore rotations. Further, the ideal compensation tool would be targeted toward the period around the reenlistment decision. In this section, we briefly discuss some compensation tools that the Navy could consider in the context of changes in sea duty. See [5] for a broader review of the different forms of compensation and how those compensation tools meet the DoN's guiding principles and strategic goals.

Basic pay

Higher levels of basic pay will increase the number of people who volunteer to serve, either through higher enlistment or reenlistment. Because basic pay is constant across ratings and sea tour attributes, it cannot be targeted toward Sailors in certain ratings or Sailors who experience specific types of sea/shore rotations. Thus, increasing basic pay to address retention issues stemming from a more sea-centric force is not the most cost-effective compensation alternative.

Sea pay

The main compensation tool linked to sea duty has been sea pay [3]. Sea pay has been used to retain Sailors as well as to compensate for

the arduous nature of sea duty. Sea pay is directly linked to time spent on sea duty and has been used in the past to encourage extended sea duty (e.g., the FY02 increase in CSP).[7]. While sea pay has been found to influence retention, it is not targeted at servicemembers who are at the end of their contract and may not be as cost-effective a tool as more targeted compensation options, such as SRBs.

Selective Reenlistment Bonus (SRB)

SRBs are offered to Sailors at the end of their obligated contract and have been targeted toward Sailors in skills with retention problems. Since SRBs can differ in amounts across Sailors with different skills, they can be used to indirectly compensate for sea duty. If the goal is to address retention issues resulting from sea duty issues, SRBs are more cost effective than changes in sea pay because SRBS are targeted to the first-term reenlistment point, whereas sea pay is spread across the sea duty period and population. Since SRBs are flexible, the Navy could offer a higher SRB level to Sailors willing to continue or return to sea upon reenlistment. Further, the amount of SRB awarded could be adjusted to meet the Navy's manning needs.

Assignment Incentive Pay (AIP)

AIP has been used to provide additional monetary incentive to encourage Sailors to volunteer for hard-to-fill or less desirable assignments. Prior to AIP, the Navy would have to order Sailors to these hard-to-fill or less desirable locations, which was theorized to reduce retention. The 2003 NDAA provided authority for this assignment special pay, and the Navy has been using it since June 2003.

While increasing retention is not a primary goal of AIP, AIP does encourage a voluntary assignment system, which may have positive retention effects. AIP authority could be used to compensate Sailors for extending at sea or shortening their shore tour. This could either be near the completion of the sea tour or when Sailors negotiate new orders. The amount of AIP awarded could be varied to meet the needs of the Navy.

Pay elasticity estimates

In all of our logistic regressions, we control for relative military-to-civilian wages using an ACOL variable. The coefficients on the ACOL variable in our reenlistment models are positive and statistically significant, indicating that increases in military pay, such as SRBs and sea pay, will increase reenlistment rates. Thus, compensation can be used, for example, to raise the reenlistment rate of Sailors rotating to sea.

Based on our rotating-to-sea model, we calculate the basic and sea pay elasticities (see table 7). Elasticities are the percentage change in reenlistment given a 1-percent increase in basic pay or a 1-percent increase in sea pay. For 4YOs a 1-percent increase in basic pay leads to a 0.31-percent increase in reenlistment for men and a 0.26-percent increase for women. Our basic pay elasticity estimates are inelastic and significantly smaller than past estimates. For example, the authors of [12] estimate a pay elasticity of 1.5 percent, and our estimates are significantly smaller than those found in the review of pay elasticity estimates in [18].

We also estimated the effect of a one-level increase in the SRB multiplier for Sailor's first decision. A one-level increase is associated with an increase in the reenlistment rate of 0.25, 0.34, and 0.64 percentage point for 4YOs, 5YOs, and 6YOs, respectively. These estimates are significantly lower than those estimated by the authors of [3], who estimate that a one-level increase in the SRB multiplier increases reenlistment by 2.5 percentage points.

Table 7. Pay effects: 4YOs, 5YOs, and 6YOs with a minimum of 24 months of service[a]

	Basic pay elasticity of reenlistment (percentage)			Sea pay elasticity of reenlistment (percentage)			One-level increase in SRB multiplier (percentage point)		
Sample	4YOs	5YOs	6YOs	4YOs	5YOs	6YOs	4YOs	5YOs	6YOs
Full	0.27	0.28	0.34	0.01	0.00	0.01	0.25	0.34	0.64
Male	0.31	0.30	0.35	0.01	0.00	0.01	0.29	0.84	0.66
Female	0.26	0.54	0.43	0.01	0.01	0.02	0.16	0.39	0.72

a. Zero lies outside the 99-percent confidence interval for all the estimates in this table.

Conclusion

For reenlistment decisions made before 2000, Sailors rotating to shore at the end of the first term were more likely to reenlist than Sailors rotating to sea. In 2000, those reenlistment rates were equal; from 2001 until 2003, Sailors rotating to sea were more likely to reenlist than Sailors rotating to shore. The difference between the to-sea and to-shore reenlistment rates have been decreasing since the mid-1990s. This suggests that it hasn't been a single event, such as September 11, 2001, that changed the characteristics of sea duty and/or preferences for sea duty. It does suggest, however, that characteristics of sea duty and/or preferences for sea duty have been changing and that prior research on retention and sea duty or deployments may no longer be applicable. In addition, the Navy has and is introducing alternative sea manning concepts that will change the attributes of sea and shore duty. For these reasons, N1 asked CNA to reexamine how sea duty and deployment influence retention.

Summary of findings

In our analysis, we find that controlling for (a) time spent on ship, (b) Sailors' characteristics, (c) economic factors, and (d) Navy career characteristics do not account for the increase in to-sea retention in the early 2000s. This suggests that an unobservable characteristic, such as an increased patriotic sense of duty, a change in how time on sea duty was spent, or a shift in expectations over future sea duty experiences caused the change in the retention of Sailors going to sea.

Despite the recent increase in the reenlistment rate of Sailors rotating to sea, we, like the authors of [11 and 12], find a negative effect of Sailors expecting to be on sea duty immediately after the first decision. Sailors rotating to shore are more likely to reenlist than Sailors rotating to sea, even when controlling for the amount of time spent during the first term on deployments, under way not deployed, in overhaul, and in training not deployed.

In addition, our analysis on pre-9/11 data is similar to past research in that we find that reenlistment rates for 4YOs are highest when Sailors experience no deployments but, conditional on having some deployment, reenlistment rates increase as the number of completed deployment spells increase. When looking at post-9/11 data, we find that reenlistment decreases with deployment spells. This suggests that characteristics of deployments and/or preferences for deployments changed after 9/11.

