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ANALYSIS OF PROFESSIONAL AND PRE-ACCESSION CHARACTERISTICS AND JUNIOR NAVAL OFFICER PERFORMANCE

by

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March 2018

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ANALYSIS OF PROFESSIONAL AND PRE-ACCESSION CHARACTERISTICS AND JUNIOR NAVAL OFFICER PERFORMANCE

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This thesis examines ways to improve the Navy's ability to track performance and professional development of junior officers and to improve job fit. First, it examines alternative measures of junior officer performance from fitness report scores to track officers' performance and to assess job fit, whether in original job assignments or following lateral transfers. The findings show that warfare-qualified unrestricted-line officers who lateral transfer into restricted-line communities have higher seven- and ten-year retention rates and significantly higher fitness report scores and O-4 promotion rates than officers who originally commissioned into a restricted-line community. Furthermore, as the Navy increases its efforts of talent management, the thesis explores potential markers of talent, such as additional qualification designations. It finds that surface warfare officers who qualify engineering officer of the watch during their division officer tour(s) are more likely to stay in the Navy at least ten years and have significantly higher O-4 promotion rates and fitness report scores than non-qualifiers. Retention and performance outcomes are also higher for surface warfare officers who qualify engineering officer of the watch during their division officer tour(s) and lateral transfer into a restricted line community than officers who originated in the restricted line community.

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

AQD	Additional Qualification Designation
BUPERS	Bureau of Naval Personnel
CNA	Center for Naval Analysis
CNO	Chief of Naval Operations
CNP	Chief of Naval Personnel
CO	Commanding Officer
DMDC	Department of Defense Manpower Data Center
EOOW	Engineering Officer of the Watch
FITREP	Fitness Report
LDO	Limited Duty Officer
MILPERSMAN	Military Personnel Manual
MSR	Minimum Service Requirement
NAVPERSCOM	Navy Personnel Command
NOBC	Navy Officer Billet Classification
NOOCS	Navy Officer Occupational Classification System
NROTC	Naval Reserve Officers Training Corps
OCS	Officer Candidate School
OIC	Officer in Charge
OPINS	Officer Personnel Information System
PES	Performance Evaluation System
PET	Performance Evaluation Transformation
RL	Restricted Line
RS	Reporting Senior
SSP	Subspecialty
SWO	Surface Warfare Officer
SWOSDOC	Surface Warfare Officer School Division Officer Course
URL	Unrestricted Line
USNA	United States Naval Academy

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I. INTRODUCTION

A. PURPOSE

The Chief of Naval Personnel (CNP) has identified two fundamental challenges in the Navy's personnel domain: (1) the increased competition for talent, and (2) the need to change personnel processes in order to compete effectively for talent (Burke, 2018). The CNP acknowledges the Navy is in a "War for Talent." This relates to a core pillar in the Chief of Naval Operations' (CNO) strategy, *A Design for Maintaining Maritime Superiority*—to strengthen the Navy team for the future. Accomplishment of this pillar requires the aggressive implementation of the Navy's talent management program, *Sailor 2025* (Richardson, 2016). The CNP states, "Sailor 2025 is a living, breathing set of initiatives aimed at modernizing our personnel management and training systems to more effectively recruit, train, and manage the force of tomorrow" (Burke, 2018). For the Navy to strengthen its force for the future, specifically the officer corps, it must effectively recruit high-quality applicants. Additionally, the Navy must provide an accurate measure of junior officer performance to target the most talented officers for training, retention and promotion. This thesis addresses issues aligned with the Navy's ability to identify talent and generate quality by placing the right officers in the right job.

In an effort to improve the Navy's ability to identify and promote talent, the Navy is undergoing a Performance Evaluation Transformation (PET) aimed at tracking performance and professional development with a data-rich approach. The Chief of Naval Personnel views the new evaluation system as a way to track performance and professional development in greater detail and to improve job fit of naval personnel. The data collected through PET will aid future personnel decisions regarding promotions, retention, and assignments (Burke, 2018). The PET efforts have identified three dimensions of talent: technical capability (the officer's set of skills and abilities), process maturity (the degree of reliability of officer's performance), and absorptive capacity (the officer's capacity to innovate) (B. Palmer, personal communication, March 9, 2017).

This thesis investigates how different measures of technical capacity, such as additional qualification designations, or technical background, can help the Navy identity talent with the use of already-collected personnel data. In addition, this thesis explores alternative measures of performance to investigate the relationship between technical capacity and process maturity. Specifically, using a detailed data set, this thesis examines alternative measures of junior officer performance from fitness report scores that can be used to track officers' performance and measure officers' job fit, whether in their original job assignments, or following lateral transfer to new designators. One of the CNO's pillars, strengthening the Navy team for the future, emphasizes increasing career choice and flexibility. Lateral transfer is one way the Navy provides career choice flexibility and contributes to improving job fit and retention of top-performing officers.

This thesis' findings provide insight that can assist leadership in leveraging professional and background characteristics of naval officers in improving performance tracking and job fit. Additionally, this thesis provides insight into whether the lateral transfer process aligns with the CNO's strategy, *A Design for Maintaining Maritime Superiority* and the Navy's *Sailor 2025* initiative.

B. RESEARCH QUESTIONS

The primary research questions addressed in this thesis are listed below.

- What are some alternative measures of junior officer performance, including fitness report marks, which could adequately measure performance?
- What professional and pre-accession attributes predict differences in measured performance among junior officers?

The secondary research question is:

- How do warfare-qualified officers who lateral transfer perform once they join their new community?

C. SCOPE AND METHODOLOGY

This thesis includes a quantitative multivariate analysis of the relationship between junior officers' professional and pre-accession attributes and their performance and retention. The thesis uses a large individual-level data set on officers who joined the Navy between 1999 and 2003, and who are tracked longitudinally until they promote to O-4 or separate from the Navy. The data is drawn from Department of Defense Manpower Data Center (DMDC) and Bureau of Naval Personnel/Navy Personnel Command (BUPERS-NAVPERSCOM) personnel files.

To measure performance, the thesis examines alternative measures using fitness report scores to track officers' performance and measure job fit, whether in the original job assignments, or following lateral transfer. Furthermore, as the Navy increases its efforts of talent management based on a data-rich approach, the thesis explores potential markers of talent, such as additional qualification designations or technical background, which could help Navy identity talent with the use of already-collected personnel data.

D. ORGANIZATION

This rest of the thesis is organized as follows. Chapter II provides background information on the applicable institutional and procedural rules that govern Navy officer career paths, performance evaluations, and the lateral transfer process. Chapter II describes in more detail the Navy's surface warfare officer (SWO) career path, additional qualification designators (AQD), fitness reports (FITREP), and the lateral transfer process. In addition, Chapter II conducts a literature review to establish a foundation for framing the research used in this thesis. The literature review examines the quantitative multivariate analysis approaches used in previous relevant studies and the main findings. Chapter III provides a through description of the data set and the variables used to conduct the statistical analysis. Chapter IV and Chapter V include the results from the multivariate regression models. Chapter VI provides a summary of findings, conclusions, and offers recommendations based on the findings of this thesis.

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II. BACKGROUND AND LITERATURE REVIEW

This thesis examines the relation between junior naval officer characteristics, recorded in military personnel files, and performance and retention outcomes. Furthermore, the thesis investigates the quality of the job match for junior naval officers who lateral transfer. Therefore, this chapter provides Navy procedural information on performance evaluations, professional characteristic classifications, training and qualification processes, and the lateral transfer process. It also discusses the approach and results from previous research that analyzes performance and retention of junior officers.

A. NAVY PERFORMANCE EVALUATION SYSTEM

This section provides background information and reviews previous research on the Navy's Performance Evaluation System (PES). The PES is the primary means by which the Navy measures and documents junior officer performance. A thorough understanding of the PES allows for the development of a reliable performance metric, as presented later in this thesis. The predictive power of professional and pre-accession characteristics on the developed performance metric provides the means by which to answer the research questions listed in Chapter I.

Article 1129 of U.S. Navy Regulations requires records be maintained on officer and enlisted personnel which reflect their fitness for service and performance of duties. Specific policy guidance for performance evaluations is published in the Bureau of Naval Personnel Instruction (BUPERSINST) 1610.10D CH-1.

The respective reporting senior, either a commanding officer (CO) or officer in charge (OIC), evaluates the performance of the officers within their commands. The reporting senior documents performance on a fitness report (FITREP) which is placed in the officer's official service record. The FITREP lists the seven performance traits officers are graded on including professional expertise, command or organizational climate/equal opportunity, military bearing/character, teamwork, mission accomplishment and initiative, leadership, and tactical performance. Each performance trait is scored between 1.0 and 5.0. The trait scores are categorized as follows: 1.0 is "below standards," 2.0 is "progressing,"

3.0 “meets standards,” 4.0 is “above standards,” and 5.0 “greatly exceeds standards.” Officers receive a mark of “not observed” in circumstances when the performance trait category was not observed during the reporting cycle. The seven traits scores are averaged and listed on the FITREP as the member’s trait average.

An officer’s FITREP trait average is influenced by both individual performance and the scale their respective reporting senior uses to assign trait scores. The Navy PES mitigates for differences in reporting senior scores by documenting both an officer’s trait average and the summary group average. The summary group average is the overall trait average for officers evaluated within the specific competitive category and FITREP time period. The competitive categories are based on officer designators and can be found in BUPERSINST 1610.10D CH-1. A FITREP is considered competitive when more than one officer within a competitive category is evaluated at the same time by the same reporting senior. The member’s trait average compared to the summary group average determines if the officer was above, at, or below the average of the officers evaluated within the same competitive category for the specific FITREP cycle.

A second way the Navy PES mitigates for differences in reporting senior scores is by tracking the reporting senior’s cumulative average. The reporting senior’s cumulative average comprises of their overall FITREP trait average for each specific rank at the moment in time they complete each FITREP. The reporting senior’s cumulative average allows a comparison of an officer’s trait average to all officers the reporting senior has graded within each specific rank.

Selection boards use officers’ FITREP trait averages in multiple ways. First, they compare each individual officer’s trait average to the summary group average. Second, they compare each officer’s trait average to the reporting senior’s cumulative trait average. Promotion boards consider officers with a FITREP trait average above both the summary group average and cumulative trait average in a positive manner.

In addition to trait scores, performance is also documented through promotion recommendations. The reporting senior must recommend each officer for one of six promotion recommendation categories. Officers with less than three months at the

command or in a training status can receive a promotion recommendation of "not observed" while all other officers receive a promotion recommendation of either "significant problems," "progressing," "promotable," "must promote," and "early promote." The exception to this policy are non-limited duty officers in paygrades O-1 and O-2 who are ineligible to receive "must promote" and "early promote" promotion recommendations (Chief of Naval Personnel, 2016). Reporting seniors are limited in the number of "early promote" and "must promote" promotion recommendations they can assign for each competitive category. These limits can be found in BUPERSINST 1610.10D CH-1.

The current FITREP system has several drawbacks. One such drawback is the forced distribution of promotion recommendations. This can limit the reporting senior's ability to provide accurate performance recommendations by restricting the number of "early promote" and "must promote" recommendations. This thesis mitigates this drawback in the FITREP system by not using performance recommendations as a performance outcome.

Another weakness in the current FITREP system occurs when officers receive non-competitive FITREPs. Officers who are not ranked against other officers receive a trait average equal to the reporting senior's summary group average. This does not provide useful information to promotion boards because they are unable to compare an officer's performance relative to other officers. This thesis mitigates this issue by not comparing the officer's trait average to their respective reporting senior's summary group average in the FITREP performance outcome variable. Instead, the FITREP performance outcome variable compares the reporting senior's cumulative trait average to the officer's trait average.

Previous studies have utilized FITREPs to examine the effect of officer characteristics on performance to include Bowman (1990), Bowman and Mehay (2002), and Vellucci (2017). Bowman (1990) utilizes FITREPs to classify junior officer performance as superior for those ranking in top one percent for both "overall summary" and "command desirability" categories. However, the methodology Bowman (1990) uses to identify top-performing officers in not applicable to the officers examined in this thesis

since those traits do not exist on current Navy FITREPs. Bowman and Mehay (2002) use the percentage of "recommendation for accelerated promotion" (RAP) each officer receives to measure FITREP performance. Similar to Bowman (1990), the FITREP grade RAP no longer exists on current FITREPs. In addition, this metric lacks a normal distribution since the concentration of RAPs fall in the upper end of the scale (Bowman & Mehay, 2002, p. 66).

Vellucci (2017) uses the Navy's current officer performance evaluation system to construct measures of performance based on FITREP grades. She calculates the relative average FITREP score based on the ratio of an officer's individual trait score to the reporting senior's cumulative average. This FITREP comparison puts all officers, regardless of designator, on a level playing field and applies to the Navy's current FITREP format.

B. PROFESSIONAL CHARACTERISTIC CLASSIFICATIONS

"The Navy Officer Occupational Classification System (NOOCS) is the method the Navy uses to identify skills, education, training, experience and capabilities related to both officer personnel and manpower requirements" (Department of the Navy [DoN], 2018). Volume I of the NOOCS consists of four sections: designator and grade; subspecialty (SSP); Navy Officer Billet Classification (NOBC); and Additional Qualification Designator (AQD).

The first part of the NOOCS Volume I includes designator and grade. Designators and grades provide the primary means to classify, identify, and document officer manpower inventory and requirements (DoN, 2018). Designators are four-digit numbers that identifies an officer's primary occupational specialty, and an officer's grade identifies their respective rank. The NOOCS also includes SSP codes to identify officers with "postgraduate education (or equivalent training and/or experience) in various fields and disciplines" (DoN, 2018). SSP codes are considered a secondary classification method to designators in which the Navy identifies subspecialists and billets that require subspecialists (DoN, 2018). The third part of the NOOCS Volume I is NOBC. The NOBC provides a functional description of the occupational duties for each billet (DoN, 2018).

The NOOCS Volume I's final section contains AQDs. AQDs identify specific qualifications and skills not identified in other sections of NOOCS (DoN, 2018).

This thesis seeks to identify characteristics recorded in Navy personnel files that can predict differences in measured performance of junior officers. AQDs identify skills and knowledge officers acquire throughout their career and are readily available in Navy personnel files records. One specific AQD the Navy tracks for surface warfare officers (SWO) is the engineering officer of the watch (EOOW) qualification. The four AQD codes the Navy uses to identify EOOW qualified officers include LC1 and LC4 for steam propulsion plants, LC2 for diesel propulsion plants, and LC3 for gas turbine propulsion plants (DoN, 2018).

Nolan (1993) observes officers from the O-3 (1981 to 1985) and O-4 (1985 to 1990) selections boards to assess the effect of the EOOW qualification and other characteristics on retention and performance outcomes for SWOs. Nolan (1993) finds that retention between the O-3 and O-4 promotion boards is no different between SWOs who qualify EOOW early in their careers versus those who do not qualify. On the other hand, Nolan's (1993) results show that early EOOW qualifiers have an 8.9 percent higher probability for O-4 promotion than non-early EOOW qualifiers. Although the latter result supports the view that EOOW qualification signals differences in officer quality, the data Nolan (1993) uses is somewhat dated and the research does not capture FITREP performance.

Bowman (1990) also examines the effect of AQDs on career performance outcomes. Specifically, he tests the hypothesis held by ADM Hyman Rickover that the best naval officers have strong technical backgrounds. Bowman (1990) analyzed data on 1,560 male Naval Academy graduates from the classes 1976–1980 who selected surface and submarine warfare communities. The officers were tracked through their initial five-year obligation. His two measures of quality include FITREP performance and retention. Specifically, he uses fourth year officer FITREPs performance and retention six months beyond the minimum service requirement for his outcome variables.

Although not the main focus of Bowman's (1990) research, he finds that officers who earn their surface and submarine warfare qualifications within their first sea tour

display higher FITREP scores and retention. "Achieving this status by the end of one's first sea duty increases the probability of achieving superior officer performance by 14.2 percent in the nuclear navy and by 35.1 percent in the conventional surface navy, while increasing the probability of staying beyond one's initial period of obligation by 6 percent in the conventional surface navy and by 10.2 percent in the nuclear navy" (Bowman, 1990, p. 281). Bowman (1990) concludes that the length of time it takes officers to earn their warfare qualification may signal differences in motivation and ability.

There are several issues with Bowman's research. Naval Academy graduates accounted for only approximately 18 percent of commissioned officers during the time period covered by his data and, therefore, his sample of USNA graduates is not representative of the officer population (Bowman 1990, p. 273). In addition, current Navy policy does not allow SWOs who do not attain their warfare qualification within their first 18 months of their initial sea assignment to continue in the SWO community without a waiver. Therefore, the length of time it takes officers to attain their warfare qualification is not a relevant indicator of talent in today's training environment.

C. INITIAL SURFACE WARFARE OFFICER (SWO) TRAINING AND QUALIFICATION PROCESS

This thesis examines professional characteristics, particularly among SWOs, that can predict differences in performance and retention outcomes. As mentioned in Chapter I, the Navy seeks to use professional development data to aid future personnel decisions regarding promotions, retention, and assignments (Burke, 2018). Therefore, this section provides background information on the initial SWO training and qualification process to better understand potential professional characteristics that may signal differences in officer quality. The professional characteristics identified in this section are explanatory variables for the statistical analysis conducted in Chapters IV and V. The explanatory variables are tested to determine if talent indicators early in an officer's career predict measured differences in future career outcomes.

The primary commissioning sources for SWOs in training (referred to by their designator 116X) include the Naval Academy, Naval Reserve Officers Training Corps

(NROTC), and Officer Candidate School (OCS). Prior to January 2003, newly commissioned 116Xs reported to the Surface Warfare Officer School Division Officer Course (SWOSDOC) in Newport, RI for six months of classroom-style instruction. Upon SWOSDOC graduation, 116Xs reported to their respective ships where they received follow-on on-the-job training and completed the required initial qualification process (Bowman, Crawford, & Mehay, 2008, p. 1). This thesis analyzes officer cohorts that enter the Navy between FY99 and FY03 and, therefore, the majority of 116Xs completed the six-month SWOS course. The 116Xs commissioned after January 2003 did not complete the six-month SWOS course and instead reported directly to their assigned ship. Those officers received on-the-job training and were required to complete the computer-based training called SWOS-at-Sea in conjunction with their required initial qualifications (Bowman, Crawford, & Mehay, 2008, p. 1).