Implications of a more sea-centric Navy

We find that marginal changes will not have negative retention effects, but more significant changes may have such effects. We estimate that marginal increases in expected sea duty or deployments *do not* significantly decrease retention. For example, Navy policies that increase the amount of time spent on sea duty by approximately 5 months during the second term are found to decrease reenlistment rates; however, that result is driven by whether the Sailor is or isn't expecting to have any sea duty at all. Thus, we conclude that, for Sailors who expect to rotate to sea duty at the start of the second term, a marginal change, such as a 5-month increase, in the length of that sea duty tour has either no statistically significant effect or a positive statistically significant effect on retention. In the case of deployments, increasing the number of months spent deployed by one month in the first term does not negatively affect retention as long as the Sailor was already on sea duty.

However, the recent changes in Navy policies that affect sea duty—particularly the change in the sea/shore rotation cycle—are not marginal. Our analysis on the effect of rotating to sea at the end of the first term and changes in the number of deployment spells suggests that the effect of these changes may be negative. Looking at data since 9/11, we find that Sailors clearly prefer fewer deployment spells. Increases in time spent on sea duty will influence the amount of time available for Sailors to be deployed and the number of deployment spells experienced during the first term. Further, despite the recent increase in to-sea retention rates, our to-shore retention estimates are still significantly higher than our to-sea estimates. This suggests that Sailors prefer to go to shore duty at the start of the second

term or at least to have a break from sea duty. Increases in sea duty lengths during the first term could significantly change the share of Sailors expecting to be on sea duty at the beginning of the second term. In addition, Sailors' perception of rotating to shore duty may change if shore duty attributes become more similar to sea duty—for example, if shore billets become part of on-call or on-deck billets to supplement ship crewing. Consequently, we strongly recommend that retention trends be monitored with any alternative sea manning concept pilot program and the recent change in the sea/shore rotation cycle.

We further recommend that the Navy use targeted compensation tools to reduce the negative retention effect of a more sea-centric force. In particular, we recommend the use of tools that increase voluntary sea manning and sea assignment flexibility, as well as influence retention. For example, two existing compensation tools—SRBs and AIP authority —could be used to target compensation toward specific skill sets and lengths of sea tours. These tools could be targeted to Sailors as an incentive to voluntarily provide more time at sea and increase retention.

Appendix A: Variable definitions

Table 8 defines the variables we used in our models.

Table 8. Variable definitions

Variable	Definition
	Dependent Variable
Reenlistment	Equals 1 if the Sailor reenlists or extends for at least 36 months, 0 otherwise
	Sea Duty and PERSTEMPO Independent Variables
Sea duty	Equals 1 if the Sailor had any sea duty in the initial obligation, 0 otherwise
Proportion of time on sea duty	Proportion of non-early career training time spent on idle, shore, or sea duty during the first obligation that was spent on sea duty
Time on sea duty	The number of months spent on sea duty during the initial obligation
One deployment	Equals 1 for one deployment spell completed during the initial obligation, 0 otherwise
Two or more deployments	Equals 1 if two or more deployment spells completed during the initial obligation, 0 otherwise
On ship duty	Equals 1 if the Sailor was attached to a ship while on sea duty, 0 otherwise
Time on deployment	Number of months spent deployed during the initial obligation
Time under way, not deployed	Number of months spent under way, not deployed during the initial obligation
Time in overhaul	Number of months spent in overhaul during the initial obligation
Time in training, not deployed	Number of months spent in training, not deployed during the initial obligation
Rotating to sea	Equals 1 if the Sailor is going to be on sea duty 12 months from the decision point, 0 otherwise[a]
Expected proportion of time on sea duty	Expected proportion of idle, sea, and shore duty time during the second term that is spent on sea duty
	Economic Variables
ACOL variable	Discounted and deflated expected military and civilian pay stream comparison
Home unemployment rate	Unemployment rate at the decision point in home state
Decision fiscal year dummies	Equal 1 if the Sailor is making the reenlistment decision in that fiscal year, 0 otherwise

Table 8. Variable definitions (continued)

Variable	Definition
	Characteristics of military service
E1 through E6 rating dummies	Equal 1 if the Sailor is at that rank by the first decision point, 0 otherwise
2 through 6 years of service dummies	Equal 1 if the Sailor had that number of completed years of service at the first decision point, 0 otherwise
Rating category[b]	Equal 1 if the Sailor is in that rating category at the first decision point, 0 otherwise
	Demographic characteristics
Female	Equals 1 if the Sailor is female, 0 otherwise
Marital status	Equals 1 if the Sailor is married at the decision point, 0 otherwise
Dependent status	Equals 1 if the Sailor has any dependent children at the decision point, 0 otherwise
High school	Equals 1 if the Sailor finished high school prior to accessing into the Navy, 0 otherwise
AFQT	Sailor's AFQT score
Tier 1, 2 and 3 dummies	Equal 1 if the Sailor accessed in that Tier category, 0 otherwise
Under the age of 24	Equals 1 if the Sailor is less than 24 at the decision point, 0 otherwise
Age 25 to 29	Equals 1 if the Sailor is 25 to 29 at the decision point, 0 otherwise
Age 30 or higher	Equals 1 if the Sailor is at least 30 at the decision point, 0 otherwise
White	Equals 1 if the Sailor is White, 0 otherwise
Black	Equals 1 if the Sailor is Black, 0 otherwise
Asian Pacific Islander	Equals 1 if the Sailor is Asian/Pacific Islander, 0 otherwise
Hispanic	Equals 1 if the Sailor is Hispanic, 0 otherwise
Native American	Equals 1 if the Sailor is Native American, 0 otherwise
Other	Equals 1 if the Sailor is not White, Black, Asian/Pacific Islander, Native American, or Hispanic, 0 otherwise

a. This variable is measured based on Sailor's decision date and point in a sea tour. Based on the prescribed sea and shore tour lengths, we estimate whether a Sailor will be rotating within the next 12 months. If a Sailor is determined to not be rotating, we classify that Sailor as staying in his or her existing tour.

b. The rating categories are defined in appendix B.

Appendix B: Navy Enlisted ratings and occupational groups

This appendix lists the Navy enlisted ratings found in each occupational group used in our analysis. Our classification categories reflect the Community Manager rating groupings. Because our sample spans several years, our dataset includes some ratings that have been either discontinued or reassigned. For instance, Electronic Warfare Technician (EW) was converted to Cryptologic Technician - Technical in 2003. We include these ratings that were converted to ratings in the community; these are signified by **boldface** type. Our dataset also includes ratings that were not converted to a new rating and are not included in any community. We include those ratings with the most similar community; these are signified by underlined type. In our analysis, we exclude those in the Nuclear Field Community and Submarine Community along with Sailors in other communities who were designated as "Nuclear" or "Submarine" in our dataset.