The Office of the Chief of Naval Operations Instruction (OPNAVINST) 1412.2 (series) contains the SWO qualification requirements applicable to the time period of the 116Xs analyzed in this thesis. The qualifications 116X officers must complete include: basic damage control, SWO engineering (this qualification is different from engineering officer of the watch), small boat officer, in port officer of the deck, combat information center watch officer, and underway officer of the deck (Chief of Naval Operations, 2002, p. 3). 116Xs must complete these qualifications before attaining their surface warfare officer (SWO) qualification. 116Xs serve as division officers during this time period in their career. 116Xs must qualify SWO within 18 months of checking onboard their first ship; however, commanding officers may grant six-month extensions (Chief of Naval Operations, 2002, p. 3). 116Xs who fail to qualify SWO within the prescribed timelines are redesignated out of the community.

Engineering officer of the watch (EOOW) is an optional qualification SWOs may earn during their division officer tours. The EOOW qualification is not required at the division officer level; however, SWOs must qualify EOOW in order to command at sea. Although all division officers must qualify SWO engineering, division officers in engineering billets may have an advantage in qualifying EOOW over division officers in non-engineering billets. Since EOOW is an optional qualification at the division officer

level and perceived as difficult to obtain qualification, it may be an indicator of unobserved characteristics of officers, such as motivation, cognitive ability, or desire to align with Navy's requirements in the long run. This professional characteristic may indicate officer talent and it will be tested later in this thesis as to whether it can predict differences in performance and retention outcomes later in the SWO's career.

D. LATERAL TRANSFERS/REDESIGNATIONS

The purpose of lateral transfers and redesignations in the Navy is "to provide flexibility in officer community manning and improve the Navy's return on investment in officer training and education by maximizing and utilizing the specialized skillsets of officers throughout their careers" (Office of the Chief of Naval Operations, 2016). The authority to transfer officers between communities is derived in Chapter 539 of United States Code Title 10. The Navy provides specific lateral transfer/redesignation policy guidance in the Military Personnel Manual (MILPERSMAN) 1212–010 and Office of the Chief of Naval Operations Instruction (OPNAVINST) 1210.5A. Many Navy Restricted Line officer communities, including Human Resources Officer, Foreign Area Officer, and Engineering Duty Officer, rely predominately on lateral transfers and redesignations to fill their inventory of billets authorized. Although the lateral transfer and redesignation policies are governed by the same instructions, the terms are not synonymous.

The term redesignation is "any change of designator in the line of the Navy to a different line competitive category (e.g., unrestricted line to restricted line) or in the same competitive category to a different specialty (e.g., surface warfare officer to pilot)" (Office of the Chief of Naval Operations, 2016). There are several circumstances in which redesignations can occur without requiring a board action. One instance is when officers redesignate after they obtain a warfare qualification within certain designators. An example of this happens when surface warfare officers in training earn their warfare qualification and redesignate from the 116X designator to the 111X designator. Redesignations also occur when officers fail to complete entry-level training programs, such as officers unable to complete flight school requirements. Navy Personnel Command (NAVPERSCOM) is

responsible for changing officer designators in these circumstances without a formal board action (Navy Personnel Command, 2002).

A third way redesignations occur is when officers apply to and are selected for lateral transfer by a lateral transfer and redesignation board. Unrestricted Line (URL) officers comprise the majority of lateral transfers in the Navy. Dailey (2013) studied the semiannual lateral transfer boards from November 2010 until November 2012 and found 74.7 percent of lateral transfers consisted of unrestricted line (URL) officers. It is important to note that URL officers must have achieved their warfare qualification to request lateral transfer (Navy Personnel Command, 2002). For purposes of this research, only officers selected at a formal lateral transfer and redesignation board will be treated as lateral transfers. The studies conducted by Moore and Reese (1997), Mooney and Cook (2004), and Dailey (2013) provide more extensive background information on the lateral transfer process.

Several studies, including Monroe and Cymrot (2004), Kleyman and Parcell (2010), and Vellucci (2017), examine the effect of lateral transfer on officer performance and retention. Kleyman and Parcell (2010) at the Center for Naval Analyses (CNA) observe 2,598 lateral transfer applicants between June 2004 and November 2009 and compare the retention outcomes of officers selected for lateral transfer to those not selected. The study finds officers approved for lateral transfer are four times more likely to stay in the Navy at least 36 months after the lateral transfer board than officers who apply for lateral transfer and are not selected (Kleyman & Parcell, 2010, p. 25). However, Kleyman and Parcell (2010) do not compare retention and performance outcomes of officers who lateral transfer to their new Navy community peers to test whether the lateral transfer and redesignation process generates a good job fit for the transferred officers.

Vellucci (2017) uses data on officers who joined the Navy between FY99 and FY03 to investigate whether the Navy's lateral transfer process improves the quality of the job match. Vellucci (2017) measures the effect of lateral transfer and other officer characteristics on four career outcomes: MSR retention; ten-year retention; O-4 promotion; and FITREP performance. The author finds that officers who successfully lateral transfer or redesignate have higher MSR- and ten-year retention rates than officers originally

assigned to the community joined by transferees (Vellucci, 2017, p. 77). In addition, male lateral transfers are found to promote to O-4 at higher rates than male non-lateral transfers; however, female lateral transfers have O-4 promotion rates not statistically different than female non-lateral transfers (Vellucci, 2017, p. 78).

However, the definition of a lateral transfer in Vellucci (2017) includes both administrative redesignations that occur without board action as well as those approved by a lateral transfer board. In addition, the lateral transfer variable captures the dissolution of the Fleet Support community in 2001. Fleet Support officers were given the opportunity to redesignate into the Information Professional, Human Resource, and Supply Corps communities or retain as Fleet Support Officers in the 1100 designator (CNP, 2001). This definition generates about four thousand lateral transfers for the five officer cohorts, 1999–2003, during their first 10 years of service, which exceeds the number of board approved lateral transfers during this time period. Dailey (2013) finds the average number of approved lateral transfers per year for the entire Navy to be approximately 223 from November 2010 to November 2012.

Unqualified officers who redesignate, such as those who fail to meet flight school requirements, may possess different characteristics than qualified officers who are selected for lateral transfer. In addition, administrative redesignations due to routine changes in designator after completion of training or qualifications do not represent voluntary decisions by officers to seek different jobs. This thesis seeks to examine the effect of lateral transfer for qualified URL officers on career retention and performance outcomes, and, therefore, excludes all unqualified URL officers who redesignate in the definition of a lateral transfer.

Monroe and Cymrot (2004) compare the retention and performance outcomes of qualified URL officers who lateral transfer into RL, civil engineer corps, and supply corps communities to non-warfare qualified officers in those respective communities. They examine officer retention to 108 and 168 months as well as promotion to O-4 and O-5 given officers stay in the navy at least 108 months and 168 months, respectively (Monroe & Cymrot, 2004, p. 38). They find warfare qualified RL/Staff officers are promoted and retain at higher rates than non-warfare qualified RL/Staff officers, after controlling for race,

marital status, college quality, fiscal year, accession source, and grades (Monroe & Cymrot, 2004, p. 12). Specifically, warfare qualified RL/Staff officers have an 18 percentage point higher O-4 promotion rate than non-warfare qualified RL/Staff officers, given they stayed in the Navy at least 108 months (Monroe & Cymrot, 2004, p. 40). In addition, the probability of warfare qualified RL/Staff officers staying in the Navy at least 108 months is 44.2 percentage points higher than non-warfare qualified RL/Staff officers (Monroe & Cymrot, 2004, p. 40).

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III. DATA AND SUMMARY STATISTICS

A. DATA DESCRIPTION

The data used in the statistical analyses in this thesis is drawn from Department of Defense Manpower Data Center (DMDC) and Bureau of Naval Personnel/Navy Personnel Command (BUPERS-NAVPERSCOM) personnel files. The DMDC data set captures 16,108 officers who commissioned into the Navy in grade O-1 from Fiscal Year 1999 to Fiscal Year 2003 (DMDC, 2014). This data set contains information on demographic, pre-accession, and professional characteristics of these newly commissioned officers. The BUPERS-NAVPERSCOM data set includes information on fitness report (FITREP) scores on a representative sample of 8,514 officers from the same accession cohorts covered by the DMDC data. Officers in both data sets are tracked longitudinally until they are promoted to O-4, or separate from the Navy.

This thesis seeks to identify potential talent markers among the characteristics of junior officers already available in military personnel records. It tests whether these markers statistically predict important career outcomes, including measures of job performance. Career milestone events such as promotion and retention, as well as FITREP scores, are used to measure officer performance and retention outcomes. The data sets include information on five consecutive annual Navy officer entry cohorts (year groups) to mitigate the risk of observing a potential outlier cohort that significantly differs in officer quality. Using data from multiple cohorts also helps to control for promotion vacancies, labor market conditions, and other policies that may change over time and could affect retention or promotion outcomes across year groups. Additionally, the officers are tracked longitudinally throughout their careers to allow them time to achieve significant career milestone events.

FITREPs are the primary way the Navy currently documents officer performance. The two measurable ways FITREPs differentiate officer performance is through the performance trait scores and promotion recommendations given by the reporting senior (RS). Maugeri (2016) measured officer performance by calculating the percentage of "early promotion" FITREP recommendations each officer received. However, officers in pay

grades O-1 and O-2 (excluding LDO) are unable to receive "early promotion" FITREP recommendations (Chief of Naval Personnel, 2016). Therefore, the FITREPs officers receive in their first four years of service would be excluded from the analysis of this thesis. Additionally, not all FITREPs are considered competitive. A competitive FITREP is recorded when two or more officers in the same competitive category are ranked against each other. Competitive FITREPs restrict the number of "early promotion" FITREP recommendations a RS can assign. Conversely, officers are able to receive "early promotion" recommendations for all non-competitive FITREPs. Therefore, since not all officers receive the same number of competitive FITREPs, using the percentage of "early promotion" FITREPs is not a reliable measure of officer performance. However, individual trait scores can be used as measures of junior officer performance.

Vellucci (2017) measures officer performance by comparing an officer's FITREP average trait scores to his/her reporting senior's cumulative average scores. This metric measures an individual officer's performance relative to all other officers in the same grade previously evaluated by the same reporting senior. Relative FITREP performance controls for the variance in reporting senior performance marks since reporting seniors use different scales in evaluating officers.

This thesis develops an alternate FITREP performance measure similar to the one in Vellucci (2017), but with some differences. Whereas Vellucci calculates the ratio of the individual officer's trait average to the RS's cumulative average, in this thesis the FITREP indicator is based on the difference between an individual's trait average on each FITREP and the RS's cumulative average. The differences are summed for all FITREPs received in a given period and divided by the number of FITREPs each officer receives over the given period (such as years 6–10). The average FITREP difference for each officer for the specified time period is then categorized into quartiles. Whereas Vellucci's performance measure looked at whether officers scored above the reporting senior's cumulative average, the performance measure in this thesis identifies officers who rank in the top quartile for relative average FITREP scores, making the statistical estimates easier to interpret. In addition, the top quartile for relative average FITREP measure easily distinguishes high-performing officers—capturing officers the Navy seeks to retain.

Officer performance can also be measured by whether or not they are selected for promotion to O-4. The Navy promotes fully qualified officers to paygrades O-2 and O-3 without selection board action. O-4 is the first paygrade an officers' record is evaluated by a selection board to determine promotion. This thesis utilizes O-4 promotion among ten-year stayers as a measure of performance, as done in numerous prior studies, including Bowman and Mehay (2002), Koopman (1995), Maugeri (2016), Monroe and Cymrot (2004), Mundell (2016), and Vellucci (2017).

Seven- and ten-year retention outcomes also are important indicators during an officer's career. Longer retention is important to the Navy in maximizing the return on investment in recruiting, educating, and training new officers. Surface warfare, submarine, and special warfare officers have either a four- or five-year service obligation, depending on commissioning program. Also, officers who lateral transfer are obligated to serve an additional two years in the Navy. Thus, measuring retention at seven years of service instead of the end of the minimum service requirement allows surface warfare, submarine, and special warfare officers to complete their service obligations and make voluntary retention decisions, regardless of whether they completed a lateral transfer in the first five years or not.

The retention outcome is similar to the approach adopted in Mundell (2016) and Vellucci (2017) to measure retention beyond the initial Minimum Service Requirement (MSR). However, the seven-year retention approach adopted in this thesis is more accurately capturing the time when officers can make stay or leave decisions, including for those who may lateral transfer and accumulate additional service obligation. Although seven-year retention improves upon the MSR retention approach used in previous research, it is possible that some officers who complete lateral transfers early in their careers may still be under orders and unable to separate from the Navy by their seventh year of service. Any such measurement error will upwardly bias the effect of lateral transfer on seven-year retention. However, as the descriptive statistics show, the majority (61.7 percent) of officers who lateral transfer do so by year five.

This research also utilizes ten-year retention as a dependent variable. Those who stay at least ten years represent officers who are likely to remain in the Navy and complete a career. During the time period in the data, at 20 years of service, officers are eligible to

retire and receive an immediate pension. The ten-year retention outcome is similar to retention measures used by Maugeri (2016), Mundell (2016), and Vellucci (2017). Table 1 defines the dependent (outcome) variables used in the statistical analyses.

Table 1. Dependent Variable Definitions

Dependent Variable	Variable Definition
Relative Average Top Quartile 6–10 YOS	= 1 if difference in FITREP trait scores relative to the reporting senior's cumulative average for 6–10 YOS is in the top quartile; else = 0
O-4 Promotion	= 1 if promoted to O-4; else = 0
Seven Year Retention	= 1 if retained in the Navy for at least 7 years; else = 0
Ten Year Retention	= 1 if retained in the Navy for at least 10 years; else = 0

This section discusses the independent (explanatory) variables that are used in the multivariate analyses in this thesis. The independent variables are separated into the following categories: demographics, pre-accession characteristics, professional characteristics, and cohort year. Demographic variables include gender, marital status, dependent children status, race, and ethnicity. Table 2 provides definitions of the demographic variables.

Table 2. Demographic Variable Definitions

Independent Variable	Variable Definition
Female	= 1 if female; else = 0
Married	= 1 if married at time of commissioning; else = 0
Married Year 2	= 1 if married by year 2; else = 0
Married Year 6	= 1 if married by year 6; else = 0
Dependent Children Year 2	= 1 if has dependent child/children by year 2; else = 0
Dependent Children Year 6	= 1 if has dependent child/children by year 6; else = 0
White Non-Hispanic	= 1 if White (race) & Non-Hispanic (ethnicity); else = 0
Black Non-Hispanic	= 1 if Black (race) & Non-Hispanic (ethnicity); else = 0
Asian	= 1 if Asian; else = 0
Hispanic	= 1 if Hispanic; else = 0
Other Unknown Race	= 1 if race is other/unknown; else = 0

Pre-accession variables consist of commissioning source and whether the officer completed a STEM related undergraduate degree. The technical background may be an

indicator of skills or abilities that might predict performance differences for naval junior officers, and it is one of the dimensions of the Technical Capability in the PET. The *STEM Degree* variable definition comes from Maugeri's (2016) research, which includes officers who hold bachelor degrees listed on the NROTC Scholarship degree list (Naval Service Training Command Officer Development, 2016) and the Manual of Navy Officer Manpower and Personnel Classifications Volume II, Appendix D (Department of the Navy, 2018. Table 3 lists the undergraduate degrees contained in the *STEM Degree* variable. Maugeri's (2016) compared officers with a STEM educational background against all others. This thesis includes the variable *STEM Degree Unknown* to capture officers whose educational records are incomplete. Table 4 provides definitions of the pre-accession variables.

Table 3. STEM Degrees. Source: Maugeri (2016).

Aerospace, Aeronautical, Astronautical Engineering	General Science
Agricultural/Biological Engineering & Bioengineering	Industrial Engineering
Architectural Engineering/Architectural Engineering Technologies	Manufacturing Engineering
Astrophysics	Materials Engineering
Biochemistry, Biophysics & Molecular Biology	Mathematics
Biomathematics & Bioinformatics	Mechanical Engineering
Biomedical/Medical Engineering	Metallurgical Engineering
Biotechnology	Microbiological Sciences and Immunology
Cell/Cellular Biology & Anatomical Sciences	Mining & Mineral Engineering
Ceramic Sciences & Engineering	Naval Architecture & Marine/Naval Engineering
Chemical Engineering	Nuclear & Industrial Radiologic Technology
Chemistry	Nuclear Engineering
Civil Engineering	Ocean Engineering
Computer Engineering	Oceanography
Computer Programming	Petroleum Engineering
Computer Science/Info. Tech.	Pharmacology & Toxicology
Construction Engineering	Physics
Electrical Engineering	Physiology, Pathology & Related Sciences
Electronics & Comm. Engineering	Polymer/Plastics Engineering
Engineering Mechanics	Quantitative Economics
Engineering Physics	Statistics
Engineering Science	Systems Engineering
General Engineering	Textile Sciences & Engineering

Table 4. Pre-accession Characteristic Variable Definitions

Independent Variable	Variable Definition
Naval Academy	= 1 if commissioning source was the Naval Academy; else = 0
NROTC	= 1 if commissioning source was NROTC; else = 0
OCS	= 1 if commissioning source was OCS; else = 0
Direct/Other Commissioning	= 1 if commissioning source was Direct, Other, or Unknown; else = 0
STEM Degree	= 1 if undergraduate degree was in a STEM related degree program; else = 0
STEM Degree Unknown	= 1 if undergraduate degree in a STEM related degree program is unknown; else = 0

Table 5 presents definitions of the variables for officer professional characteristics, which include officer designators and whether an officer completes a lateral transfer. The variable *Lateral Transfer* is restricted to officers who lateral transfer and does not include redesignations. Vellucci (2017) classifies both qualified officers who lateral transfer and unqualified officers who redesignate as lateral transfers. However, unqualified officers who redesignate may possess different characteristics from qualified officers who lateral transfer. Therefore, this thesis excludes unqualified officers who redesignate from the definition of the *Lateral Transfer* variable.

The variable *EOOW Year 4* captures surface warfare officers (SWO) who qualify as engineering officer of the watch (EOOW) within their first four years. It is important to note that SWOs are not required to qualify EOOW during their first four years. Additionally, the EOOW qualification is considered difficult to obtain. SWOs with the time, capability, and motivation to qualify EOOW will attempt to do so. Thus, EOOW qualification may be a candidate as an indicator of talent among the surface warfare officers.

The use of EOOW qualification within the first four years of service as a measure of SWO talent can be linked to the economic value of credentialing and signaling. Credentials—such as education, training, and degrees or diplomas—can provide information to employers in two ways. First, a person who possesses a credential may indicate they have knowledge or skills that directly apply to a job. Second, a person who possesses a credential may signal that they have intrinsic abilities that increase their job-related productivity. Credentials are most likely to signal differences in ability when the credential is relatively easy for high-aptitude workers to obtain compared to lower-aptitude workers (Lazear & Gibbs 2015, p.

25). Therefore, the *EOOW Year 4* variable may represent a credential that provides an indicator of several components of quality, including aptitude and motivation. The lateral transfer and EOOW variables are included in the multivariate models to test their ability to predict the selected officer performance and retention outcomes.

Table 5. Variable Definitions of Professional Characteristics

Independent Variable	Variable Definition
Lateral Transfer	= 1 if completed lateral transfer; else = 0
Lateral Transfer Year t	= 1 if completed lateral transfer by year t, where t = 5, 6, 8, 10 YOS; else = 0
Non-SWO Lateral Transfer Year t	= 1 if non-SWO URL officer completed lateral transfer by year t, where t = 6, 8, 10 YOS; else = 0
Non-EOOW SWO Lateral Transfer Year t	= 1 if SWO who did not qualify EOOW by year four and completed lateral transfer by year t, where t = 6, 8, 10 YOS; else = 0
EOOW SWO Lateral Transfer Year t	= 1 if SWO who qualified EOOW by year four and completed lateral transfer by year t, where t = 6, 8, 10 YOS; else = 0
EOOW Year 4	= 1 if qualified EOOW by year 4; else = 0
SWO	= 1 if SWO designator at time of entry; else = 0
SUB	= 1 if SUB designator at time of entry; else = 0
Pilot	= 1 if Pilot designator at time of entry; else = 0
NFO	= 1 if NFO designator at time of entry; else = 0
Special Warfare	= 1 if Special Warfare designator at time of entry; else = 0
Restricted Line	= 1 if Restricted Line designator at time of entry; else = 0
Staff	= 1 if Staff designator at time of entry; else = 0
Unknown Designator	= 1 if unknown designator at time of entry; else = 0
SWO Year t	= 1 if SWO designator at time t, where t = 1, 2…10; else = 0
SUB Year t	= 1 if SUB designator at time t, where t = 1, 2…10; else = 0
Pilot Year t	= 1 if Pilot designator at time t, where t = 1, 2…10; else = 0
NFO Year t	= 1 if NFO designator at time t, where t = 1, 2…10; else = 0
Special Warfare Year t	= 1 if Special Warfare designator at time t, where t = 1, 2…10; else = 0
Restricted Line Year t	= 1 if Restricted Line designator at time t, where t = 1, 2…10; else = 0
Staff Year t	= 1 if Staff designator at time t, where t = 1, 2…10; else = 0
Unknown Designator Year t	= 1 if unknown designator at time t, where t = 1, 2…10; else = 0

Cohort year variables capture the fiscal year each officer was commissioned. Cohort dummies are included in the O-4 promotion model to control for differences in Navy billets authorized and other policies that can affect the number of vacancies available for each year group being reviewed for promotion. Cohort year variables are also included

in the retention models to control for differences in officer continuation bonuses and labor market conditions. Table 6 describes the cohort year binary variables.

Table 6. Cohort Year Variable Definitions

Independent Variable	Variable Definition
Cohort FY99	= 1 if officer commissioned in FY99; else = 0
Cohort FY00	= 1 if officer commissioned in FY00; else = 0
Cohort FY01	= 1 if officer commissioned in FY01; else = 0
Cohort FY02	= 1 if officer commissioned in FY02; else= 0
Cohort FY03	= 1 if officer commissioned in FY03; else = 0

B. SUMMARY STATISTICS

This section includes summary statistics for the variables that are used in the statistical analyses below. Tables 7–11 provide the summary statistics, and include the variable name, number of observations, mean, and standard deviation. As mentioned earlier, the data set includes the population of officers commissioned as ensigns between FY1999 and FY2003. These officers are tracked longitudinally until they are reviewed for promotion to O-4 or they separate from the Navy.

Table 7 lists summary statistics for the full DMDC data set, which includes the population of 16,108 O-1 officers who commissioned into the Navy during the 1999–2003 timeframe. This file was used to estimate the retention and promotion models. Table 7 shows that the sample is 18 percent *Female*, which closely matches the Navy's typical officer gender distribution. Officers who were married at commissioning represent 18 percent of the sample. The race and ethnicity variable makeup is 75 percent *White Non-Hispanic*, 7 percent *Black Non-Hispanic*, 5 percent *Asian*, 9 percent *Hispanic*, and 3 percent *Other Unknown Race*.

Table 7 also indicates that 24 percent of officers were commissioned via the *Naval Academy*, 27 percent via *NROTC*, 32 percent via *OCS*, and 17 percent via *Direct/Other Commissioning*. Additionally, officers with STEM related undergraduate degrees make up 42 percent of the sample.

Table 7. Summary Statistics of Variables in DMDC File

Variable	Obs.	Mean	Std. Dev.
Dependent Variables			
O-4 Promotion	16,108	0.42	0.49
Seven Year Retention	16,108	0.65	0.48
Ten Year Retention	16,108	0.53	0.50
Demographic Variables			
Female	16,108	0.18	0.39
Male	16,108	0.82	0.39
Married	16,108	0.18	0.39
Married Year 2	16,108	0.34	0.47
Married Year 6	16,108	0.45	0.50
Dependent Children Year 2	16,108	0.24	0.43
Dependent Children Year 6	16,108	0.26	0.44
White Non-Hispanic	16,108	0.75	0.43
Black Non-Hispanic	16,108	0.07	0.26
Asian	16,108	0.05	0.22
Hispanic	16,108	0.09	0.29
Other Unknown Race	16,108	0.03	0.17
Pre-accession Characteristic Variables			
Naval Academy	16,108	0.24	0.43
NROTC	16,108	0.27	0.44
OCS	16,108	0.32	0.47
Direct/Other Commissioning	16,108	0.17	0.37
STEM Degree	16,108	0.42	0.49
STEM Degree Unknown	16,108	0.20	0.40
Professional Characteristic Variables			
SWO	16,108	0.27	0.44
SUB	16,108	0.11	0.32
Pilot	16,108	0.23	0.42
NFO	16,108	0.11	0.31
Special Warfare	16,108	0.02	0.15
Restricted Line	16,108	0.07	0.26
Staff	16,108	0.19	0.39
Cohort Year			
Cohort FY99	16,108	0.18	0.39
Cohort FY00	16,108	0.21	0.41
Cohort FY01	16,108	0.21	0.41
Cohort FY02	16,108	0.21	0.40
Cohort FY03	16,108	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 8 lists summary statistics for the BUPERS-NAVPERSCOM data file, which was used to estimate the performance models based on FITREP scores. The data set

includes information on 8,514 officers, approximately half of the full population of newly commissioned officers recorded in the DMDC data set. The FITREP scores from the BUPERS-NAVPERSCOM data set was merged with the variables contained in the DMDC data set. The BUPERS-NAVPERSCOM data benefits this research by capturing officer performance through FITREP scores.

It is noteworthy that the data provided by BUPERS-NAVPERSCOM appears to represent a random sample of the population of five Navy accession cohorts, 1999–2003. A comparison of Table 7 (DMDC data) and Table 8 (BUPERS-NAVPERSCOM data) reveals that the differences in mean proportions in the two files are negligible for the entry-level characteristics of gender, race and ethnicity, commissioning source, and cohort year. That is, the officer sample contained in the FITREP data appears to be representative of the true cohort population for 1999–2003.

The dependent variable measures officer FITREP performance in the 6–10 YOS time period. FITREP performance is based on the difference between an individual's trait average on each FITREP and the corresponding reporting senior's cumulative average on the same FITREP. Those differences are summed for all FITREPs received in a given period and divided by the number of FITREPs each officer receives over a specified time period. This variable is called the relative average.

The variable *Relative Average Top Quartile 6–10 YOS* represent officers whose FITREP scores rank in the top 25 percent during years 6–10. The highest two quartiles (top quartile and second quartile) are officers whose relative average rank in the top 50 percent. The third quartile represents officers whose relative average ranks in the bottom 25 to 50 percent for FITREP performance, and the fourth quartile characterizes officers with the lowest 25 percent of relative average scores.

Table 8 shows the minimum and maximum average value of the difference between the individual's FITREP score relative to the reporting senior's cumulative average (i.e., the relative average) for each quartile. For example, *the top quartile* contains officers whose average difference of trait average and their respective reporting senior's cumulative

average ranges from +0.22 to a maximum of +1.11. The second quartile captures officers who relative average is between +0.12 and +0.22.

Table 8. Summary Statistics of Variables in BUPERS-NAVPERSCOM File

Variable	Obs.	Min. Value	Max. Value
Dependent Variables: Relative Average Quartiles			
Relative Average Top Quartile 6–10 YOS	1,711	0.22	1.11
Relative Average Second Quartile 6–10 YOS	1,720	0.12	0.22
Relative Average Third Quartile 6–10 YOS	1,717	0.00	0.12
Relative Average Fourth Quartile 6–10 YOS	1,717	-2.01	0.00
Dependent Variables	**Obs.**	**Mean**	**Std. Dev.**
O-4 Promotion	8,514	0.63	0.48
Seven Year Retention	8,514	0.81	0.39
Ten Year Retention	8,514	0.75	0.43
Demographic Variables			
Female	8,514	0.20	0.40
Male	8,514	0.80	0.40
Married at entry	8,514	0.21	0.41
Married Year 2	8,514	0.40	0.49
Married Year 6	8,514	0.59	0.49
Dependent Children Year 2	8,514	0.29	0.46
Dependent Children Year 6	8,514	0.36	0.48
White Non-Hispanic	8,514	0.74	0.44
Black Non-Hispanic	8,514	0.08	0.28
Demographic Variables			
Asian	8,514	0.05	0.23
Hispanic	8,514	0.09	0.28
Other Unknown Race	8,514	0.03	0.17
Pre-accession Characteristic Variables			
Naval Academy	8,514	0.22	0.41
NROTC	8,514	0.24	0.42
OCS	8,514	0.33	0.47
Direct/Other Commissioning	8,514	0.22	0.41
STEM Degree	8,514	0.49	0.50
STEM Degree Unknown	8,514	0.11	0.31
Professional Characteristic Variables			
SWO	8,514	0.26	0.44
SUB	8,514	0.12	0.32
Pilot	8,514	0.16	0.37
NFO	8,514	0.07	0.26
Special Warfare	8,514	0.01	0.12
Restricted Line	8,514	0.07	0.25
Staff	8,514	0.29	0.45

Cohort Year			
Cohort FY99	8,514	0.20	0.40
Cohort FY00	8,514	0.21	0.41
Cohort FY01	8,514	0.22	0.41
Cohort FY02	8,514	0.19	0.39
Cohort FY03	8,514	0.18	0.38

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 9 provides summary statistics for the sample of officers who completed at least seven years of service. The sample size contains 9,962 officers who stay for seven years, about 62 percent of the original entrants. For the seven year stayers the O-4 promotion rate is 67 percent, compared to 42 percent for all entrants, and the ten-year retention rate is 84 percent, compared to 53 percent for all entrants. The percentage of officers with STEM-related undergraduate degrees is 42 percent upon accession, but 46 percent for seven year stayers. This suggests officers with STEM-related undergraduate degrees have higher retention rates than both officers without STEM-related undergraduate degrees and officers with unknown undergraduate degrees. Lastly, the proportion of females is 18 percent at accession, but only 14 percent among seven-year stayers.

Table 9. Summary Statistics for Seven Year Stayers

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	9,962	0.67	0.47
Ten Year Retention	9,962	0.84	0.37
Female	9,962	0.14	0.35
Married Year 2	9,962	0.40	0.49
Dependent Children Year 2	9,962	0.28	0.45
White Non-Hispanic	9,962	0.75	0.43
Black Non-Hispanic	9,962	0.07	0.26
Asian	9,962	0.05	0.21
Hispanic	9,962	0.09	0.29
Other Unknown Race	9,962	0.03	0.18
Naval Academy	9,962	0.24	0.43
NROTC	9,962	0.22	0.42
OCS	9,962	0.35	0.48
Direct/Other Commissioning	9,962	0.18	0.39

Variable	Obs.	Mean	Std. Dev.
STEM Degree	9,962	0.46	0.50
STEM Degree Unknown	9,962	0.11	0.31
SWO	9,962	0.20	0.40
SUB	9,962	0.09	0.28
Pilot	9,962	0.30	0.46
NFO	9,962	0.13	0.34
Special Warfare	9,962	0.02	0.15
Restricted Line	9,962	0.07	0.25
Staff	9,962	0.19	0.40

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 10 lists the summary statistics for officers who stay in the Navy at least ten years. There are several significant differences between the variables at time of accession in the full sample and the ten-year stayers' sample.

The sample size for ten-year stayers is 8,546 for ten-year stayers, 53 percent of the entry cohort. The proportion of female officers decreases from 18 percent at accession to only 13 percent among ten-year stayers, which suggests that female officers may be less likely to stay in the Navy for at least ten years than males. Another significant difference is marital status. Officers married by year six in the total sample makeup 45 percent of the total sample versus 67 percent of the ten-year retention sample (when compared to officers not married by year six). This suggests married officers may be more likely to stay in the Navy for at least ten years than unmarried officers. There is a trend for officers with STEM related undergraduate degrees to retain at higher rates. The proportion of officers with STEM related undergraduate degrees at accession, the seven year retention sample, and ten year retention sample are 42 percent, 46 percent, and 47 percent, respectively, when compared to both officers without STEM related undergraduate degrees and those with unknown under graduate degrees.

Table 10. Summary Statistics for Ten Year Stayers

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	8,546	0.77	0.42
Female	8,546	0.13	0.34
Married Year 6	8,546	0.67	0.47
Dependent Children Year 6	8,546	0.42	0.49
White Non-Hispanic	8,546	0.75	0.43
Black Non-Hispanic	8,546	0.08	0.27
Asian	8,546	0.05	0.22
Hispanic	8,546	0.09	0.28
Other Unknown Race	8,546	0.03	0.18
Naval Academy	8,546	0.22	0.42
NROTC	8,546	0.22	0.41
OCS	8,546	0.36	0.48
Direct/Other Commissioning	8,546	0.19	0.39
STEM Degree	8,546	0.47	0.50
STEM Degree Unknown	8,546	0.09	0.28
SWO Year 6	8,546	0.16	0.37
SUB Year 6	8,546	0.07	0.26
Pilot Year 6	8,546	0.25	0.43
NFO Year 6	8,546	0.11	0.31
Special Warfare Year 6	8,546	0.03	0.16
Restricted Line Year 6	8,546	0.14	0.35
Staff Year 6	8,546	0.22	0.41

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 11 lists the summary statistics for the sample of officers who are promoted to the paygrade O-4. The sample of promotes is 79 percent of the officers who stayed in the Navy for 10 years. Officers with STEM-related undergraduate degrees make up 47 percent of the ten year retention sample and 48 percent of the O-4 promotion sample when compared to both officers without STEM related undergraduate degrees and those with unknown undergraduate degrees. This suggests officers with STEM degrees may promote to O-4 at higher rates than officers without STEM degrees. Gender and demographic variables remained constant from the 10-year retention sample to the O-4 promotion sample.

Table 11. Summary Statistics for Officers Who Are Promoted to O-4

Variable	Obs.	Mean	Std. Dev.
Female	6,763	0.13	0.34
Married 6	6,763	0.69	0.46
Dependent Children 6	6,763	0.43	0.50
White Non-Hispanic	6,763	0.75	0.43
Black Non-Hispanic	6,763	0.08	0.27
Asian	6,763	0.05	0.22
Hispanic	6,763	0.09	0.29
Other Unknown Race	6,763	0.03	0.18
Naval Academy	6,763	0.22	0.41
NROTC	6,763	0.21	0.41
OCS	6,763	0.37	0.48
Direct/Other Commissioning	6,763	0.20	0.40
STEM Degree	6,763	0.48	0.50
STEM Degree Unknown	6,763	0.08	0.26
SWO Year 6	6,763	0.16	0.37
SUB Year 6	6,763	0.07	0.26
Pilot Year 6	6,763	0.23	0.42
NFO Year 6	6,763	0.10	0.30
Special Warfare Year 6	6,763	0.03	0.17
Restricted Line Year 6	6,763	0.15	0.36
Staff Year 6	6,763	0.24	0.43

As described in Chapter III, data for this table is compiled from the DMDC data set.

C. DESCRIPTIVE STATISTICS

This section contains a more detailed description of the lateral transfer and EOOW variables. This thesis analyzes the performance of officers who lateral transfer by year five, eight, and ten, respectively. Table 12 shows the cumulative distribution of lateral transfers out of the SWO, SUB, Pilot, NFO, RL, and Staff communities by five, eight, and ten years of service. SWOs make up 82.3 percent, 74.7 percent, and 69.5 percent of the total lateral transfers for the five-, eight-, and ten-year time intervals, respectively.