5. Administration Community

   — Draftsman (DM), Journalist (JO), **Instrumentman (IM)**, Legalman (LN), Lithographer (LI), Musician (MU), Navy Counselor (NC), Navy Counselor - Career Recruiting Force (NC-CRF), Patternmaker (PM), **Personnelman (PN)**, Personnel Specialist (PS), Photographer's Mate (PH), Religious Program Specialist (RP), Yeoman (YN)

6. Aviation Community

   — Airman - not rated (AN), Aviation Boatswain's Mate - Launch/Recovery (ABE), Aviation Boatswain's Mate - Fuels (ABF), Aviation Boatswain's Mates - Aircraft Handler (ABH), Air Traffic Controller (AC), Aviation Machinist's Mate (AD), Aviation Electrician's Mate (AE), Aviation Storekeeper (AK), Aerographer's Mate (AG), Aviation

Structural Mechanic (AM), Aviation Structural Mechanic - Hydraulic Mechanic (AMH), Aviation Structural Mechanic - Safety Equipment (AME), Aviation Structural Mechanic - Structures (AMS), Aviation Ordnanceman (AO), Aviation Support Equipment Technician (AS), Aviation Electronics Technician Intermediate (AT), Aviation Warfare Systems Operator (AW), Aviation Maintenance Administrationman (AZ), Aircrew Survival Equipmentman (PR)

7. Cryptologic Technicians Community

   — Cryptologic Technician - Administrative (CTA), Cryptologic Technician - Collection (CTR), Cryptologic Technician - Communications (CTO), Cryptologic Technician - Interpretive (CTI), Cryptologic Technician - Maintenance (CTM), Cryptologic Technician - Networks (CTN), Cryptologic Technician - Technical (CTT), **Electronic Warfare Technician (EW)**

8. Intelligence Community

   — Intelligence Specialist (IS)

9. Medical/Dental Community

   — Hospital Corpsman (HM), **Dental Technician (DT)**

10. Nuclear Field Community

    — Electrician Mate (EM), Electronics Technician (ET), Machinist's Mate (MM)

11. Seabees Community

    — Constructionman - not rated (CN), Builder (BU), Construction Electrician (CE), Construction Mechanic (CM), Engineering Aid (EA), Equipment Operator (EO), Steelworker (SW), Utilitiesman (UT)

12. Security Community

    — Master-at-Arms (MA)

13. Submarine Community

    — Culinary Specialist - Submarines (CS SS), Communication Electronics Technician Submarines (ET COM), Navigation Electronics Technician Submarines (ET NAV), Fire Control Technician (FT), Auxiliary Machinist Mate Submarines (MM AUX), Weapons Machinist Mate Submarines (MM WEP), Missile Technician (MT), Storekeeper Submarines (SK SS), Sonar Technician Submarines (STS), Yeoman Submarines (YN SS), **Mess Management Specialist (MS SS)**

14. Supply Community

    — Culinary Specialist (CS), Postal Clerk (PC), Ship's Serviceman (SH), Storekeeper (SK), **Disbursing Clerk (DK)**, **Mess Management Specialist (MS)**

15. Surface Combat Systems Community

    — Electronic Technician (ET), Fire Controlman (FC), Fireman - not rated (FN), Gunner's Mate (GM), Gunner's Mate - Guns (GMG), Gunner's Mate - Missiles (GMM), Mineman (MN), Ocean Systems Technician Analyst (OTA), Ocean Systems Technician Maintainer (OTM), Sonar Technician - Surface (STG), Torpedoman's Mate (TM), **Weapons Technician (WT)**

16. Surface Operations Community

    — Boatswain's Mate (BM), Boiler Technician (BT), **Data Processing Technician (DP)**, Data Systems Technician (DS), Information System Technician (IT), Operations Specialist (OS), Quartermaster (QM), **Radioman (RM)**, **Signalman (SM)**, Seaman - not rated (SN)

17. Surface Engineering Community

    — Damage Controlman (DC), Electricians Mate (EM), Engineman (EN), Gas Turbine Systems Technician - Electrical (GSE), Gas Turbine Systems Technician - Mechanical (GSM), Hull Maintenance Technician (HT), Interior Communications Electrician (IC), Machinist's Mate (MM), Machinery Repairman (MR), Molder (ML)

Appendix C: Summary statistics

Tables 9 through 11 provide summary statistics of our 4YO, 5YO, and 6YO samples.

Table 9. Descriptive statistics for 4YOs at first reenlistment decision point, with at least 24 months of service

Variable	Mean or proportion	Variable	Mean or proportion
Reenlistment rate	33.53	**Personal Characteristics**	
Economic Data		Married	34.81
ACOL ($1,000)[a]	10.56	Number of dependent children	21.83
Unemployment rate (home state)	5.08		
Characteristics of Military Service		Female	16.28
E-1	0.19		
E-2	0.83	Age 25 to 29	21.00
E-3	15.77	Age 30 or older	4.21
E-4	63.63		
E-5	19.50	AFQT	56.51
E-6	0.08		
		White	60.46
Two years of service at decision[b]	1.21	Asian/Pacific Islander	5.04
Three years of service at decision[b]	28.41	Black	19.98
Four years of service at decision[b]	61.83	Hispanic	12.48
Five years of service at decision[b]	8.03	Native American	1.63
Six years of service at decision[b]	0.52	Other ethnicity	0.41
Rotating to sea duty[c]	59.07	High school graduate	96.19
Expected proportion of second term on sea duty[d]	21.43	Tier 1 status	96.14
Any sea duty experience		Tier 2 status	2.27
		Tier 3 status	1.59
Time on deployment	7.01		
Time under way, not deployed	3.34	**Fiscal Year**	
Time in overhaul	1.05	FY95	11.64
Time in training, not deployed	2.78	FY96	10.89
		FY97	12.69
No deployment spells	43.35	FY98	9.25
One deployment spells	25.15	FY99	8.10
Two or more deployment spells	31.51	FY00	8.18
		FY01	9.82
Rating Group		FY02	8.87
Administration	6.28	FY03	9.99
Aviation Maintenance and Ground Support	32.34	FY04	10.57
Surface Combat Systems	5.53		

Table 9. Descriptive statistics for 4YOs at first reenlistment decision point, with at least 24 months of service (continued)

Variable	Mean or proportion	Variable	Mean or proportion
Cryptology	4.28		
Intelligence	1.10		
Medical care	5.53		
Seabee	0.49		
Security	0.37		
Surface Engineering	17.74		
Surface Operations	17.68		
Support	8.66	**Number of observations**	**154,091**

a. The number of observations for this variable is 153,479.
b. The number of observations for this variable is 153,653.
c. The number of observations for this variable is 148,287.
d. The number of observations for this variable is 152,724.