Table 12. Cumulative Distribution of Officer Lateral Transfers by Losing Community at Five, Eight, and Ten Years of Service

Designator	Year 5		Year 8		Year 10	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
SWO	380	82.3	508	74.7	520	69.5
SUB	5	1.1	63	9.3	78	10.4
Pilot	12	2.6	17	2.5	40	5.3
NFO	16	3.5	43	6.3	61	8.2
Staff	14	3.0	14	2.1	14	1.9
RL	35	7.6	35	5.1	35	4.7
Total	**461**	**100**	**681**	**100**	**749**	**100**

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 13 shows the cumulative distribution of lateral transfers into the SWO, SUB, Pilot, NFO, SPEC, RL, and Staff communities by five, eight, and ten years of service. Several RL communities, including Human Resources Officers, Engineering Duty Officers, and Foreign Area Officers, rely on lateral transfers and redesignations to fill the majority of their inventory of billets authorized. Conversely, the primary commissioning sources for URL communities are the Naval Academy, NROTC, and OCS. Therefore, as expected, the RL communities comprise the majority of lateral transfer gains including 58.5 percent, 67.2 percent and 68.8 percent for the five-, eight-, and ten-year time periods, respectively.

Table 13. Cumulative Distribution of Officer Lateral Transfers by Gaining Community at Five, Eight, and Ten Years of Service

Designator	Year 5		Year 8		Year 10	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
SWO	14	3.0	14	2.1	14	1.9
SUB	10	2.2	11	1.6	11	1.5
Pilot	48	10.4	62	9.1	62	8.3
NFO	16	3.5	17	2.5	17	2.3
SPEC	60	13.0	64	9.4	64	8.5
Staff	44	9.5	56	8.2	66	8.8
RL	271	58.5	458	67.2	516	68.8
Total	**463**	**100**	**682**	**100**	**750**	**100**

As described in Chapter III, data for this table is compiled from the DMDC data set.

This thesis also examines performance of SWOs who qualify EOOW within four years. Qualification for EOOW within four years may be an important predictor of differences in retention and performance outcomes for both lateral transfer and non-lateral transfer officers. The data indicates that of the 4,334 SWOs, 34.3 percent qualified EOOW within four years.

Table 14 shows the cumulative distribution of SWO lateral transfers by year five, six, eight, and ten, respectively, and whether they qualify EOOW within four years. Table 14 indicates that approximately one-fourth of SWO lateral transfers during each time period qualified EOOW by year four.

Table 14. Cumulative Distribution of SWO Lateral Transfers Based on Qualifying EOOW within Four Years

EOOW Year 4	SWO who Lateral Transfer by Year 5		SWO who Lateral Transfer by Year 6		SWO who Lateral Transfer by Year 8		SWO who Lateral Transfer by Year 10	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
No	286	75.3	329	75.5	375	73.8	383	73.7
Yes	94	24.7	107	24.5	133	26.2	137	26.3
Total	**380**	**100**	**436**	**100**	**508**	**100**	**520**	**100**

As described in Chapter III, data for this table is compiled from the DMDC data set.

Figure 1 shows a histogram of the relative average FITREP difference in 6–10 YOS. The sample is restricted to officers who stay in the Navy at least 10 years and have received at least three FITREPs between their sixth and tenth year of service. The mean relative average FITREP difference is 0.10, with the majority of values falling in the range between -0.5 and +0.6.

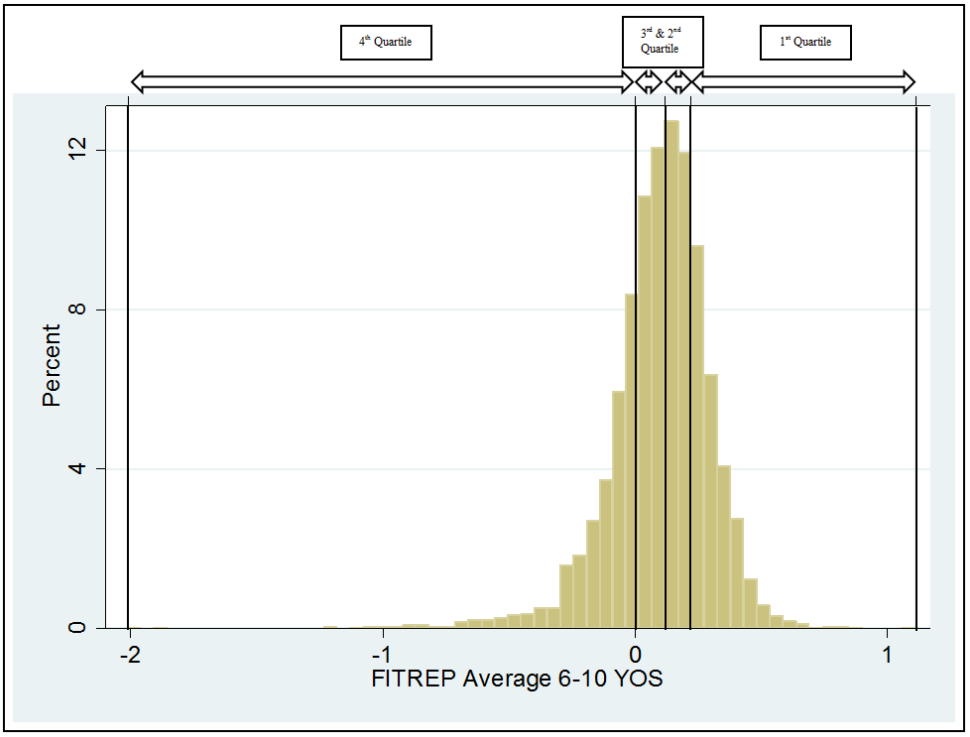

Figure 1. Average FITREP Difference Histogram

D. T-TESTS OF DIFFERENCES IN GROUP MEANS

Table 15 shows the results of t-tests of the differences in the means of the three career outcomes—seven-year retention, ten-year retention, and O-4 promotion rates—between officers who lateral transfer by years five, eight, and ten, respectively, and officers who do not lateral transfer by those service dates. Table 15 shows that officers who lateral transfer have higher retention and promotion rates then non-lateral transfer officers. Specifically, officers who lateral transfer by year five have an 81.1 percent seven-year retention rate compared to only 64.7 percent for officers who do not lateral transfer by year five. Officers who lateral transfer by year eight have a 76 percent ten-year retention rate compared to only 52 percent for officers who do not lateral transfer by year eight. Lastly, officers who lateral transfer by year ten, and stay in the Navy at least ten years, have an O-4 promotion rate of 83.1 percent versus 76.7 percent for officers who do not lateral transfer by year ten and stay in the Navy at least ten years. The t-tests show that the differences in seven-year retention, ten-year retention, and O-4 promotion rates between the lateral-transfer and the non-lateral transfer groups are all statistically significant at the .01 level.

Table 15. T-Test of Differences in Retention and Promotion Rates Between Officers Who Do and Do Not Lateral Transfer

Variable	Lateral Transfer	Non-Lateral Transfer	T-test
Seven Year Retention (n=16,108)	0.811 (n=461)	0.647 (n=15,647)	7.32***
Ten Year Retention (n=16,108)	0.760 (n=649)	0.520 (n=15,429)	12.29***
O-4 Promotion (n=8,546)	0.831 (n=579)	0.767 (n=7,967)	3.51***

*** Significant at 1 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

Previous research by Asch, Miller, and Malchiodi (2012) and the Military Leadership Diversity Council (2011) finds that female officer retention is lower than male officer retention across all services. The Military Leadership Diversity Council (2011) also shows that female officers promote at lower rates than male officers. Therefore, this thesis tests for retention and other career differences between female and male officers.

Table 16 shows the results of t-tests of the differences in means of seven-year retention, ten-year retention, and O-4 promotion rates between female and male officers. Female officers have a 50.4 percent seven-year retention rate compared to 68.5 percent for male officers. Additionally, female officers have a 38.4 percent ten-year retention rate compared to the 56.4 percent ten-year retention rate for male officers. The results of the t-tests show that both the seven- and ten-year retention differences are statistically significant, but that the O-4 promotion difference between female and male officers is not statistically significant.

Table 16. T-Test of Differences in Retention and Promotion Rates for Female Officers Versus Male Officers

Variable	Female Officers	Male Officers	T-test
7 Year Retention (n=16,108)	0.504 (n=2,967)	0.685 (n=13,141)	18.92***
10 Year Retention (n=16,108)	0.384 (n=2,967)	0.564 (n=13,141)	17.90***
O-4 Promotion (n=8,546)	0.766 (n=1,139)	0.773 (n=7,407)	0.52

*** Significant at 1 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

A significant body of research, including Chun and Lee (2001) and Antonovics and Town (2004), finds marriage increases the productivity of male civilian workers. Mehay and Bowman (2004) and Ryu and Kol (2002) also find evidence for a positive marriage effect on the performance of male Navy officers. Because the cohort data used by the two studies of Navy officers is somewhat dated we re-examine the marriage effect in this thesis. However, this thesis will differ from Mehay and Bowman (2004) and Ryu and Kol (2002) by combining both male and female officers into the marriage variable.

Table 17 shows the t-tests of the differences in means of seven-year retention, ten-year retention, and O-4 promotion rates between officers married and not married at six years of service. Officers married at six years of service have a 94.1 percent seven-year retention rate compared to the 41.2 percent seven-year retention rate for unmarried officers at six years of service. Additionally, officers married at six years of service have a 78.7 percent ten-year retention rate compared to the 31.9 percent ten-year retention rate for unmarried officers at six years of service. Lastly, officers married at six years of service, and who stay in the Navy at least ten years, have an O-4 promotion rate of 80.5 percent compared to 70.3 percent for unmarried officers at six years of service who stay in the Navy at least ten years. The t-tests indicate that the differences in seven-year retention, ten-retention, and O-4 promotion rates between the married and the unmarried groups are all statistically significant at the .01 level.

Table 17. T-Test of Differences in Retention and Promotion Rates Between Married and Unmarried Officers at Six YOS

Variable	Officers Married at 6 YOS	Officers Unmarried at 6 YOS	T-test
7 Year Retention (n=16,108)	0.941 (n=7,295)	0.412 (n=8,813)	84.00***
10 Year Retention (n=16,108)	0.787 (n=7,295)	0.319 (n=8,813)	66.98***
O-4 Promotion (n=8,546)	0.805 (n=5,738)	0.703 (n=2,808)	10.58***

*** Significant at 1 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 18 shows the results of t-tests of the differences in means of seven-year retention, ten-year retention, and O-4 promotion rates between STEM graduates and non-STEM graduates. The sample was restricted to officers with known undergraduate degrees. The 3,200 observations where *STEM Degree Unknown* equaled one were dropped from the sample for this t-test since it is unknown whether or not those officers hold a STEM degree. However, the observations where *STEM Degree Unknown* equaled one were re-added to the sample for all subsequent t-tests and models. Table 18 shows that officers with STEM-related degrees have a 70.9 percent seven-year retention rate compared to 73.6 percent for officers without STEM degrees. Additionally, officers with STEM degrees have a 58.6 percent ten-year retention rate compared to the 62.3 percent ten-year retention rate for officers without STEM degrees. Lastly, officers with STEM degrees that stay in the Navy for at least ten years have an O-4 promotion rate of 79.7 percent compared to the 77.9 percent for officers with a non-STEM degrees and who stay in the Navy for at least ten years. The t-tests find that the seven-year retention, ten-year retention, and O-4 promotion differences are all statistically significant. However, the size of the promotion difference is very small, and the difference is significant at only the .10 level.

Table 18. T-Test of Differences in Retention and Promotion for Officers With and Non-STEM Degrees

Variable	STEM Degree	Non-STEM Degree	T-test
7 Year Retention (n=12,908)	0.709 (n=6,815)	0.736 (n=6,093)	3.41***
10 Year Retention (n=12,908)	0.586 (n=6,815)	0.623 (n=6,093)	4.23***
O-4 Promotion (n=7,791)	0.797 (n=3,996)	0.779 (n=3,795)	1.90*

*** Significant at 1 percent; * Significant at 10 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 19 shows the results of t-tests of the differences in means of seven-year retention, ten-year retention, and O-4 promotion rates between SWOs who qualify EOOW within four years versus those who do not qualify. SWOs with EOOW qualification have a 70.9 percent seven-year retention rate compared to the 42.8 percent for non-qualifiers. Additionally, SWOs who qualify EOOW within four years have a 63.1 percent ten-year retention rate compared to the 33.9 percent ten-year retention rate for SWOs who do not qualify EOOW within four years. Lastly, SWOs who qualify EOOW within four years, and stay in the Navy for at least ten years, have an O-4 promotion rate of 94.8 percent compared to 82 percent for SWOs who do not qualify EOOW within four years and stay in the Navy for at least ten years. The t-tests find that the differences in the retention and promotion outcomes are all statistically significant at the .01 level.

Table 19. T-Test of Differences in Retention and Promotion for SWOs Who Do and Do Not Qualify EOOW within Four Years

Variable	SWO–EOOW	SWO–No EOOW	T-test
7 Year Retention (n=4,334)	0.709 (n=1,367)	0.428 (n=2,967)	17.83***
10 Year Retention (n=4,334)	0.631 (n=1,367)	0.339 (n=2,967)	18.74***
O-4 Promotion (n=1,109)	0.948 (n=541)	0.820 (n=566)	6.77***

*** Significant at 1 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 20 shows the results of t-tests of the differences in means of seven-year retention, ten-year retention, and O-4 promotion rates between lateral-transfer SWOs who qualify EOOW within four years versus SWOs who do not qualify EOOW within four years. SWOs who qualify EOOW within four years and lateral transfer have a 91.5 percent seven-year retention rate compared to the 80.4 percent for SWOs who lateral transfer but fail to qualify EOOW within four years. Additionally, SWOs who qualify EOOW within four years and lateral transfer have an 85.7 percent ten-year retention rate compared to 71.7 percent for SWOs who lateral transfer but fail to qualify EOOW. The t-tests find that the seven- and ten-year retention differences were both statistically significant. However, the promotion rate for SWOs who qualify EOOW within four years, lateral transfer, and stay in the Navy for at least ten years is not statistically different from the promotion rate for SWOs who do not qualify EOOW within four years, lateral transfer, and stay in the Navy for at least ten years.

Table 20. T-Test of Differences in Retention and Promotion for SWOs Who Lateral Transfer and Do and Do Not Qualify EOOW within Four Years

Variable	SWO Lateral Transfer EOOW	SWO Lateral Transfer No EOOW	T-test
7 Year Retention (n=380)	0.915 (n=94)	0.804 (n=286)	2.50**
10 Year Retention (n=508)	0.857 (n=133)	0.717 (n=375)	3.24***
O-4 Promotion (n=392)	0.863 (n=117)	0.844 (n=275)	0.50

*** significant at 1 percent; ** significant at 5 percent

As described in Chapter III, data for this table is compiled from the DMDC data set.

E. SUMMARY

Seven-year and ten-year retention rates for female officers are approximately 18 percentage points below that of males. The t-tests of the differences in the means show female officers who lateral transfer have higher retention rates than female officers who do not lateral transfer. Specifically, female officers who lateral transfer are 24.5 percentage

points and 32.3 percentage points more likely to stay in the Navy for seven and ten years, respectively, than female officers who do not lateral transfer during those time periods. Additionally, the comparison of group means show officers married by six years of service have significantly higher retention and promotion rates than officers not married by six years of service.

The comparison of group means also demonstrates significant differences between categories of officers based on lateral transfer, STEM degrees, and EOOW status. Specifically, the t-test of group means show officers who lateral transfer have an 18.9 and 26.3 percentage point higher seven- and ten-year retention rate, respectively, compared to officers who do not lateral transfer. Officers who lateral transfer also have a 6.4 percentage point higher O-4 promotion rate than officers who do not lateral transfer. Additionally, t-tests show officers with STEM related undergraduate degrees have seven- and ten-year retention rates approximately 3 percentage points lower and an O-4 promotion rate 1.8 percentage points higher when compared to officers without STEM degrees. Lastly, SWOs who qualify EOOW within four years have an approximately 30 percentage point higher seven- and ten-year retention rate and a 9.8 percentage point higher O-4 promotion rate when compared to SWOs who do not qualify EOOW within four years.

While the t-tests of the differences in group means are useful, they are based on bivariate statistics that do not hold constant the effects of other potentially important determinants of the outcome measures. To isolate the independent effects of the key explanatory variables, such as lateral transfer and EOOW qualification, multivariate models are needed, which will be specified and estimated in Chapters IV and V.

IV. LATERAL TRANSFER MODELS AND RESULTS

A. METHODOLOGY

The multivariate regression models presented in this chapter examine the following outcomes for officers who lateral transfer into a community and officers who are originally assigned to that community: seven-year retention, ten-year retention, O-4 promotion, and FITREP performance in YOS 6–10. All outcome variables are binary; therefore, the models are specified as Linear Probability Models (LPM) and estimated via ordinary least squares (OLS) techniques. The OLS coefficient estimates in the LPM represent the change in the probability of success for a one unit change in the independent variable, holding the other variables in the model fixed (Wooldridge 2015, 225). When the explanatory variable is binary, the coefficient represents the effect of the condition when the binary variable takes value 1 on the probability of success compared to when the condition take value 0.

B. MODEL SPECIFICATION

1. Seven-Year Retention Model

The model specification in equation (1) examines whether there are any differences in seven-year retention rates among officers who lateral transfer and those who are originally designated into a given community. The cohort years are added to the model to control for promotion vacancies, lateral transfer quotas, labor market conditions, and other policies that could affect retention outcomes across year groups. The outcome variable *Seven Year Retention* is binary, taking the value of 1 if the officer stays in the Navy for at least 7 years, and 0 otherwise. The seven-year retention outcome is estimated for separate samples consisting of URL, RL/Staff, and RL-only officers. The RL-only sample is calculated separately from the RL/Staff sample because although URL officers lateral transfer into both competitive categories (RL and Staff), the majority of URL officers who lateral transfer redesignate into an RL designator. The summary statistics for the seven-year retention models are displayed in Tables 28–30 of Appendix A.

Observing officer retention at year seven captures the retention decisions for officers who do and do not lateral transfer upon completion of their initial service

obligation. However, it is possible some officers who lateral transfer near their five-year mark may still be under orders and unable to separate from the Navy by their seventh year of service. Any such measurement error will upwardly bias the Lateral Transfer 5 coefficient estimate.

The URL model excludes both pilots and NFOs from the sample because their minimum service requirement (MSR) exceeds seven years. Since pilots and NFOs are unable to make a voluntary retention decision by year seven, including them in the sample for the seven-year retention model would downwardly bias the variable *Lateral Transfer Year 5*.

$$\begin{aligned}(1)\qquad &\Pr(\textit{Seven Year Retention} = 1 \mid X) = \beta_0 + \beta_1\, \textit{Lateral Transfer Year } 5 + \\ &\beta_2\,(\text{Demographics}) + \beta_3\,(\text{Pre-accession Characteristics}) + \beta_4\,(\text{Cohort Year}) + \mu\end{aligned}$$

Table 21 presents the results of the seven-year retention model. The first two columns present the results for the URL community, the second two columns show the estimates for the RL/Staff community, and last two columns present the results for the RL-only community. The first column of each model presents the estimated coefficients and the standard errors, while the second column provides the means of each independent variable in the sample used to estimate the model. The URL and RL/Staff models contain a combined 10,663 observations—approximately 5,400 less than in the full sample of newly commissioned officers for the 1999–2003 period. The total sample size is reduced because pilots and NFOs are excluded from the seven-year retention model.

The key explanatory variable in the model is *Lateral Transfer Year 5*, which is restricted to officers who lateral transfer within the first five years of service. The definition excludes unqualified URL officers who redesignate. Vellucci (2017) classifies both qualified officers who lateral transfer and unqualified officers who redesignate as lateral transfers.1 However, unqualified officers who redesignate often do so after they fail to complete the training requirements of their original community. Because unqualified

[1] Vellucci's (2017) lateral transfer variable also captures Fleet Support Officers who were given the opportunity to redesignate into the Information Professional, Human Resources, and Supply Corps communities in 2001 (CNP, 2001).

officers may possess different characteristics from qualified officers who lateral transfer, this thesis excludes unqualified officers who redesignate from the Lateral Transfer Year 5 variable.

The variable *Lateral Transfer Year 5* in the URL model compares both RL/Staff officers who lateral transfer into a URL community and URL officers who lateral transfer between designators within the URL community to non-lateral transfer URL officers. The seven-year retention model results in columns 1 and 2 of Table 21 find that URL officers who lateral transfer are 17.3 percentage points (32.8 percent) more likely to stay in the Navy at least seven years compared to non-lateral transfers.

The variable *Lateral Transfer Year 5* in the RL/Staff seven-year retention model includes qualified URL officers who lateral transfer into a RL/Staff community. As mentioned previously, qualified officers who voluntarily lateral transfer may possess different characteristics than unqualified officers who redesignate without board action. The results in columns 3 and 4 of Table 21 find that URL officers who lateral transfer into a RL/Staff community have a 21.6 percentage point higher probability of staying seven years than other RL/Staff officers, a difference of 33.4 percent.

The variable *Lateral Transfer Year 5* in the RL-only seven-year retention model includes qualified URL officers who lateral transfer into a RL community. The results in the last two columns of Table 21 find that URL officers who lateral transfer into a RL community have a 25.1 percentage point (or 38.7 percent) higher probability to stay in the Navy at least seven years than other RL officers. The positive effect of lateral transfer on officer retention is similar to the results in previous research by Monroe and Cymrot (2004).

As mentioned in Chapter III, prior studies show that female officers have lower retention rates than male officers (Asch et al., 2012; The Military Leadership Diversity Council, 2011). This thesis finds similar results to those studies. The URL, RL/Staff, and RL-only models find that the probability female officers stay in the Navy for at least 7 years is 13.5 percentage points, 8.2 percentages points, and 7.5 percentage points below, respectively, that of male officers.

The variables *Married Year 2* and *Dependent Children Year 2* capture officers' marital status and dependent children status at their second year of service. Previous research by Ryu and Kol (2002) shows that both married officers and officers with dependent children have higher retention rates than unmarried officers and officers without dependent children, respectively. The URL, RL/Staff, and RL-only models in this thesis find similar results to Ryu and Kol (2002). URL, RL/Staff, and RL-only officers who are married at year two have a 9.4 percentage point, a 5 percentage point, and an 8 percentage point higher probability to stay in the Navy at least seven years, respectively, than URL, RL/Staff, and RL-only officers who are not married at year two. Similarly, URL, RL/Staff, and RL-only officers with dependent children at year two have a 7.1 percentage point, a 9.8 percentage point, and a 9.9 percentage point higher probability to stay in the Navy at least seven years, respectively, than URL, RL/Staff, and RL-only officers without dependent children at year 2.

Asch et al. (2012) found that minority officers are more likely to stay in the Navy compared to Caucasian officers. The seven-year retention model in this thesis finds results somewhat similar to Asch et al. (2012). Both URL and RL/Staff seven-year retention models show Black non-Hispanics are statistically more likely to stay in the Navy at least seven years than White non-Hispanics. However, the RL-only seven-seven year retention shows Black non-Hispanics do not have statistically different seven-year retention rates from White non-Hispanics. Additionally, the URL seven-year retention model show Hispanics are 3.6 percentage points more likely to stay for seven years compared to White non-Hispanics. However, the seven-year retention model results differ from Asch et al. (2012) for other minority and ethnic groups. Asch et al. (2012) show statistically higher retention rates for other minority officer groups compared to Caucasian officers. The URL, RL/Staff, and RL-only seven-year retention models in this thesis show no statistical differences in the probability Asian and other minority group officers stay in the Navy at least seven years compared to White non-Hispanics.

The variables *NROTC*, *OCS*, *Direct/Other Commissioning* capture differences in retention outcomes when officers commissioned from these three programs are compared to Naval Academy graduates. The URL, RL/Staff, and RL-only models all indicate that

NROTC graduates are less likely than Naval Academy graduates to stay in the Navy for at least seven years. Additionally, officers who commission from OCS and direct/other commissioning sources are more likely to stay in the Navy seven years compared to Naval Academy graduates. Vellucci (2017) finds a similar effect of NROTC on retention in both size and direction. However, this thesis finds a positive effect of OCS and direct/other commissioning sources on retention, whereas Vellucci (2017) shows those commissioning sources has either no effect or a negative effect on retention.

This thesis also examines the effect of STEM undergraduate education on retention. The URL and RL-only models on Table 21 show no effect of STEM-related undergraduate degrees on seven-year retention rates. However, the RL/Staff model finds that STEM-related degrees negatively affect seven-year retention. Specifically, RL/Staff officers with STEM degrees have a 6.2 percentage point lower probability to stay seven years than RL/ Staff officers without STEM degrees.

The negative effect of STEM degrees on retention differs from Maugeri (2016) who finds a positive effect. However, as previously mentioned in Chapter III, Maugeri (2016) classifies officers whose college major is unknown as not possessing a STEM degree. The variable *STEM Degree Unknown* in this thesis separates those officers whose major is unknown from those with a non-STEM degree. Officers whose degree is unknown have significantly lower seven-year retention rates than officers with STEM degrees. Combining officers with unknown degrees and those with non-STEM degrees in the larger category of officers without STEM degrees, as done in Maugeri (2016), would positively bias the *STEM degree* variable.

Table 21. Seven-Year Retention Model

Variables	(1) URL Model		(2) RL/Staff Model		(3) RL Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Lateral Transfer Year 5	0.173*** (0.046)	0.01	0.216*** (0.023)	0.07	0.251*** (0.028)	0.20
Female	-0.135*** (0.016)	0.16	-0.082*** (0.015)	0.32	-0.075*** (0.030)	0.21
Married Year 2	0.094*** (0.013)	0.29	0.050*** (0.014)	0.42	0.080*** (0.025)	0.41
Dependent Children Year 2	0.071*** (0.015)	0.21	0.098*** (0.014)	0.36	0.099*** (0.026)	0.33
Black Non-Hispanic	0.087*** (0.021)	0.08	0.042** (0.020)	0.10	0.035 (0.037)	0.07
Asian	0.017 (0.028)	0.05	0.013 (0.024)	0.07	0.018 (0.049)	0.05
Hispanic	0.036* (0.020)	0.11	-0.016 (0.028)	0.07	-0.039 (0.047)	0.07
Other Unknown Race	0.044 (0.034)	0.03	-0.003 (0.033)	0.04	0.041 (0.058)	0.04
NROTC	-0.051*** (0.016)	0.36	-0.095** (0.037)	0.13	-0.138*** (0.053)	0.16
OCS	0.259*** (0.016)	0.31	0.162*** (0.033)	0.42	0.234*** (0.048)	0.52
Direct/Other Commissioning	0.217*** (0.044)	0.01	0.216*** (0.034)	0.38	0.183*** (0.053)	0.23
STEM Degree	0.018 (0.013)	0.44	-0.062*** (0.014)	0.43	-0.005 (0.026)	0.34
STEM Degree Unknown	-0.465*** (0.017)	0.16	-0.453*** (0.018)	0.27	-0.442*** (0.031)	0.24
Cohort FY99	0.049** (0.019)	0.18	0.075*** (0.022)	0.20	0.107*** (0.037)	0.18
Cohort FY00	0.005 (0.018)	0.20	0.040* (0.021)	0.21	0.033 (0.036)	0.20
Cohort FY01	0.030* (0.018)	0.21	0.061*** (0.020)	0.23	0.080** (0.033)	0.22
Cohort FY02	-0.002 (0.018)	0.20	0.027 (0.022)	0.19	0.05 (0.035)	0.20
Constant	0.478*** (0.018)		0.564*** (0.037)		0.461*** (0.054)	
Observations	6,198		4,421		1,382	
R-Squared	0.176		0.241		0.294	
Mean Retention Rate	0.527		0.647		0.649	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the DMDC data set.

2. Ten-Year Retention Model

The ten-year retention model examines whether there are any differences in ten-year retention rates among officers who lateral transfer and those who are originally designed into a community. Unlike the seven-year retention model, the ten-year retention model for URL officers includes pilots and NFOs in the sample since they are able to make a voluntary retention decisions by year ten. However, it is possible that some pilots may still be under orders and unable to separate from the Navy by their tenth year of service. Any such measurement error will downwardly bias the effect of lateral transfer on ten-year retention.

Table 22 shows the results of the ten-year retention model. Similar to the seven-year retention models, the first two columns present the results for the URL community, the second two columns for the RL/Staff community, and the last two columns for the RL-only community. The first column of each model presents the estimated coefficients and the standard errors, while the second column provides the means of each independent variable in the model. The summary statistics for the ten-year retention models are displayed in Tables 31–33 of Appendix A.

The key explanatory variable, *Lateral Transfer Year 8*, is restricted to officers who lateral transfer within the first eight years of service and excludes unqualified URL officers who redesignate. Given that officers who lateral transfer face an additional two-year obligated service, this sample includes officers who are in a position to make the leave/stay decisions by year ten. The variable *Lateral Transfer Year 8* in the URL model compares RL/Staff officers who either lateral transfer into a URL community or URL officers who lateral transfer between designators within the URL community to officers who commissioned directly into a URL community. In the URL ten-year retention model in Table 22, the ten-year retention rates are 12 percentage points (23.4 percent) higher for lateral transfer officers than non-lateral officers.

The variable *Lateral Transfer Year 8* in the RL/Staff ten-year retention model includes qualified URL officers who lateral transfer into a RL/Staff community. The results in Table 22 show that URL officers who lateral transfer into a RL/Staff community have

an 19.1 percentage point (or 32.9 percent) higher probability to stay in the Navy at least ten years than officers who originated in the RL/Staff community.

The variable *Lateral Transfer Year 8* in the RL-only ten-year retention model includes qualified URL officers who lateral transfer into a RL community. The results in the last two columns of Table 22 show that URL officers who lateral transfer into a RL community have a 19.9 percentage point (32.9 percent) higher probability to stay in the Navy at least ten years than officers who originated in the RL community. The positive effect of lateral transfer on retention in RL communities is consistent with previous research by Monroe and Cymrot (2004).

The variable *Married Year 6* in the ten-year retention model is significantly greater in magnitude than the variable *Married Year 2* in the seven-year retention model. URL, RL/Staff, and RL officers who are married at year two have a 9.4 percentage point, a 5 percentage point, and an 8 percentage point higher probability to stay in the Navy at least ten years, respectively, than URL, RL/Staff, and RL-only officers who are not married at year two. URL, RL/Staff, and RL-only officers married at year six have a 30.5 percentage point, a 35.3 percentage point, and a 37.2 percentage point higher probability to stay ten years, respectively, than unmarried URL, RL/Staff, and RL-only officers.

The effect of the commissioning source NROTC on retention differs between the seven- and ten-year retention models. NROTC has a significantly negative effect on seven-year retention rates for, URL, RL/Staff, and RL-only officers compared to the Naval Academy. However, Table 22 shows no statistical difference in ten-year retention rates between NROTC and the Naval Academy for URL and RL/Staff officers. The effects of dependent children, race, and STEM-related undergraduate degree on ten-year retention are similar to their effects on seven-year retention.

Table 22. Ten-Year Retention Model

Variables	(1) URL Model		(2) RL/Staff Model		(3) RL Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Lateral Transfer Year 8	0.120*** (0.031)	0.01	0.191*** (0.021)	0.11	0.199*** (0.025)	0.29
Female	-0.097*** (0.012)	0.13	-0.022 (0.014)	0.32	-0.044* (0.027)	0.22
Married Year 6	0.305*** (0.010)	0.44	0.353*** (0.017)	0.49	0.372*** (0.027)	0.49
Dependent Children Year 6	0.105*** (0.011)	0.23	0.132*** (0.016)	0.34	0.057** (0.027)	0.33
Black Non-Hispanic	0.011 (0.016)	0.06	0.052*** (0.019)	0.10	0.025 (0.034)	0.08
Asian	-0.012 (0.020)	0.04	0.027 (0.022)	0.07	0.080** (0.039)	0.05
Hispanic	-0.003 (0.014)	0.10	0.006 (0.024)	0.07	0.006 (0.041)	0.08
Other Unknown Race	0.020 (0.024)	0.03	0.035 (0.027)	0.04	0.113** (0.046)	0.04
NROTC	-0.003 (0.011)	0.32	-0.035 (0.029)	0.14	-0.073** (0.038)	0.18
OCS	0.184*** (0.012)	0.29	0.134*** (0.026)	0.42	0.150*** (0.036)	0.50
Direct/Other Commissioning	0.242*** (0.016)	0.09	0.197*** (0.027)	0.37	0.135*** (0.042)	0.20
STEM Degree	0.001 (0.009)	0.42	-0.048*** (0.014)	0.44	-0.043* (0.024)	0.37
STEM Degree Unknown	-0.394*** (0.012)	0.17	-0.342*** (0.017)	0.26	-0.351*** (0.029)	0.22
Cohort FY99	-0.048*** (0.013)	0.18	-0.003 (0.019)	0.19	0.021 (0.032)	0.17
Cohort FY00	-0.062*** (0.013)	0.21	-0.036** (0.018)	0.21	-0.05 (0.030)	0.20
Cohort FY01	-0.033*** (0.013)	0.20	-0.006 (0.018)	0.23	0.006 (0.028)	0.23
Cohort FY02	0.011 (0.012)	0.21	0.007 (0.019)	0.19	0.049 (0.029)	0.21
constant	0.386*** (0.013)		0.333*** (0.030)		0.343*** (0.044)	
Observations	11,389		4,608		1,569	
R-Squared	0.276		0.406		0.416	
Mean Retention Rate	0.513		0.581		0.604	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the DMDC data set.

3. O-4 Promotion Model

Table 23 presents the results of the O-4 promotion model. This model examines whether there are differences in O-4 promotion rates among officers who lateral transfer and those who are originally designated into a community, given they stayed in the Navy 10 years. The cohort year dummy variables are included in the model to mitigate the risk of observing a potential outlier cohort that differs in quality. Also, the cohort dummy variables control for promotion vacancies that could affect promotion outcomes across year groups. The sample includes only officers who stayed in the Navy for at least 10 years and thus were eligible for O-4 promotion.

The first two columns present the results for the URL community, the second two columns for the RL/Staff community, and the last two columns for the RL-only community. The first column of each model presents the estimated coefficients and the standard errors, while the second column provides the means of each independent variable in the model. The summary statistics for the O-4 promotion models are displayed in Tables 34–36 of Appendix A.

The key explanatory variable *Lateral Transfer Year 10* includes officers who lateral transfer within the first ten years of service. The variable *Lateral Transfer Year 10* in the URL model compares both RL/Staff officers who lateral transfer into a URL community and qualified URL officers who lateral transfer between designators within the URL community to non-lateral transfer URL officers. The results in Table 23 find no statistical difference in O-4 promotion rates for URL officers who do and do not lateral transfer.

The variable *Lateral Transfer Year 10* in the RL/Staff model includes qualified URL officers who lateral transfer into a RL/Staff community. Similar to the URL model, the RL/Staff O-4 promotion model in Table 23 finds no statistical difference in O-4 promotion rates for officers who do and do not lateral transfer. However, the RL-only sample in Table 23 shows URL officers who lateral transfer into an RL community have a 5.9 percentage point higher O-4 promotion rate than non-lateral RL officers. This outcome is similar in direction but lower in magnitude than reported in Monroe and Cymrot (2004), who find warfare qualified officers who lateral transfer into RL, CEC, and Supply Corps

communities have an 18 percentage point higher O-4 promotion rate than non-warfare qualified officers in those respective communities.

A second difference between the RL/Staff and RL-only samples is in the effect of gender. RL/Staff females do not have statistically different O-4 promotion rates than RL/Staff males; however, the RL-only model finds females have a 6.5 percentage point higher probability to be promoted to O-4 than males. This result is similar to Monroe and Cymrot (2004) who also find females are promoted to O-4 at higher rates than males.

Promotion-eligible URL, RL/Staff, and RL-only officers who are married at year six have a 9.8 percentage point, an 8.4 percentage point, and an 8.7 percentage point higher probability of promotion, respectively, than URL, RL/Staff, and RL-only officers not married at year six. Although this model differs from Mehay and Bowman (2004) and Ryu and Kol (2002) by including both male and female officers in the sample, all studies find that marriage positively affects performance.