Table 10. Descriptive statistics for 5 YOs at first reenlistment decision point, with at least 24 months of service

Variable	Mean or Proportion	Variable	Mean or Proportion
Reenlistment rate	45.75	**Personal Characteristics**	
Economic Data		Married	42.60
ACOL ($1,000)[a]	9.63	Number of dependent children	25.79
Unemployment rate (home state)	5.06		
Characteristics of Military Service		Female	19.63
E-1	0.10		
E-2	0.40	Age 25 to 29	30.15
E-3	10.51	Age 30 or older	6.90
E-4	56.93		
E-5	31.86	AFQT	61.03
E-6	0.20		
		White	63.06
Two years of service at decision[b]	0.81	Asian/Pacific Islander	6.74
Three years of service at decision[b]	15.42	Black	16.31
Four years of service at decision[b]	35.52	Hispanic	11.42
Five years of service at decision[b]	46.01	Native American	2.07
Six years of service at decision[b]	2.25	Other ethnicity	0.40
Rotating to sea duty[c]	47.51	High school graduate	94.85
Expected proportion of second term on sea duty[d]	15.97	Tier 1 status	94.77
Any sea duty experience		Tier 2 status	3.70
		Tier 3 status	1.53
Time on deployment	3.51		
Time under way, not deployed	1.69	**Fiscal Year**	
Time in overhaul	0.50	FY95	7.86
Time in training, not deployed	1.40	FY96	5.32
		FY97	4.51
No deployment spells	71.55	FY98	6.16
One deployment spells	12.36	FY99	9.38
Two or more deployment spells	16.09	FY00	11.51
		FY01	11.82
Rating Group		FY02	11.49
Administration	4.74	FY03	14.37
Aviation Maintenance and Ground Support	24.09	FY04	17.56
Surface Combat Systems	2.61		

Table 10. Descriptive statistics for 5 YOs at first reenlistment decision point, with at least 24 months of service (continued)

Variable	Mean or Proportion	Variable	Mean or Proportion
Cryptology	3.44		
Intelligence	0.31		
Medical care	29.84		
Seabee	15.51		
Security	0.17		
Surface Engineering	5.06		
Surface Operations	8.95		
Support	5.27	**Number of observations**	**34,000**

a. The number of observations for this variable is 33,876.
b. The number of observations for this variable is 33,960.
c. The number of observations for this variable is 32,872.
d. The number of observations for this variable is 33,210.

Table 11. Descriptive statistics for 6 YOs at first reenlistment decision point, with at least 24 months of service

Variable	Mean or Proportion	Variable	Mean or Proportion
Reenlistment rate	47.66	**Personal Characteristics**	
Economic Data		Married	42.92
ACOL ($1,000)[a]	9.82	Number of dependent children	23.64
Unemployment rate (home state)	4.97		
Characteristics of Military Service		Female	9.11
E-1	0.06		
E-2	0.32	Age 25 to 29	33.47
E-3	3.87	Age 30 or older	6.85
E-4	46.56		
E-5	48.49	AFQT	77.76
E-6	0.70		
		White	76.64
Two years of service at decision[b]	0.60	Asian/Pacific Islander	4.65
Three years of service at decision[b]	16.86	Black	8.57
Four years of service at decision[b]	24.15	Hispanic	8.35
Five years of service at decision[b]	28.08	Native American	1.55
Six years of service at decision[b]	30.31	Other ethnicity	0.24
Rotating to sea duty[c]	51.52	High school graduate	97.83
Expected proportion of second term on sea duty[d]	23.05	Tier 1 status	97.79
Any sea duty experience		Tier 2 status	1.90
		Tier 3 status	0.31
Time on deployment	7.30		
Time under way, not deployed	4.35	**Fiscal Year**	
Time in overhaul	1.19	FY95	15.23
Time in training, not deployed	3.49	FY96	14.55
		FY97	12.43
No deployment spells	35.73	FY98	8.68
One deployment spells	28.98	FY99	7.69
Two or more deployment spells	35.29	FY00	7.39
		FY01	10.43
Rating Group		FY02	8.90
Administration	1.25	FY03	8.89
Aviation Maintenance and Ground Support	6.98	FY04	5.82
Surface Combat Systems	47.73		

Table 11. Descriptive statistics for 6 YOs at first reenlistment decision point, with at least 24 months of service (continued)

Variable	Mean or Proportion	Variable	Mean or Proportion
Cryptology	7.18		
Intelligence	0.36		
Medical care	6.96		
Seabee	0.81		
Security	0.23		
Surface Engineering	19.07		
Surface Operations	8.37		
Support	1.05	**Number of observations**	**32,892**

a. The number of observations for this variable is 32,405.
b. The number of observations for this variable is 32,482.
c. The number of observations for this variable is 31,210.
d. The number of observations for this variable is 32,394.

Appendix D: Logistic regressions

The outcome of interest for all the logistic regressions is whether a Zone A Sailor who reached his or her first-term reenlistment point reenlisted.[28] The probability of reenlisting, Pi, for a second term is given by the cumulative logistic distribution:

$$Pi = F(Zi) = \frac{1}{(1 + \exp(-Zi))} .$$

In addition to the independent variables of interest listed below, all the logistic regressions include economic variables, characteristics of military service, and demographic variables. The coefficients and standard errors of all variables included in logistic regressions 1, 3, 4, and 5 are listed in tables 12 through 15 in appendix E.

Expected second-term experience logistic regressions

Below are the main independent variables of interest included in the several logistic regressions used to determine the effect of expected sea duty on retention. We used logistic regression 1 to estimate our pay elasticities.

Logistic regression 1: Rotating to sea versus rotating to shore

- Rotating to sea
- Time on deployment
- Time under way, not deployed
- Time in overhaul
- Time in training, not deployed

Logistic regression 2: Rotating to sea retention trend

28. We looked only at reenlistments or extensions of 36 or more months.

- Rotating to sea
- Rotating to sea interacted with fiscal years
- Time on deployment
- Time under way, not deployed
- Time in overhaul
- Time in training, not deployed

Logistic regression 3: Expected length of second-term sea duty

- Expected proportion of time on sea duty
- Time on deployment
- Time under way, not deployed
- Time in overhaul
- Time in training, not deployed.

First-term ship activities logistic regressions

Below are the main independent variables of interest in the logistic regressions used to determine the effect of first-term ship activities on retention. The sample was restricted to those who experienced some sea duty during the first term.

Logistic regression 4: Months spent on ship activities

- Rotating to sea
- Time on deployment
- Time under way, not deployed
- Time in overhaul
- Time in training, not deployed

Logistic regression 5: Number of deployments

- Rotating to sea
- One deployment

- Two or more deployments
- Time under way, not deployed
- Time in overhaul
- Time in training, not deployed

First-term sea duty logistic regressions

Below are the main independent variables of interest included in the logistic regressions used to determine the effect of sea duty on reenlistment.