Previous research by Asch et al. (2012) finds the O-4 promotion rate for Black male officers is 2.6 percentage points less than White males. Additionally, they find Black female officers have an O-4 promotion rate 3.9 percentage points lower than White males. Although Asch, et al. (2012) uses different comparison groups based on gender, the O-4 promotion results in this thesis find similar results for RL/Staff and RL-only officers. Specifically, the Black non-Hispanic RL/Staff and RL-only officer O-4 promotion rate is 6.6 percentage points and 8.3 percentage points less than White non-Hispanic RL/Staff and RL-only officers, respectively. However, the O-4 promotion model differs from Ache et al. (2012) in that this thesis finds URL Black non-Hispanic officers do not have a significantly different O-4 promotion rates than URL White non-Hispanic officers.

This thesis also examines whether officers with STEM undergraduate degrees have different O-4 promotion rates than officers with non-STEM degrees. The results find that the URL officer O-4 promotion rate is 2.8 percentage points higher for STEM majors than non-STEM majors. Conversely, there is no effect of STEM degrees on the O-4 promotion rate for RL/Staff or RL-only officers.

Table 23. O-4 Promotion Model

Variables	(1) URL Model		(2) RL/Staff Model		(3) RL Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Lateral Transfer Year 10	0.025 (0.032)	0.02	0.025 (0.020)	0.17	0.059** (0.028)	0.42
Female	-0.027 (0.021)	0.08	0.026 (0.018)	0.25	0.065** (0.032)	0.17
Married Year 6	0.098*** (0.012)	0.65	0.084*** (0.019)	0.72	0.087*** (0.030)	0.70
Dependent Children Year 6	0.015 (0.012)	0.37	-0.030* (0.016)	0.52	0.021 (0.027)	0.48
Black Non-Hispanic	-0.022 (0.024)	0.06	-0.066*** (0.024)	0.12	-0.083** (0.042)	0.09
Asian	0.028 (0.027)	0.04	-0.083*** (0.031)	0.08	-0.078 (0.055)	0.06
Hispanic	0.008 (0.017)	0.10	-0.041 (0.031)	0.07	-0.031 (0.044)	0.08
Other Unknown Race	-0.036 (0.032)	0.03	0.024 (0.032)	0.04	0.047 (0.052)	0.04
NROTC	-0.018 (0.014)	0.27	0.065** (0.031)	0.11	0.051 (0.040)	0.15
OCS	0.017 (0.014)	0.33	0.008 (0.030)	0.44	-0.019 (0.039)	0.53
Direct/Other Commissioning	0.010 (0.020)	0.10	0.008 (0.031)	0.38	-0.028 (0.049)	0.18
STEM Degree	0.028** (0.011)	0.46	-0.008 (0.015)	0.49	-0.038 (0.025)	0.42
STEM Degree Unknown	-0.160*** (0.025)	0.08	-0.212*** (0.030)	0.11	-0.164*** (0.054)	0.08
Cohort FY99	0.412*** (0.018)	0.18	0.092*** (0.026)	0.20	0.231*** (0.044)	0.19
Cohort FY00	0.417*** (0.017)	0.20	0.072*** (0.026)	0.21	0.177*** (0.045)	0.19
Cohort FY01	0.393*** (0.018)	0.20	0.091*** (0.025)	0.24	0.230*** (0.042)	0.24
Cohort FY02	0.260*** (0.019)	0.22	0.101*** (0.026)	0.19	0.213*** (0.043)	0.21
Constant	0.388*** (0.019)		0.727*** (0.040)		0.587*** (0.058)	
Observations	5,788		2,774		1,001	
R-Squared	0.168		0.052		0.094	
Mean Promotion Rate	0.749		0.820		0.821	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the DMDC data set.

4. FITREP Model

The fitness report (FITREP) model examines whether there are any differences in FITREP performance in 6–10 YOS among officers who lateral transfer and those who are originally designated into a community. The 6–10 YOS period is chosen to measure the

impact of lateral transfer in the post-transfer career period. The outcome variable *Relative Average Top Quartile 6–10 YOS* is binary and equals one if the officer ranks in the top quartile for relative average FITREP scores, 0, otherwise. The FITREP performance outcome is estimated separately for URL, RL/Staff, and RL-only officers. The sample includes only officers who stayed in the Navy for at least 10 years.

Table 24 displays the results of the FITREP model. The first two columns show the results for URL officers, the second two columns for RL/Staff officers, and the last two columns for RL-only officers. For each officer community, the first column of each model displays the estimated coefficients and the standard errors, while the second column lists the means of each independent variable in the model.

The key explanatory variable, *Lateral Transfer Year 6*, includes officers who lateral transfer within the first six years of service. Similar to the previous models, the lateral transfer variable excludes unqualified URL officers who redesignate. The variable *Lateral Transfer Year 6* in the URL model captures both RL/Staff officers who lateral transfer into a URL community and URL officers who lateral transfer between designators within the URL community. These officers' are then compared to officers who commissioned directly into a URL community. The first column in Table 24 shows that the relative average FITREP scores for lateral and non-lateral transfers are not statistically different.

The variable *Lateral Transfer Year 6* in the RL/Staff FITREP model includes qualified URL officers who lateral transfer into a RL/Staff community. Columns 3 and 4 in Table 24 indicate URL officers who lateral transfer into a RL/Staff community by year six have a 7.5 percentage point higher probability of ranking in the top quartile for relative average FITREP scores than non-lateral transfer RL/Staff officers. The RL-only model also finds a positive effect of lateral transfer, which is almost double the magnitude in the RL/ Staff model—the difference in a top quartile ranking between is 13.5 points in the RL-only model.

The coefficients of the demographic variables, *Female*, *Married Year 6*, and several race and ethnicity variables are statistically significant. Specifically, the probability of female URL officers ranking in the top quartile is 7.7 percentage points higher than male URL

officers. Additionally, similar to the higher retention and promotion rates for married officers, Table 24 shows URL and RL/Staff officers married by year six have a 3.3 percentage point and an 8.1 percentage point higher probability of ranking in the top quartile for relative average FITREPs scores, respectively, than unmarried officers. Lastly, Black non-Hispanic, Asian, and Hispanic URL officers, Asian RL/Staff officers, and Asian RL-only officers have significantly lower probabilities of ranking in the top quartile for relative average FITREP scores when compared to White non-Hispanic officers.

The first and last two columns of Table 24 show no effect of STEM-related undergraduate degrees on the probability URL and RL-only officer's rank in the top quartile for relative average FITREP scores. This finding is similar to Bowman (1990). However, the RL/Staff model shows officers with STEM degrees have a lower probability of ranking in the top quartile for relative average FITREP scores compared to officers without STEM degrees. Specifically, RL/Staff officers with STEM degrees have a 3.5 percentage point lower probability to rank in the top quartile of relative average scores than RL/Staff officers without STEM degrees.

It is important to note the results contained in this chapter may suffer from selection bias. Officers are not selected at random to lateral transfer into a new community. Instead they voluntarily apply for lateral transfer. Dailey (2013) finds the Navy selected 558 of the 1391 officers (40 percent) who applied for lateral transfer between November 2010 and November 2012. An officer's motivation to apply for lateral transfer is unknown. In addition, the lateral transfer board attempts to select the highest quality officers among those who apply. Therefore, this thesis cannot hypothesize officers who lateral transfer display higher job performance later in their careers. Due to these selection biases, the results in this chapter do not necessarily demonstrate a causal relationship between lateral transfer and performance. However, the results from this chapter find the Navy selects officers for lateral transfer who are more likely to stay in the Navy and who perform at a higher level than their non-lateral transfer counterparts.

Table 24. Relative Average Top Quartile 6–10 YOS Model

Variables	(1) URL Model		(2) RL/Staff Model		(3) RL Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Lateral Transfer Year 6	-0.032 (0.059)	0.02	0.075** (0.036)	0.10	0.135*** (0.043)	0.34
Female	0.077*** (0.030)	0.08	0.014 (0.023)	0.26	-0.027 (0.049)	0.18
Married Year 6	0.033* (0.018)	0.68	0.081*** (0.023)	0.74	0.057 (0.047)	0.74
Dependent Children Year 6	-0.020 (0.017)	0.39	0.018 (0.022)	0.54	0.035 (0.045)	0.52
Black Non-Hispanic	-0.052* (0.030)	0.06	0.002 (0.028)	0.13	0.000 (0.058)	0.12
Asian	-0.116*** (0.034)	0.04	-0.092*** (0.030)	0.08	-0.160** (0.058)	0.06
Hispanic	-0.057** (0.025)	0.11	0.013 (0.038)	0.07	0.041 (0.073)	0.07
Other Unknown Race	-0.062 (0.041)	0.03	-0.009 (0.051)	0.04	0.119 (0.106)	0.04
NROTC	-0.020 (0.020)	0.28	-0.006 (0.051)	0.09	-0.059 (0.076)	0.13
OCS	-0.045** (0.020)	0.33	-0.064 (0.044)	0.43	-0.036 (0.065)	0.58
Direct/Other Commissioning	-0.056* (0.029)	0.08	0.008 (0.044)	0.41	0.086 (0.077)	0.17
STEM Degree	-0.025 (0.015)	0.50	-0.035* (0.021)	0.49	-0.010 (0.039)	0.39
STEM Degree Unknown	-0.060 (0.045)	0.02	-0.186*** (0.031)	0.09	-0.033 (0.129)	0.02
Cohort FY99	-0.012 (0.025)	0.20	-0.020 (0.032)	0.22	-0.034 (0.064)	0.21
Cohort FY00	-0.034 (0.024)	0.22	-0.040 (0.032)	0.22	-0.126** (0.061)	0.20
Cohort FY01	-0.014 (0.025)	0.19	-0.037 (0.031)	0.23	-0.094 (0.060)	0.24
Cohort FY02	-0.035 (0.024)	0.20	-0.086*** (0.032)	0.18	-0.067 (0.063)	0.19
constant	0.321*** (0.026)		0.285*** (0.052)		0.264*** (0.087)	
Observations	3,536		2,256		623	
R-Squared	0.011		0.033		0.048	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

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V. EOOW MODELS AND RESULTS

A. METHODOLOGY

One of this thesis' goals is to investigate how different measures of technical capacity, such as additional qualification designations, or technical background, can help the Navy identity talent with the use of already-collected personnel data. To this end, this chapter examines performance and retention differences between SWOs who obtain their EOOW qualification in the first four years of service and SWOs who do not. Similar to the lateral transfer models in Chapter IV, the statistical analysis in this chapter assesses ten-year retention, O-4 promotion, and FITREP performance in YOS 6–10 outcomes. The multivariate regression models use Linear Probability Models (LPM) to estimate the effects of relevant explanatory variables via ordinary least squares (OLS) techniques. Each career outcome model examines the effect of qualifying EOOW for officers in the RL/Staff, RL-only, and SWO communities, respectively. EOOW-qualified officers in the RL/Staff and RL-only communities were previously SWOs who lateral transferred to either an RL or Staff designator.

The summary statistics for the samples used to estimate the models in this chapter are presented in Tables 40–48 of Appendix A. The tables displayed in this chapter present only the results for the key explanatory variables. The results for the full model are shown in Appendix B, Tables 49–51.

B. MODEL SPECIFICATION

1. Ten-Year Retention Model

The model specification in equation (2) examines the combined effects of lateral transfer and EOOW qualification (among SWOs) on 10-year retention. For the analysis of retention among RL/Staff and RL-only officers the models distinguishes between three separate groups of URL officers who transfer to those communities:

(1) non-SWO URL officers who lateral transfer to RL or Staff (*Non-SWO Lateral Transfer Year 8*);

(2) non-EOOW-qualified SWOs who lateral transfer to RL or Staff (*Non-EOOW SWO Lateral Transfer Year 8*); and

(3) EOOW-qualified SWOs who lateral transfer to RL or Staff (*EOOW SWO Lateral Transfer Year 8*).

The RL/Staff model is estimated on a sample of RL and Staff officers (N=4,664) and the RL-only model is estimated on a sample of only RL officers (N=1,569). All models include control variables for demographics, pre-accession characteristics, and cohort year.

The model in equation (3) uses a sample of SWOs who remain in the SWO community and do not lateral transfer out of Surface Warfare (N=3,846). The model examines the effects of SWOs who qualify EOOW by year four, demographics, pre-accession characteristics, and cohort year on the 10-year retention probability.

This thesis seeks to identify professional characteristics of junior officers that predict differences in measured performance and retention outcomes. The EOOW qualification is a professional characteristic that may represent an indicator of several components of officer quality, including aptitude and motivation. Therefore, the EOOW qualification is used a key explanatory variable for SWOs who do and do not lateral transfer.

$$\begin{aligned}(2)\quad &\Pr(\textit{Ten Year Retention} = 1 \mid X) = \beta_0 + \beta_1 \textit{Non-SWO Lateral Transfer Year } 8 \\ &+ \beta_2 \textit{Non-EOOW SWO Lateral Transfer Year } 8 + \\ &\beta_3 \textit{EOOW SWO Lateral Transfer Year } 8 + \beta_4(\text{Demographics}) \\ &+ \beta_5(\text{Pre-accession Characteristics}) + \beta_6(\text{Cohort Year}) + \mu\end{aligned}$$

$$\begin{aligned}(3)\quad &\Pr(\textit{Ten Year Retention} = 1 \mid X) = \beta_0 + \beta_1 \textit{EOOW Year} 4 \\ &+ \beta_2(\text{Demographics}) + \beta_3(\text{Pre-accession Characteristics}) \\ &+ \beta_4(\text{Cohort Year}) + \mu\end{aligned}$$

Table 25 shows the of the ten-year retention models for the key explanatory variables. The full results of the ten-year retention model are presented in Appendix B, Table 49.

In Table 25, the first two columns (labeled "RL/Staff Model") present the results for the sample of RL/Staff officers, including URL officers who lateral transfer into RL/ Staff (equation 2). The second two columns present the estimates for the sample of RL-only officers, including URL officers who lateral transfer into RL (equation 2). The last two columns present the results for the sample of SWOs who remain in the Surface Warfare community during their careers (equation 3). For each model, the table displays the estimated coefficients, the standard errors, and the means of each independent variable in the model.

The key explanatory variables in the RL/Staff and RL-only models are *Non-SWO Lateral Transfer Year 8*, *Non-EOOW SWO Lateral Transfer Year 8*, and *EOOW SWO Lateral Transfer Year 8*. Similar to Monroe and Cymrot (2004) and the models in Chapter IV, the URL lateral transfer variables are restricted to qualified officers.

The ten-year retention model results in columns 1 and 2 of Table 25 for the RL/ Staff sample find a significantly higher retention probability for each of the key explanatory variables. Specifically, non-SWO URL officers who lateral transfer to RL/Staff communities by year eight are 20.8 percentage points (35.8 percent) more likely to stay in the Navy ten years than RL/Staff officers who enter the communities directly. SWOs who do not qualify EOOW by year four and lateral transfer to RL/Staff by year eight also are more likely to stay in the Navy for 10 years (by 14 percentage points, or 24.1 percent) compared to RL/Staff non-lateral transfers. Lastly, SWOs who lateral transfer by year eight and qualify EOOW have ten-year retention rates 26.7 percentage points (46 percent) higher than RL/Staff officers who do not enter the community via lateral transfer.

The key explanatory variable coefficient estimates in the RL-only model in the second column of Table 25 are similar in size and significance to those in the RL/Staff model. The other statistical differences in results between the RL/Staff model and RL-only samples are for the coefficients of *Black Non-Hispanic*, *Asian*, *Other Unknown Race*, and *NROTC*. Black non-Hispanics have a higher ten-year retention rate than White non-Hispanics in the RL/Staff model, whereas there is no significant difference in the RL-only model. The RL/Staff model finds no differences in retention rates between Asians and other/unknown race officers versus White non-Hispanics, whereas in the RL-only model

Asian and other/unknown race officers have statistically higher ten-year retention rates than Whites. Lastly, the RL/Staff model shows no statistical difference in ten-year retention rates between NROTC and Naval Academy graduates, whereas the RL-only model finds that NROTC have statistically lower ten-year retention rates than Naval Academy graduates.

Columns 5 and 6 of Table 25 present the results of the ten-year retention model for the SWO-only sample. The key explanatory variable, *EOOW Year 4*, compares the retention rate of EOOW-qualified SWOs to non-qualified SWOs. EOOW-qualified SWOs have an 18.1 percentage points (46.3 percent) higher probability to stay in the Navy ten years compared to non-qualifiers. This finding differs from Nolan (1993) who finds no statistical difference in retention for SWOs who qualify EOOW. However, Nolan (1993) observes officers between the O-3 and O-4 selection board, whereas the ten-year retention model observes officers upon commissioning until 10 YOS.

Table 25. Effects of EOOW Qualification on Ten-Year Retention

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 8	0.208*** (0.045)	0.02	0.209*** (0.050)	0.06		
Non-EOOW SWO Lateral Transfer Year 8	0.140*** (0.025)	0.07	0.161*** (0.029)	0.17		
EOOW SWO Lateral Transfer Year 8	0.267*** (0.033)	0.02	0.292*** (0.036)	0.07		
EOOW Year 4					0.181*** (0.015)	0.32

As described in Chapter III, data for this table is compiled from the DMDC data set.

2. O-4 Promotion Model

Table 26 presents the results for the key explanatory variables of the O-4 promotion model. The full results for the O-4 promotion model are presented in Appendix B, Table 50.

Columns 1 and 2 of Table 26 examine the effects of EOOW qualification among SWOs and lateral transfer into an RL/Staff community on promotion (N=2,774). Columns

3 and 4 of Table 26 also examine the effects of EOOW qualification and lateral transfer into an RL-only community on promotion for the same groups as the RL/Staff model (N=1,001). Both samples include only officers who stay in the Navy at least 10 years and are eligible for promotion.

The last two columns of Table 26 use a sample of SWOs only to examine the effect of EOOW qualification and other officer characteristics on the probability an officer is promoted to O-4, given he/she stayed in the Navy ten years. The sample is restricted to ten year stayers to capture O-4 promotion-eligible officers (N=1,497).