Logistic regression 6: Any sea duty

- Sea duty

Logistic regression 7: Any Sea duty and proportion of time spent on sea duty

- Sea duty
- Proportion of time on sea duty

Appendix E: Logistic regression results

This appendix contains complete regression results for each of our main models (see tables 12 through 15). We arrange the results in the same order as the results are presented in the paper and present results separately for 4YOs, 5YOs, and 6YOs. In this appendix, we include all coefficients and standard errors, as well as measures of the overall explanatory power of our equations and the number of observations included in each. We have not included the results from some of our other models. These are available from the authors.

Rotating to sea results

Table 12. Logit regression results, rotating to sea

Variable	4YO sample[a] Coefficient[d] (Standard error)	5YO sample[b] Coefficient[d] (Standard error)	6YO sample[c] Coefficient[d] (Standard error)
Rotating to sea	-0.438*** (0.014)	-0.264*** (0.03)	-0.227*** (0.036)
Time on deployment	-0.001 (0.001)	0.000 (0.002)	-0.001 (0.002)
Time under way, not deployed	0.009** (0.004)	-0.009 (0.013)	-0.021*** (0.007)
Time in overhaul	-0.005*** (0.002)	-0.001 (0.005)	-0.002 (0.004)
Time in training, not deployed	-0.051*** (0.005)	-0.004 (0.015)	-0.04*** (0.009)
ACOL	0.018*** (0.001)	0.027*** (0.003)	0.033*** (0.002)
AFQT	-0.007*** (0.000)	-0.005*** (0.001)	-0.013*** (0.001)
High school	-0.691** (0.28)	0.056 (0.452)	-0.7 (0.687)
Tier 2	-0.553** (0.277)	0.165 (0.447)	-0.443 (0.68)
Tier 3	-0.519* (0.284)	0.079 (0.466)	-0.205 (0.734)
Asian Pacific Islander	0.75*** (0.028)	0.814*** (0.059)	1.228*** (0.072)
Black	0.675*** (0.018)	0.467*** (0.042)	0.571*** (0.054)
Hispanic	0.129*** (0.02)	0.117*** (0.046)	-0.15*** (0.057)
Native American	0.19*** (0.048)	0.37*** (0.096)	0.409*** (0.118)
Other race	0.353*** (0.092)	0.547** (0.214)	0.85*** (0.31)
Female	-0.426*** (0.021)	-0.529*** (0.044)	-0.445*** (0.059)
Age 25 to 29	0.189*** (0.015)	0.127*** (0.031)	0.087*** (0.032)
Age 30 or higher	0.489*** (0.031)	0.437*** (0.06)	0.769*** (0.064)
Marital status	0.355*** (0.015)	0.244*** (0.031)	0.401*** (0.033)

Table 12. Logit regression results, rotating to sea (continued)

Variable	4YO sample[a] Coefficient[d] (Standard error)	5YO sample[b] Coefficient[d] (Standard error)	6YO sample[c] Coefficient[d] (Standard error)
Dependent status	0.299*** (0.016)	0.356*** (0.035)	0.354*** (0.037)
Home unemployment rate	-0.017*** (0.005)	0.004 (0.011)	-0.062*** (0.011)
E2	-3.157*** (0.182)	-3.556*** (0.524)	-3.982*** (0.601)
E3	-0.871*** (0.02)	-0.912*** (0.048)	-1.685*** (0.081)
E5	0.487*** (0.017)	0.583*** (0.034)	0.552*** (0.033)
E6	1.892* (1.148)	----------	0.672*** (0.205)
3 YOS	-0.907*** (0.056)	-0.147 (0.169)	-0.499** (0.206)
4 YOS	-2.252*** (0.056)	-1.727*** (0.166)	-1.774*** (0.204)
5 YOS	-1.766*** (0.06)	-3.581*** (0.167)	-2.667*** (0.206)
6 YOS	-1.594*** (0.096)	-2.959*** (0.185)	-4.115*** (0.208)
Aviation Maintenance and Ground Support	0.508*** (0.027)	0.934*** (0.071)	1.292*** (0.131)
Surface Combat Systems	0.323*** (0.037)	0.653*** (0.105)	1.636*** (0.124)
Cryptology	0.41*** (0.088)	0.052 (0.335)	1.552*** (0.157)
Intelligence	0.483*** (0.06)	0.08 (0.245)	0.136 (0.245)
Medical care	0.692*** (0.037)	0.999*** (0.075)	1.371*** (0.134)
Seabee	0.977*** (0.083)	0.9*** (0.077)	0.875*** (0.189)
Security	0.934*** (0.094)	1.477*** (0.322)	1.683*** (0.282)
Surface Engineering	0.225*** (0.03)	0.55*** (0.089)	1.06*** (0.126)
Surface Operations	0.533*** (0.029)	0.658*** (0.079)	0.807*** (0.13)
Support	0.458*** (0.032)	0.748*** (0.088)	0.622*** (0.174)

Table 12. Logit regression results, rotating to sea (continued)

Variable	4YO sample[a] Coefficient[d] (Standard error)	5YO sample[b] Coefficient[d] (Standard error)	6YO sample[c] Coefficient[d] (Standard error)
FY 1996	-0.046*	0.201***	0.242***
	(0.027)	(0.075)	(0.049)
FY 1997	-0.05*	-0.014	0.265***
	(0.026)	(0.08)	(0.053)
FY 1998	0.112***	-0.083	0.059
	(0.028)	(0.073)	(0.06)
FY 1999	0.093***	0.02	0.063
	(0.03)	(0.068)	(0.063)
FY 2000	0.228***	0.284***	0.443***
	(0.03)	(0.066)	(0.066)
FY 2001	0.71***	0.647***	0.955***
	(0.027)	(0.064)	(0.061)
FY 2002	0.609***	0.484***	0.66***
	(0.028)	(0.065)	(0.063)
FY 2003	0.535***	0.386***	0.427***
	(0.027)	(0.062)	(0.063)
FY 2004	0.12***	-0.176***	-0.527***
	(0.027)	(0.06)	(0.072)
Constant	1.383***	0.844*	2.204***
	(0.289)	(0.497)	(0.737)
Pseudo R-squared	0.1332	0.2413	0.2516
Number of observations	147,402	32,725	30,731

a. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
b. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
c. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
d. * indicates statistical significance at the 10-percent level.
** indicates statistical significance at the 5-percent level.
*** indicates statistical significance at the 1-percent level.

Expected length of second-term sea duty results

Table 13. Logit regression results, expected length of second-term sea duty

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Expected proportion of time on sea duty	-0.024*** (0.001)	-0.015*** (0.002)	-0.013*** (0.002)
Time on deployment	0.000 (0.001)	0.000 (0.002)	-0.001 (0.002)
Time under way, not deployed	0.01** (0.004)	-0.011 (0.013)	-0.019** (0.007)
Time in overhaul	-0.004*** (0.002)	0.001 (0.005)	-0.002 (0.004)
Time in training, not deployed	-0.049*** (0.005)	-0.001 (0.015)	-0.039*** (0.009)
ACOL	0.019*** (0.001)	0.028*** (0.003)	0.033*** (0.002)
AFQT	-0.008*** (0.000)	-0.006*** (0.001)	-0.013*** (0.001)
High school	-0.62** (0.275)	0.032 (0.45)	-0.531 (0.663)
Tier 2	-0.489* (0.273)	0.153 (0.446)	-0.297 (0.656)
Tier 3	-0.45 (0.279)	0.051 (0.465)	-0.054 (0.712)
Asian Pacific Islander	0.751*** (0.027)	0.829*** (0.059)	1.23*** (0.071)
Black	0.664*** (0.017)	0.462*** (0.042)	0.56*** (0.053)
Hispanic	0.135*** (0.019)	0.121*** (0.045)	-0.155*** (0.055)
Native American	0.202*** (0.047)	0.442*** (0.096)	0.457*** (0.117)
Other race	0.365*** (0.091)	0.533** (0.215)	0.902*** (0.304)
Female	-0.427*** (0.02)	-0.559*** (0.044)	-0.441*** (0.056)
Age 25 to 29	0.18*** (0.015)	0.118*** (0.031)	0.082*** (0.031)
Age 30 or higher	0.485*** (0.031)	0.425*** (0.059)	0.736*** (0.062)
Marital status	0.344*** (0.014)	0.229*** (0.03)	0.385*** (0.032)

Table 13. Logit regression results, expected length of second-term sea duty (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Dependent status	0.298*** (0.016)	0.358*** (0.034)	0.355*** (0.037)
Home unemployment rate	-0.017*** (0.005)	0.006 (0.011)	-0.059*** (0.011)
E2	-3.596*** (0.359)	----------	-2.537** (1.053)
E3	-0.885*** (0.02)	-0.9*** (0.049)	-1.71*** (0.085)
E5	0.499*** (0.016)	0.618*** (0.034)	0.536*** (0.033)
E6	----------	----------	0.937*** (0.236)
3 YOS	-1.021*** (0.054)	-0.227 (0.173)	-0.617*** (0.21)
4 YOS	-2.359*** (0.054)	-1.817*** (0.17)	-1.874*** (0.208)
5 YOS	-1.841*** (0.058)	-3.654*** (0.171)	-2.777*** (0.21)
6 YOS	-1.654*** (0.093)	-3.055*** (0.188)	-4.236*** (0.212)
Aviation Maintenance and Ground Support	0.61*** (0.027)	0.996*** (0.072)	1.399*** (0.135)
Surface Combat Systems	0.458*** (0.038)	0.787*** (0.11)	1.719*** (0.128)
Cryptology	0.777*** (0.038)	0.994*** (0.099)	1.438*** (0.135)
Intelligence	0.608*** (0.06)	0.411 (0.418)	0.095 (0.285)
Medical care	0.55*** (0.037)	0.892*** (0.077)	1.319*** (0.137)
Seabee	1.075*** (0.083)	0.923*** (0.077)	0.955*** (0.196)
Security	0.684*** (0.103)	1.526*** (0.526)	0.83** (0.38)
Surface Engineering	0.342*** (0.032)	0.65*** (0.092)	1.162*** (0.131)
Surface Operations	0.663*** (0.031)	0.753*** (0.082)	0.923*** (0.135)
Support	0.554*** (0.032)	0.789*** (0.089)	0.756*** (0.181)

Table 13. Logit regression results, expected length of second-term sea duty (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
FY 1996	-0.01 (0.026)	0.233*** (0.073)	0.268*** (0.048)
FY 1997	-0.004 (0.026)	0.022 (0.078)	0.28*** (0.052)
FY 1998	0.185*** (0.028)	-0.04 (0.072)	0.084 (0.059)
FY 1999	0.129*** (0.029)	0.098 (0.068)	0.088 (0.062)
FY 2000	0.235*** (0.029)	0.295*** (0.065)	0.393*** (0.064)
FY 2001	0.693*** (0.027)	0.66*** (0.063)	0.941*** (0.06)
FY 2002	0.611*** (0.027)	0.502*** (0.064)	0.698*** (0.062)
FY 2003	0.53*** (0.027)	0.391*** (0.061)	0.459*** (0.062)
FY 2004	0.059** (0.027)	-0.199*** (0.059)	-0.531*** (0.069)
Constant	1.583*** (0.285)	1.053** (0.498)	2.204*** (0.716)
Pseudo R-squared	0.1306	0.2384	0.2489
Number of observations	152,148	33,131	31,939

a. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
b. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
c. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
d. * indicates statistical significance at the 10-percent level.
** indicates statistical significance at the 5-percent level.
*** indicates statistical significance at the 1-percent level.

First-term ship activities results

The sample is constrained to those who experienced some sea duty for these logit regressions.

Table 14. Logit regression results, first-term ship activities

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Rotating to sea	-0.388*** (0.015)	-0.234*** (0.033)	-0.141*** (0.038)
Time on deployment	-0.001* (0.001)	0.000 (0.002)	-0.002 (0.002)
Time under way, not deployed	0.006 (0.004)	-0.011 (0.013)	-0.022*** (0.007)
Time in overhaul	-0.005*** (0.002)	-0.002 (0.005)	-0.002 (0.004)
Time in training, not deployed	-0.051*** (0.005)	-0.003 (0.015)	-0.041*** (0.009)
ACOL	0.017*** (0.001)	0.022*** (0.003)	0.031*** (0.003)
AFQT	-0.008*** (0.000)	-0.005*** (0.001)	-0.013*** (0.001)
High school	-0.677** (0.288)	0.011 (0.49)	-0.692 (0.689)
Tier 2	-0.532* (0.285)	0.13 (0.485)	-0.421 (0.681)
Tier 3	-0.502* (0.292)	0.073 (0.503)	-0.201 (0.739)
Asian Pacific Islander	0.736*** (0.029)	0.718*** (0.067)	1.182*** (0.075)
Black	0.688*** (0.019)	0.475*** (0.047)	0.596*** (0.057)
Hispanic	0.13*** (0.021)	0.154*** (0.05)	-0.125** (0.059)
Native American	0.162*** (0.05)	0.273*** (0.104)	0.421*** (0.123)
Other race	0.312*** (0.094)	0.562** (0.239)	0.788** (0.317)
Female	-0.4*** (0.023)	-0.489*** (0.053)	-0.364*** (0.067)
Age 25 to 29	0.194*** (0.016)	0.131*** (0.034)	0.083** (0.033)