The RL/Staff model finds non-SWO URL lateral transfers have lower promotion rates than other RL/Staff officers who do not lateral-in to those communities. In addition, the O-4 promotion rate for SWOs who do and do not qualify EOOW by year four and lateral transfer into RL/Staff communities is not statistically different from other RL/Staff officers.

The model estimates presented in Table 26 indicate the key explanatory variable coefficients in the RL-only O-4 promotion model are larger in magnitude than in the RL/ Staff O-4 promotion model. Specifically, lateral transfer officers that include non-SWO URL officers, SWOs who do not qualify EOOW by year four, and SWOs who qualify EOOW by year four have a 5.9 percentage point, 5.4 percentage point, and 7.2 percentage point higher O-4 promotion rates, respectively, than RL non-lateral transfer officers. However, only *EOOW SWO Lateral Transfer Year 10* is statistically significant at the 90 percent confidence level. The other key explanatory variables, *Non-SWO Lateral Transfer Year 10* and *Non-EOOW SWO Lateral Transfer Year 10* are only statistically significant at the 88 percent confidence level, which is below the generally accepted 90 percent level.

One factor that likely contributes to the differences in the estimated coefficients between the RL-only and RL/Staff O-4 promotion models are the different promotion rates within each RL and Staff community. The FY-13 O-4 promotion board results shows the overall average in-zone selection rates were 76.9 percent and 83.8 percent for RL and Staff communities, respectively (Navy Personnel Command, 2018). It is not unexpected then for the key explanatory variables in the RL/Staff O-4 promotion model to have smaller

coefficients than the RL-only O-4 promotion model because the majority of URL officer lateral transfers move into RL communities, which have lower O-4 promotion rates than Staff communities.

The effects of gender and dependents differ in the RL/Staff and the RL-only O-4 promotion models. The RL/Staff model finds no gender-based differences in promotion rates, whereas in the RL-only model the promotion probability for females is 6.5 percentage points above that of males. In addition, the RL/Staff model shows that officers with dependent children have a 3 percentage point lower probability to be promoted than officers without dependent children. However, the O-4 promotion rate for officers with dependent children in the RL-only model is not statistically significant.

The results for the SWO-only sample are displayed in columns 5 and 6 of Table 26. The key explanatory variable for the SWO-only O-4 promotion model is *EOOW Year 4*. The results in Table 26 are similar to those in Nolan (1993). Specifically, SWOs who qualify EOOW have a 9 percentage point (11.7 percent) higher O-4 promotion probability than SWOs who do not qualify EOOW by year four. Nolan (1993) finds the difference in promotion rates to be 8.9 percent. However, the EOOW qualification is explicitly considered by SWO O-4 selection boards and therefore the coefficient may have an upward bias.

Table 26. Effects of EOOW Qualification on O-4 Promotion Model

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 10	-0.063* (0.037)	0.05	0.059 (0.038)	0.12		
Non-EOOW SWO Lateral Transfer Year 10	0.006 (0.027)	0.08	0.054 (0.034)	0.20		
EOOW SWO Lateral Transfer Year 10	0.025 (0.034)	0.04	0.072* (0.039)	0.10		
EOOW Year 4					0.090*** (0.020)	0.50

As described in Chapter III, data for this table is compiled from the DMDC data set.

3. Relative Average Top Quartile 6–10 YOS Model

Table 27 displays the results for the key explanatory variables of the Relative Average Top Quartile 6–10 YOS model shown in equation 2. The full results of the Relative Average Top Quartile 6–10 YOS model are presented in Appendix B, Table 51.

In Table 27, columns 1 and 2 display the results of the Relative Average Top Quartile 6–10 YOS model for the RL/Staff sample (N=2,280). Columns 3 and 4 analyzes the sample that includes only RL-only officers (N=625). The last two columns use the SWO-only sample to examine the effect of EOOW qualification (N=1,106). The samples are restricted to ten year stayers and officers who receive at least three FITREPs between 6 and 10 YOS.

The use of FITREP performance as a measure of quality has several advantages over the O-4 promotion outcome. In the promotion model the key explanatory variable, *EOOW Year 4*, may be upwardly biased since the O-4 selection board considers the EOOW qualification when determining promotion recommendations. Therefore, on average, an EOOW-qualified officer is more likely to be promoted to O-4 than a non-qualifier. The FITREP outcome variable provides a cleaner measure of job performance that is not influenced by this institutional policy. A FITREP is a direct measure of performance that covers a specific time period. The FITREP performance measure in this thesis compares the average difference between an officer's trait average and their respective reporting senior's cumulative average for each FITREP in 6–10 YOS. This puts all officers, regardless of designator, on a level playing field to determine their performance relative to other officers who were evaluated by the same reporting senior.

The O-4 promotion outcome is problematic when comparing officers across different communities because O-4 selection rates vary for each community based on availability of positions in the next highest grade. In addition, the O-4 selection board considers measures not directly tied to job performance such as professional military education, graduate education, professional certifications, etc. Therefore, FITREP performance is a preferred measure of quality because it directly measures performance and evaluates all officers in a consistent manner.

The dependent variable *Relative Average Top Quartile 6–10 YOS* is binary and =1 if the officers' relative average FITREP difference in 6–10 YOS is in the top quartile and =0 otherwise. The first two columns of Table 27 present results for the RL/Staff sample, the second two columns for the RL-only community, and the last two columns for the SWO-only community.

Each model in Table 27 includes SWOs who qualified EOOW. As mentioned in Chapter III, SWOs are not required to qualify EOOW during their first four years. Additionally, the EOOW qualification is considered difficult to obtain. The models in Table 27 examine if using officers who qualify EOOW by year four as a measure of talent can be linked to the economic value of credentialing and signaling. SWOs who attain the EOOW qualification early in their careers may signal that they have intrinsic abilities that increase their job-related productivity. The FITREP performance of SWOs who qualify EOOW are observed for both those who stay in the SWO community at least ten years and those who lateral transfer into a RL/Staff community by year six.

Columns 1 and 2 of Table 27 compare the FITREP performance of SWO lateral transfers who do and do not qualify EOOW within four years. Officers who lateral transfer out of the SWO community and qualify EOOW are 15.7 percentage points (59.5 percent) more likely to score in the top quartile of FITREP scores in 6–10 YOS than other RL/Staff officers. However, the FITREP performance for SWOs who do not qualify EOOW and lateral transfer is not statistically different from other RL/Staff officers.

Columns 1 and 2 of Table 27 also find statistical differences in some of the other explanatory variables, including *Non-SWO Lateral Transfer Year 8*, *Married Year 6*, *Asian*, *STEM Degree*, and *Unknown STEM Degree*. Specifically, non-SWO URL lateral transfers into RL/Staff communities have a 21.9 percentage point higher probability to rank in the top quartile than RL/Staff non-lateral transfers.

The estimates for lateral transfer on the probability of ranking in the top quartile for the RL-only sample are displayed in columns 3 and 4 of Table 27. The RL-only model shows EOOW-qualified SWOs who lateral transfer into an RL community have a 24.2

percentage point (88 percent) higher probability of ranking in the top quartile for relative average FITREP scores than other RL officers.

The results in columns 5 and 6 of Table 27 uses the SWO-only sample to compare the effect of EOOW qualification on the FITREP performance of SWOs who remain in the SWO community. The results find that EOOW-qualified SWOs have a 9.3 percentage points (32 percent) higher probability of scoring in the top quartile than non-EOOW qualified SWOs.

Table 27. Effects of EOOW Qualification on Top Quartile Relative Average Scores

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 6	0.219* (0.128)	0.01	0.281** (0.132)	0.02		
Non-EOOW SWO Lateral Transfer Year 6	0.029 (0.040)	0.07	0.075 (0.047)	0.22		
EOOW SWO Lateral Transfer Year 6	0.157*** (0.064)	0.03	0.242*** (0.071)	0.10		
EOOW Year 4					0.093*** (0.027)	0.54

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

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VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The Chief of Naval Operations' (CNO) strategy, *A Design for Maintaining Maritime Superiority*, emphases the importance of talent management in meeting the Navy's future manpower needs while maintaining its advantage over adversaries. Specifically, the CNO seeks to strengthen the Navy team through the implementation of *Sailor 2025*. The Performance Evaluation Transformation (PET) effort supports *Sailor 2025* that overhauls the Navy's current evaluation system. The new evaluation system aims to track performance and talent evaluation more robustly and more transparently to support the recruiting, assignment, development and promotion of high-performing officers (Burke, 2018).

This thesis supports the Navy's PET efforts by using a quantitative, multivariate regression analysis approach to examine alternative measures of junior officer performance, including fitness report scores that can be used to track officers' performance and measure job fit, whether in their original job assignments, or following lateral transfer. The lateral transfer process aims to provide flexibility in officer community manning while increasing the Navy's return on investment from training high quality personnel. This thesis builds on previous research including Monroe and Cymrot (2004), Kleyman and Parcell (2010), and Vellucci (2017). Specifically, it focuses on the performance and retention outcomes of officers who lateral transfer to evaluate the Navy's ability to successfully match officers into different communities.

Furthermore, as the Navy increases its efforts of talent management based on a data-rich approach, the thesis explores potential markers of talent, such as additional qualification designations, which are already available in personnel files and can help the Navy identity talented officers who are likely to become high performers.

B. CONCLUSIONS AND RECOMMENDATIONS

- Research Question #1—What are some alternative measures of junior officer performance, including fitness report marks, which could adequately measure performance?

1. Conclusion for Research Question #1

FITREPs are the primary way the Navy currently documents officer performance. The ongoing *Performance Evaluation Transformation* efforts aim to address some of the shortfalls of the current system, such as valuing tenure over performance, or the relative nature of scoring, which skews larger cohort data comparison. While the new evaluation system is being developed and implemented the Navy must continue to track performance using the legacy system.

This thesis uses an alternate measure of performance based on FITREP scores that track the difference in FITREP scores between an individual's trait average and their reporting senior's cumulative average (the relative average). The relative average provides a valuable measure of performance in the Navy's current evaluation system by facilitating the comparison of each officer to all other officers of the same rank evaluated by the same reporting senior.

The other available measure in the current FITREP system compares a member's trait average to the summary group average. However, comparing a member's trait average to the summary group average is not useful for performance evaluation when, as is often the case, only one officer is evaluated by a reporting senior in a FITREP cycle. In addition, even when other officers are evaluated within the same time period by the same reporting senior, the officer comparison is generally limited to a small group of officers. Further, the relative average also may be superior to the use of reporting seniors' promotion recommendations. The Navy restricts the number of promotion recommendations a reporting senior can assign through forced distribution. When reporting seniors are prevented from providing a high promotion recommendation that they believe is accurate, this performance measure loses reliability.

This thesis identifies officers who rank in the top quartile for relative average FITREP scores to identify high-performing officers. The results of this thesis find that individual background characteristics, including the EOOW qualification among SWOs and being married or having dependent children, have positive effects on FITREP performance. This thesis also finds Asians and OCS graduates have lower FITREP scores than Whites and Naval Academy graduates, respectively, among URL officers. The top quartile FITREP measure can be a benchmark of top performance when formulating recommendations that align with the Navy's desire to retain high-quality officers.

2. Recommendation for Research Question #1

The results from this thesis suggest that NPC PERS-321 should examine the alternative FITREP-score based performance metric that compares the difference in FITREP scores between an individual's trait average and their reporting senior's cumulative average (relative average) can be used to evaluate officer performance in the current performance evaluation system. This metric could be used while the new performance evaluation system is being developed and implemented.

- Research Question #2— What professional and pre-accession attributes predict differences in measured performance among junior officers?

3. Conclusion for Research Question #2

One of the goals of this thesis was to investigate how different measures of technical capacity, such as additional qualification designations, may be used as talent markers. The EOOW qualification, and subsequent AQD, in the SWO community is readily available in personnel files. SWOs are not required to qualify EOOW during their first four years. Additionally, the EOOW qualification is considered difficult to obtain. Thus, SWOs who have the capability and motivation to qualify EOOW may signal their ability and desire to go the extra mile. Thus, EOOW qualification may be a candidate for a talent marker among the surface warfare officers.

This thesis finds the EOOW qualification predicts differences in measured performance and retention outcomes. SWOs who qualify EOOW during their division

officer tour(s) are more likely to stay in the Navy at least ten years, have higher O-4 promotion rates, and higher FITREP scores than officers who fail to achieve the EOOW qualification. The positive performance and retention outcomes associated with qualifying EOOW by year four was consistent for both lateral and non-lateral transfers when compared to officers within the same competitive category (SWO, RL, and RL/Staff). This thesis argues that the EOOW qualification is a talent marker that identifies officers with traits, ability and skills, such as higher motivation, or aptitude that may predict future retention and performance outcomes.

4. Recommendations for Research Question #2

1: The results of this thesis suggest that it may be warranted for NPC PERS-41 to consider integrating the EOOW qualification in their SWO assignment decisions. Specifically, division officers who qualify EOOW should be considered for career-enhancing assignments since they are more likely to stay in the Navy and to perform better than non-EOOW-qualified SWOs. In addition, the EOOW qualification should remain a voluntary qualification for division officers. If the EOOW qualification became mandatory, it would lose its ability to predict quality differences among SWOs.

2: The results of this thesis suggest the indicators that predict future success, such as the EOOW qualification for SWOs, can aid lateral transfer/redesignations board members' in selecting officers with the greatest likelihood of future success. Therefore, the DCNO N1 should consider including indicators that predict future success in the lateral transfer/resdesignation selection board precept and convening order may be warranted.

- Research Question #3— How do warfare-qualified officers who lateral transfer perform once they join their new community?

5. Conclusion for Research Question #3

The CNP acknowledges the Navy faces increased competition for talent and it must change personnel processes to compete for that talent (Burke, 2018). This thesis finds warfare-qualified URL officers selected for lateral transfer have higher O-4 promotion rates and FITREP scores (in the post-lateral 6–10 YOS period) in their new community

than their non-lateral transfer counterparts. Lateral transfers also have higher seven- and ten-year retention rates than officers originally assigned to each community within their respective competitive category.

Although this thesis does not causally show that lateral transfer increases the quality of the job fit, due to limitations in available data, it does find the Navy's lateral transfer process selects officers who go on to have above-average performance and retention outcomes. Previous research by Kleyman and Parcell (2010) finds officers who request lateral transfer and are not selected are four times more likely to leave the Navy than officers selected for lateral transfer. Dailey (2013) finds approximately 40 percent of officers who apply are selected for lateral transfer. It is reasonable to conclude that among the officers not approved for lateral transfer many are high-quality officers who decide to leave the Navy.

6. Recommendations for Research Question #3

This thesis's findings suggest that it would be warranted for the CNP to convene a working group to evaluate the feasibility of increasing the number of lateral transfers. This recommendation aligns with the CNO's strategic vision of strengthening the Navy team for the future by increasing career choice and flexibility. More lateral transfer opportunities available for qualified officers may strengthen the Navy's team for the future by retaining high-quality officers.

In addition, the Navy should ensure its personnel files are fully populated to include important pre-accession characteristics that may signal differences in traits, ability, and motivation, such as ACT/SAT scores and college GPA. Better records can allow for more robust analyses and findings in support of Navy leadership personnel management decisions.

C. FURTHER RESEARCH

As the Navy transforms its performance evaluation system and increases its efforts to manage talent and remain competitive in the "war for talent," additional research that examines data available in Navy personnel files may identify other talent markers that

predict differences in performance and retention outcomes by officer community. Specifically, AQDs should be analyzed outside the SWO community to determine if their effects in predicting performance and retention are similar to the EOOW qualification for SWOs. In addition to researching the attainment of AQDs officers receive, the amount of time it takes for officers to achieve AQDs also should be analyzed. As was the case with the EOOW qualification for SWOs, those who achieve the AQD early in their career may indicate greater motivation and/or cognitive ability. These relationships may apply to AQDs other than EOOW. Further research can examine officers' retention and performance outcomes for longer periods of time to determine if the EOOW qualification can reliably predict promotion to the O-5 and O-6 paygrades. The analysis of more recent officer data can examine whether the EOOW qualification continues to predict retention and performance outcomes among newer cohorts.

Further research can expand the insights on the contribution of different measures of "technical capacity," such as qualifications, technical skills and other aptitudes on officer retention and performance measures. This is especially important as the Navy is transforming its performance evaluation system to more accurately assess the performance and potential of each sailor, and to support talent management efforts.