Table 14. Logit regression results, first-term ship activities (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Age 30 or higher	0.483*** (0.033)	0.401*** (0.067)	0.749*** (0.067)
Marital status	0.374*** (0.015)	0.281*** (0.034)	0.391*** (0.034)
Dependent status	0.298*** (0.018)	0.358*** (0.039)	0.377*** (0.039)
Home unemployment rate	-0.02*** (0.005)	-0.004 (0.012)	-0.059*** (0.012)
E2	-3.215*** (0.201)	-3.639*** (0.593)	-3.961*** (0.601)
E3	-0.912*** (0.021)	-1.023*** (0.058)	-1.643*** (0.088)
E5	0.488*** (0.017)	0.553*** (0.035)	0.561*** (0.034)
E6	1.811 (1.145)	--------	0.694*** (0.205)
3 YOS	-0.414*** (0.071)	0.218 (0.227)	-0.483** (0.225)
4 YOS	-1.693*** (0.071)	-1.213*** (0.225)	-1.766*** (0.223)
5 YOS	-1.189*** (0.074)	-2.986*** (0.226)	-2.594*** (0.226)
6 YOS	-1.02*** (0.108)	-2.28*** (0.242)	-4.008*** (0.228)
Aviation Maintenance and Ground Support	0.443*** (0.03)	0.914*** (0.074)	1.127*** (0.143)
Surface Combat Systems	0.289*** (0.039)	0.604*** (0.107)	1.397*** (0.135)
Cryptology	0.367*** (0.089)	0.063 (0.332)	1.33*** (0.165)
Intelligence	0.495*** (0.065)	0.115 (0.252)	-0.009 (0.267)
Medical care	0.413*** (0.045)	0.683*** (0.082)	1.066*** (0.151)
Seabee	0.913*** (0.084)	0.857*** (0.08)	0.641*** (0.197)
Security	0.894*** (0.1)	1.453*** (0.342)	1.396*** (0.297)
Surface Engineering	0.163*** (0.033)	0.5*** (0.091)	0.84*** (0.137)

Table 14. Logit regression results, first-term ship activities (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Surface Operations	0.493*** (0.032)	0.674*** (0.082)	0.604*** (0.141)
Support	0.438*** (0.034)	0.779*** (0.09)	0.474*** (0.183)
FY 1996	-0.06** (0.029)	0.229*** (0.078)	0.247*** (0.051)
FY 1997	-0.024 (0.028)	-0.041 (0.084)	0.29*** (0.056)
FY 1998	0.148*** (0.03)	-0.169** (0.077)	0.088 (0.063)
FY 1999	0.108*** (0.032)	-0.005 (0.074)	0.085 (0.066)
FY 2000	0.238*** (0.031)	0.333*** (0.071)	0.472*** (0.068)
FY 2001	0.707*** (0.029)	0.647*** (0.068)	0.973*** (0.063)
FY 2002	0.631*** (0.029)	0.515*** (0.069)	0.679*** (0.065)
FY 2003	0.543*** (0.029)	0.438*** (0.066)	0.438*** (0.065)
FY 2004	0.139*** (0.028)	-0.13** (0.062)	-0.501*** (0.074)
Constant	0.933*** (0.3)	0.441 (0.553)	2.339*** (0.747)
Pseudo R-squared	0.1287	0.2216	0.2444
Number of observations	133,326	26,385	28,260

a. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
b. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
c. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
d. * indicates statistical significance at the 10-percent level.
** indicates statistical significance at the 5-percent level.
*** indicates statistical significance at the 1-percent level.

The number of first-term deployment spells results

The sample is constrained to those who experienced some sea duty for these logit regressions.

Table 15. Logit regression results, first-term deployment spells

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Rotating to sea	-0.386***	-0.235***	-0.163***
	(0.015)	(0.033)	(0.038)
One deployment	-0.239***	-0.122**	0.043
	(0.02)	(0.054)	(0.044)
Two or more deployments	-0.204***	-0.191***	-0.173***
	(0.022)	(0.063)	(0.048)
Time under way, not deployed	0.01**	-0.007	-0.023***
	(0.004)	(0.013)	(0.007)
Time in overhaul	-0.003	-0.001	-0.004
	(0.002)	(0.005)	(0.004)
Time in training, not deployed	-0.038***	0.011	-0.028***
	(0.005)	(0.016)	(0.01)
ACOL	0.017***	0.022***	0.031***
	(0.001)	(0.003)	(0.003)
AFQT	-0.008***	-0.005***	-0.013***
	(0.000)	(0.001)	(0.001)
High school	-0.68**	0.017	-0.66
	(0.288)	(0.49)	(0.688)
Tier 2	-0.533*	0.131	-0.389
	(0.285)	(0.486)	(0.68)
Tier 3	-0.505*	0.082	-0.172
	(0.292)	(0.504)	(0.738)
Asian Pacific Islander	0.742***	0.721***	1.182***
	(0.029)	(0.067)	(0.075)
Black	0.691***	0.48***	0.6***
	(0.019)	(0.047)	(0.057)
Hispanic	0.131***	0.156***	-0.125**
	(0.021)	(0.05)	(0.059)
Native American	0.163***	0.273***	0.416***
	(0.05)	(0.104)	(0.123)
Other race	0.316***	0.565**	0.792**
	(0.094)	(0.239)	(0.317)
Female	-0.404***	-0.492***	-0.378***
	(0.023)	(0.053)	(0.067)

Table 15. Logit regression results, first-term deployment spells (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Age 25 to 29	0.195*** (0.016)	0.13*** (0.034)	0.084** (0.033)
Age 30 or higher	0.485*** (0.033)	0.402*** (0.067)	0.746*** (0.067)
Marital status	0.366*** (0.015)	0.277*** (0.034)	0.389*** (0.034)
Dependent status	0.295*** (0.017)	0.357*** (0.039)	0.375*** (0.039)
Home unemployment rate	-0.02*** (0.005)	-0.004 (0.012)	-0.059*** (0.012)
E2	-3.21*** (0.201)	-3.643*** (0.594)	-3.955*** (0.601)
E3	-0.911*** (0.021)	-1.021*** (0.058)	-1.636*** (0.088)
E5	0.484*** (0.017)	0.551*** (0.035)	0.561*** (0.034)
E6	1.833 (1.146)	-------	0.702*** (0.205)
3 YOS	-0.42*** (0.071)	0.222 (0.227)	-0.469** (0.224)
4 YOS	-1.708*** (0.071)	-1.216*** (0.224)	-1.744*** (0.222)
5 YOS	-1.214*** (0.075)	-2.993*** (0.226)	-2.561*** (0.225)
6 YOS	-1.044*** (0.108)	-2.287*** (0.242)	-3.976*** (0.227)
Aviation Maintenance and Ground Support	0.417*** (0.03)	0.893*** (0.074)	1.113*** (0.143)
Surface Combat Systems	0.303*** (0.039)	0.61*** (0.107)	1.385*** (0.135)
Cryptology	0.405*** (0.089)	0.078 (0.332)	1.331*** (0.165)
Intelligence	0.505*** (0.065)	0.12 (0.252)	-0.009 (0.266)
Medical care	0.392*** (0.045)	0.654*** (0.082)	1.051*** (0.151)
Seabee	0.898*** (0.084)	0.816*** (0.08)	0.626*** (0.197)
Security	0.904*** (0.1)	1.45*** (0.342)	1.364*** (0.297)

Table 15. Logit regression results, first-term deployment spells (continued)

Variable	4YO sample[a] Coefficient[d] (Standard Error)	5YO sample[b] Coefficient[d] (Standard Error)	6YO sample[c] Coefficient[d] (Standard Error)
Surface Engineering	0.183*** (0.033)	0.509*** (0.091)	0.843*** (0.137)
Surface Operations	0.512*** (0.032)	0.683*** (0.082)	0.6*** (0.14)
Support	0.456*** (0.034)	0.786*** (0.09)	0.483*** (0.183)
FY 1996	-0.061** (0.029)	0.228*** (0.078)	0.238*** (0.051)
FY 1997	-0.023 (0.028)	-0.042 (0.084)	0.282*** (0.056)
FY 1998	0.156*** (0.03)	-0.167** (0.077)	0.072 (0.063)
FY 1999	0.116*** (0.032)	0.001 (0.074)	0.076 (0.066)
FY 2000	0.243*** (0.031)	0.338*** (0.071)	0.47*** (0.068)
FY 2001	0.717*** (0.029)	0.653*** (0.068)	0.967*** (0.063)
FY 2002	0.639*** (0.029)	0.522*** (0.069)	0.678*** (0.065)
FY 2003	0.554*** (0.029)	0.448*** (0.066)	0.437*** (0.066)
FY 2004	0.149*** (0.028)	-0.122* (0.062)	-0.506*** (0.074)
Constant	1.027*** (0.3)	0.485 (0.554)	2.306*** (0.746)
Pseudo R-squared	0.1296	0.2219	0.2452
Number of observations	133,326	26,385	28260

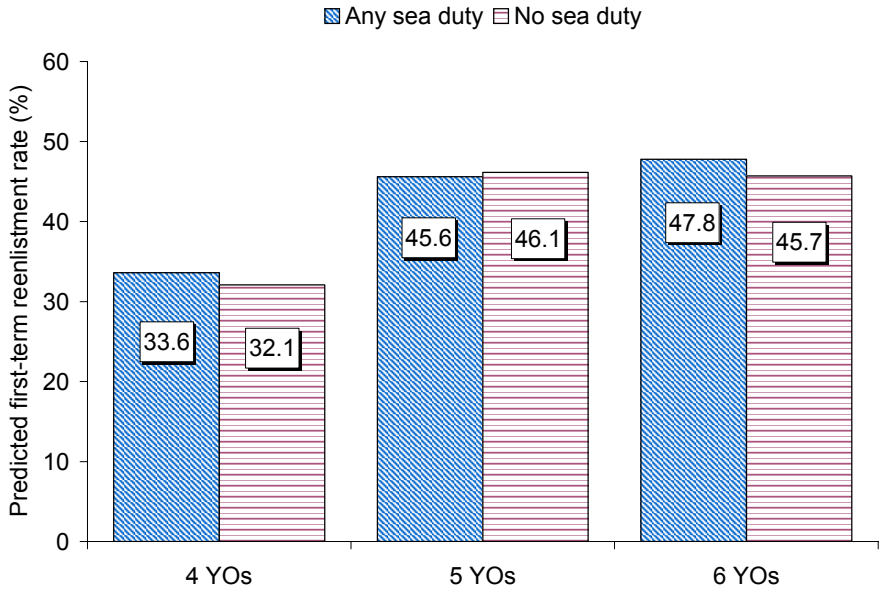
a. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
b. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
c. Omitted categories: Tier 1, White (non-Hispanic, Caucasian), E4 rating, 2 YOS, Administration Service Support Community, FY1995
d. * indicates statistical significance at the 10-percent level.
** indicates statistical significance at the 5-percent level.
*** indicates statistical significance at the 1-percent level.

Appendix F: First-term sea duty and retention

Any sea duty

Figure 17 shows the predicted reenlistment rate under two scenarios: (1) in which *everyone* experiences first-term sea duty and (2) in which *no one* does. In the latter case, we assume that no one was on sea duty or spent any portion of time on sea duty. For 4YOs and 6YOs, sea duty has a statistically significant positive effect on retention. For 5YOs, the effect of sea duty on retention is not statistically significant.[29]

Figure 17. Predicted reenlistment rate for some or no first-term sea duty[a]



a. The difference in the predicted reenlistment rate between any sea duty and no sea duty is not statistically significant for 5YOs.

29. Many studies in the 1980s found a negative impact of sea duty on retention; however, [20] found a positive relationship among some ratings.

Reaching the decision point without any sea duty experience is atypical and would explain why we're getting low retention estimates based on Sailors without any sea duty experience.[30] In addition, having been on sea duty during the first term is a broad measure of sea duty experiences, so we also examine the retention impact of more refined definitions of time on sea duty.

Amount of time on sea duty

We next turn to an evaluation of how the proportion of time spent on sea duty during the first term influences retention. We calculate the proportion of time in the first term spent on sea duty as the amount of non-initial career training time spent (a) idle, (b) on sea duty, or (c) on shore duty that was spent on sea duty. We believe our proportion of time on sea duty is an accurate measure of non-training time spent on sea duty. By using this definition, we account for the fact that Sailors have different training pipelines and available amounts of time to spend on sea duty.

We examine how a marginal increase in sea duty—a 10-percent increase in the proportion of time on sea duty—influences retention. We simulate an increase in time spent on sea duty for Sailors who actually had some sea duty experience. For all three samples, we find that an increase in the proportion of time spent on sea duty has a positive but small effect on reenlistment. The table below lists our estimates from a 10-percent increase in the proportion of time spent on sea duty. For all three groups, we get similar results, suggesting that a marginal increase in the proportion of time spent on sea duty during the first term *does not* have a negative effect on reenlistment.

	4YOs	5YOs	6YOs
Effect of a 10-percent increase in proportion of time spent on sea duty (percentage-point change)	0.60[a]	0.60[a]	0.50[a]

a. Zero lies outside the 99-percent confidence interval for this estimate.

30. For our 4YO and 6YO samples, 90 percent have had some sea duty experience by the first reenlistment decision point. For our 5YO sample, 80 percent had some sea duty experience by the first reenlistment decision point.

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List of figures

List of tables


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