APPENDIX A. SUMMARY STATISTICS

Table 28. Summary Statistics for URL Officer Seven Year Stayers (Excludes Pilots/NFOs)

Variable	Obs.	Mean	Std. Dev.
Seven Year Retention	6,198	0.53	0.50
Lateral Transfer Year 5	6,198	0.01	0.12
Female	6,198	0.16	0.37
Married Year 2	6,198	0.29	0.45
Dependent Children Year 2	6,198	0.21	0.41
White Non-Hispanic	6,198	0.73	0.44
Black Non-Hispanic	6,198	0.08	0.27
Asian	6,198	0.05	0.21
Hispanic	6,198	0.11	0.31
Other Unknown Race	6,198	0.03	0.18
Naval Academy	6,198	0.32	0.46
NROTC	6,198	0.36	0.48
OCS	6,198	0.31	0.46
Direct/Other Commissioning	6,198	0.01	0.12
STEM Degree	6,198	0.44	0.50
STEM Degree Unknown	6,198	0.16	0.36
Cohort FY99	6,198	0.18	0.39
Cohort FY00	6,198	0.20	0.40
Cohort FY01	6,198	0.21	0.41
Cohort FY02	6,198	0.20	0.40
Cohort FY03	6,198	0.02	0.15

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 29. Summary Statistics for RL/Staff Officer Seven Year Stayers

Variable	Obs.	Mean	Std. Dev.
Seven Year Retention	4,421	0.65	0.48
Lateral Transfer Year 5	4,421	0.06	0.24
Female	4,421	0.32	0.47
Married Year 2	4,421	0.43	0.49
Dependent Children Year 2	4,421	0.36	0.48
White Non-Hispanic	4,421	0.72	0.45
Black Non-Hispanic	4,421	0.10	0.30
Asian	4,421	0.07	0.26
Hispanic	4,421	0.07	0.25
Other Unknown Race	4,421	0.04	0.19
Naval Academy	4,421	0.07	0.25
NROTC	4,421	0.13	0.33
OCS	4,421	0.42	0.49
Direct/Other Commissioning	4,421	0.39	0.49
STEM Degree	4,421	0.43	0.49
STEM Degree Unknown	4,421	0.27	0.44
Cohort FY99	4,421	0.19	0.40
Cohort FY00	4,421	0.21	0.41
Cohort FY01	4,421	0.23	0.42
Cohort FY02	4,421	0.19	0.39
Cohort FY03	4,421	0.17	0.38

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 30. Summary Statistics for RL-Only Officer Seven Year Stayers

Variable	Obs.	Mean	Std. Dev.
Seven Year Retention	1,382	0.65	0.48
Lateral Transfer Year 5	1,382	0.20	0.40
Female	1,382	0.21	0.41
Married Year 2	1,382	0.41	0.49
Dependent Children Year 2	1,382	0.33	0.47
White Non-Hispanic	1,382	0.76	0.42
Black Non-Hispanic	1,382	0.07	0.26
Asian	1,382	0.05	0.22
Hispanic	1,382	0.07	0.26
Other Unknown Race	1,382	0.04	0.19
Naval Academy	1,382	0.09	0.29
NROTC	1,382	0.16	0.36
OCS	1,382	0.52	0.50
Direct/Other Commissioning	1,382	0.23	0.42
STEM Degree	1,382	0.34	0.47
STEM Degree Unknown	1,382	0.24	0.43
Cohort FY99	1,382	0.18	0.39
Cohort FY00	1,382	0.20	0.40
Cohort FY01	1,382	0.22	0.41
Cohort FY02	1,382	0.20	0.40
Cohort FY03	1,382	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 31. Summary Statistics for URL Officer Ten Year Stayers

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	11,389	0.51	0.50
Lateral Transfer Year 8	11,389	0.01	0.12
Female	11,389	0.13	0.34
Married Year 6	11,389	0.44	0.50
Dependent Children Year 6	11,389	0.23	0.42
White Non-Hispanic	11,389	0.77	0.42
Black Non-Hispanic	11,389	0.06	0.24
Asian	11,389	0.04	0.20
Hispanic	11,389	0.10	0.31
Other Unknown Race	11,389	0.03	0.17
Naval Academy	11,389	0.31	0.46
NROTC	11,389	0.32	0.47
OCS	11,389	0.29	0.45
Direct/Other Commissioning	11,389	0.09	0.28
STEM Degree	11,389	0.42	0.49
STEM Degree Unknown	11,389	0.17	0.38
Cohort FY99	11,389	0.18	0.38
Cohort FY00	11,389	0.21	0.41
Cohort FY01	11,389	0.20	0.40
Cohort FY02	11,389	0.21	0.41
Cohort FY03	11,389	0.20	0.40

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 32. Summary Statistics for RL/Staff Officer Ten Year Stayers

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	4,608	0.58	0.49
Lateral Transfer Year 8	4,608	0.10	0.30
Female	4,608	0.32	0.46
Married Year 6	4,608	0.49	0.50
Dependent Children Year 6	4,608	0.34	0.48
White Non-Hispanic	4,608	0.72	0.45
Black Non-Hispanic	4,608	0.10	0.30
Asian	4,608	0.07	0.26
Hispanic	4,608	0.07	0.25
Other Unknown Race	4,608	0.04	0.19
Naval Academy	4,608	0.13	0.34
NROTC	4,608	0.08	0.27
OCS	4,608	0.42	0.49
Direct/Other Commissioning	4,608	0.37	0.48
STEM Degree	4,608	0.43	0.50
STEM Degree Unknown	4,608	0.26	0.44
Cohort FY99	4,608	0.19	0.39
Cohort FY00	4,608	0.21	0.41
Cohort FY01	4,608	0.23	0.42
Cohort FY02	4,608	0.19	0.40
Cohort FY03	4,608	0.17	0.38

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 33. Summary Statistics for RL-Only Officer Ten Year Stayers

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	1,569	0.60	0.49
Lateral Transfer Year 8	1,569	0.29	0.45
Female	1,569	0.22	0.41
Married Year 6	1,569	0.49	0.50
Dependent Children Year 6	1,569	0.33	0.47
White Non-Hispanic	1,569	0.75	0.43
Black Non-Hispanic	1,569	0.08	0.27
Asian	1,569	0.05	0.22
Hispanic	1,569	0.08	0.26
Other Unknown Race	1,569	0.04	0.19
Naval Academy	1,569	0.12	0.33
NROTC	1,569	0.18	0.38
OCS	1,569	0.50	0.50
Direct/Other Commissioning	1,569	0.20	0.40
STEM Degree	1,569	0.37	0.48
STEM Degree Unknown	1,569	0.22	0.41
Cohort FY99	1,569	0.17	0.38
Cohort FY00	1,569	0.20	0.40
Cohort FY01	1,569	0.23	0.42
Cohort FY02	1,569	0.21	0.41
Cohort FY03	1,569	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 34. Summary Statistics for URL Officers Who Are Promotion-Eligible to O-4

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	5,788	0.75	0.43
Lateral Transfer Year 10	5,788	0.02	0.14
Female	5,788	0.08	0.27
Married Year 6	5,788	0.65	0.48
Dependent Children Year 6	5,788	0.37	0.48
White Non-Hispanic	5,788	0.78	0.42
Black Non-Hispanic	5,788	0.06	0.24
Asian	5,788	0.04	0.18
Hispanic	5,788	0.10	0.30
Other Unknown Race	5,788	0.03	0.17
Naval Academy	5,788	0.29	0.45
NROTC	5,788	0.27	0.45
OCS	5,788	0.33	0.47
Direct/Other Commissioning	5,788	0.10	0.30
STEM Degree	5,788	0.46	0.50
STEM Degree Unknown	5,788	0.08	0.27
Cohort FY99	5,788	0.18	0.38
Cohort FY00	5,788	0.20	0.40
Cohort FY01	5,788	0.20	0.40
Cohort FY02	5,788	0.22	0.41
Cohort FY03	5,788	0.21	0.40

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 35. Summary Statistics for RL/Staff Officers Who Are Promotion-Eligible to O-4

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	2,729	0.83	0.38
Lateral Transfer Year 10	2,729	0.15	0.36
Female	2,729	0.25	0.43
Married Year 6	2,729	0.72	0.45
Dependent Children Year 6	2,729	0.53	0.50
White Non-Hispanic	2,729	0.70	0.46
Black Non-Hispanic	2,729	0.12	0.32
Asian	2,729	0.08	0.27
Hispanic	2,729	0.07	0.25
Other Unknown Race	2,729	0.04	0.19
Naval Academy	2,729	0.07	0.26
NROTC	2,729	0.10	0.30
OCS	2,729	0.44	0.50
Direct/Other Commissioning	2,729	0.38	0.49
STEM Degree	2,729	0.49	0.50
STEM Degree Unknown	2,729	0.11	0.32
Cohort FY99	2,729	0.20	0.40
Cohort FY00	2,729	0.21	0.41
Cohort FY01	2,729	0.23	0.42
Cohort FY02	2,729	0.19	0.39
Cohort FY03	2,729	0.16	0.37

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 36. Summary Statistics for RL-Only Officers Who Are Promotion-Eligible to O-4

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	1,001	0.82	0.38
Lateral Transfer Year 10	1,001	0.42	0.49
Female	1,001	0.17	0.38
Married Year 6	1,001	0.70	0.46
Dependent Children Year 6	1,001	0.48	0.50
White Non-Hispanic	1,001	0.72	0.45
Black Non-Hispanic	1,001	0.09	0.29
Asian	1,001	0.06	0.24
Hispanic	1,001	0.08	0.27
Other Unknown Race	1,001	0.04	0.20
Naval Academy	1,001	0.13	0.34
NROTC	1,001	0.15	0.36
OCS	1,001	0.53	0.50
Direct/Other Commissioning	1,001	0.18	0.38
STEM Degree	1,001	0.42	0.49
STEM Degree Unknown	1,001	0.08	0.27
Cohort FY99	1,001	0.19	0.39
Cohort FY00	1,001	0.19	0.39
Cohort FY01	1,001	0.24	0.43
Cohort FY02	1,001	0.21	0.41
Cohort FY03	1,001	0.17	0.38

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 37. Summary Statistics for URL Officer FITREP Performance in 6–10 YOS Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	3,536	0.27	0.44
Lateral Transfer Year 6	3,536	0.02	0.12
Female	3,536	0.08	0.27
Married Year 6	3,536	0.68	0.47
Dependent Children Year 6	3,536	0.39	0.49
White Non-Hispanic	3,536	0.76	0.43
Black Non-Hispanic	3,536	0.06	0.24
Asian	3,536	0.04	0.19
Hispanic	3,536	0.11	0.31
Other Unknown Race	3,536	0.03	0.17
Naval Academy	3,536	0.30	0.46
NROTC	3,536	0.28	0.45
OCS	3,536	0.33	0.47
Direct/Other Commissioning	3,536	0.08	0.28
STEM Degree	3,536	0.50	0.50
STEM Degree Unknown	3,536	0.02	0.15
Cohort FY99	3,536	0.20	0.40
Cohort FY00	3,536	0.22	0.41
Cohort FY01	3,536	0.19	0.40
Cohort FY02	3,536	0.20	0.40
Cohort FY03	3,536	0.18	0.39

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 38. Summary Statistics for RL/Staff Officer FITREP Performance in 6–10 YOS Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	2,256	0.26	0.44
Lateral Transfer Year 6	2,256	0.09	0.29
Female	2,256	0.26	0.44
Married Year 6	2,256	0.74	0.44
Dependent Children Year 6	2,256	0.55	0.50
White Non-Hispanic	2,256	0.68	0.47
Black Non-Hispanic	2,256	0.13	0.34
Asian	2,256	0.08	0.27
Hispanic	2,256	0.07	0.25
Other Unknown Race	2,256	0.04	0.19
Naval Academy	2,256	0.06	0.24
NROTC	2,256	0.09	0.28
OCS	2,256	0.43	0.50
Direct/Other Commissioning	2,256	0.42	0.49
STEM Degree	2,256	0.49	0.50
STEM Degree Unknown	2,256	0.09	0.28
Cohort FY99	2,256	0.21	0.41
Cohort FY00	2,256	0.22	0.41
Cohort FY01	2,256	0.23	0.42
Cohort FY02	2,256	0.18	0.39
Cohort FY03	2,256	0.16	0.36

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 39. Summary Statistics for RL-Only Officer FITREP Performance in 6–10 YOS Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	623	0.28	0.45
Lateral Transfer Year 6	623	0.34	0.48
Female	623	0.18	0.38
Married Year 6	623	0.74	0.44
Dependent Children Year 6	623	0.52	0.50
White Non-Hispanic	623	0.70	0.46
Black Non-Hispanic	623	0.12	0.33
Asian	623	0.06	0.24
Hispanic	623	0.07	0.26
Other Unknown Race	623	0.04	0.19
Naval Academy	623	0.12	0.32
NROTC	623	0.13	0.34
OCS	623	0.58	0.49
Direct/Other Commissioning	623	0.17	0.37
STEM Degree	623	0.39	0.49
STEM Degree Unknown	623	0.02	0.13
Cohort FY99	623	0.21	0.41
Cohort FY00	623	0.20	0.40
Cohort FY01	623	0.24	0.43
Cohort FY02	623	0.19	0.39
Cohort FY03	623	0.16	0.37

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 40. Summary Statistics for Analysis of EOOW Qualification on Ten-Year Retention RL/Staff Model

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	4,664	0.58	0.49
Non-SWO Lateral Transfer Year 8	4,664	0.02	0.14
Non-EOOW SWO Lateral Transfer Year 8	4,664	0.07	0.25
EOOW SWO Lateral Transfer Year 8	4,664	0.02	0.15
Female	4,664	0.32	0.46
Married Year 6	4,664	0.49	0.50
Dependent Children Year 6	4,664	0.34	0.47
White Non-Hispanic	4,664	0.72	0.45
Black Non-Hispanic	4,664	0.10	0.30
Asian	4,664	0.07	0.26
Hispanic	4,664	0.07	0.25
Other Unknown Race	4,664	0.04	0.19
Naval Academy	4,664	0.08	0.27
NROTC	4,664	0.14	0.34
OCS	4,664	0.42	0.49
Direct/Other Commissioning	4,664	0.37	0.48
STEM Degree	4,664	0.44	0.50
STEM Degree Unknown	4,664	0.26	0.44
Cohort FY99	4,664	0.19	0.40
Cohort FY00	4,664	0.21	0.41
Cohort FY01	4,664	0.23	0.42
Cohort FY02	4,664	0.19	0.39
Cohort FY03	4,664	0.17	0.38

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 41. Summary Statistics for Analysis of EOOW Qualification on Ten-Year Retention RL-Only Model

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	1,569	0.60	0.49
Non-SWO Lateral Transfer Year 8	1,569	0.06	0.23
Non-EOOW SWO Lateral Transfer Year 8	1,569	0.17	0.38
EOOW SWO Lateral Transfer Year 8	1,569	0.07	0.25
Female	1,569	0.22	0.41
Married Year 6	1,569	0.49	0.50
Dependent Children Year 6	1,569	0.33	0.47
White Non-Hispanic	1,569	0.75	0.43
Black Non-Hispanic	1,569	0.08	0.27
Asian	1,569	0.05	0.22
Hispanic	1,569	0.08	0.26
Other Unknown Race	1,569	0.04	0.19
Naval Academy	1,569	0.12	0.33
NROTC	1,569	0.18	0.38
OCS	1,569	0.50	0.50
Direct/Other Commissioning	1,569	0.20	0.40
STEM Degree	1,569	0.37	0.48
STEM Degree Unknown	1,569	0.22	0.41
Cohort FY99	1,569	0.17	0.38
Cohort FY00	1,569	0.20	0.40
Cohort FY01	1,569	0.23	0.42
Cohort FY02	1,569	0.21	0.41
Cohort FY03	1,569	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 42. Summary Statistics for Analysis of EOOW Qualification on Ten-Year Retention SWO Model

Variable	Obs.	Mean	Std. Dev.
Ten Year Retention	3,846	0.39	0.49
EOOW Year 4	3,846	0.32	0.47
Female	3,846	0.25	0.43
Married Year 6	3,846	0.32	0.47
Dependent Children Year 6	3,846	0.19	0.40
White Non-Hispanic	3,846	0.70	0.46
Black Non-Hispanic	3,846	0.10	0.30
Asian	3,846	0.05	0.22
Hispanic	3,846	0.11	0.31
Other Unknown Race	3,846	0.04	0.19
Naval Academy	3,846	0.29	0.45
NROTC	3,846	0.42	0.49
OCS	3,846	0.27	0.44
Direct/Other Commissioning	3,846	0.02	0.12
STEM Degree	3,846	0.35	0.48
STEM Degree Unknown	3,846	0.15	0.36
Cohort FY99	3,846	0.19	0.39
Cohort FY00	3,846	0.21	0.41
Cohort FY01	3,846	0.20	0.40
Cohort FY02	3,846	0.20	0.40
Cohort FY03	3,846	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 43. Summary Statistics for Effects of EOOW Qualification on O-4 Promotion RL/Staff Model

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	2,774	0.82	0.38
Non-SWO Lateral Transfer Year 10	2,774	0.05	0.22
Non-EOOW SWO Lateral Transfer Year 10	2,774	0.08	0.27
EOOW SWO Lateral Transfer Year 8	2,774	0.04	0.19
Female	2,774	0.25	0.43
Married Year 6	2,774	0.72	0.45
Dependent Children Year 6	2,774	0.52	0.50
White Non-Hispanic	2,774	0.70	0.46
Black Non-Hispanic	2,774	0.12	0.32
Asian	2,774	0.08	0.27
Hispanic	2,774	0.07	0.25
Other Unknown Race	2,774	0.04	0.19
Naval Academy	2,774	0.08	0.26
NROTC	2,774	0.11	0.31
OCS	2,774	0.44	0.50
Direct/Other Commissioning	2,774	0.38	0.49
STEM Degree	2,774	0.49	0.50
STEM Degree Unknown	2,774	0.11	0.32
Cohort FY99	2,774	0.20	0.40
Cohort FY00	2,774	0.21	0.41
Cohort FY01	2,774	0.24	0.42
Cohort FY02	2,774	0.19	0.39
Cohort FY03	2,774	0.16	0.37

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 44. Summary Statistics for Effects of EOOW Qualification on O-4 Promotion
RL-Only Model

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	1,001	0.82	0.38
Non-SWO Lateral Transfer Year 10	1,001	0.12	0.33
Non-EOOW SWO Lateral Transfer Year 10	1,001	0.20	0.40
EOOW SWO Lateral Transfer Year 10	1,001	0.10	0.29
Female	1,001	0.17	0.38
Married Year 6	1,001	0.70	0.46
Dependent Children Year 6	1,001	0.48	0.50
White Non-Hispanic	1,001	0.72	0.45
Black Non-Hispanic	1,001	0.09	0.29
Asian	1,001	0.06	0.24
Hispanic	1,001	0.08	0.27
Other Unknown Race	1,001	0.04	0.20
Naval Academy	1,001	0.13	0.34
NROTC	1,001	0.15	0.36
OCS	1,001	0.53	0.50
Direct/Other Commissioning	1,001	0.18	0.38
STEM Degree	1,001	0.42	0.49
STEM Degree Unknown	1,001	0.08	0.27
Cohort FY99	1,001	0.19	0.39
Cohort FY00	1,001	0.19	0.39
Cohort FY01	1,001	0.24	0.43
Cohort FY02	1,001	0.21	0.41
Cohort FY03	1,001	0.17	0.38

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 45. Summary Statistics for Effects of EOOW Qualification on O-4 Promotion SWO Model

Variable	Obs.	Mean	Std. Dev.
O-4 Promotion	1,497	0.77	0.42
EOOW Year 4	1,497	0.50	0.50
Female	1,497	0.15	0.36
Married Year 6	1,497	0.63	0.48
Dependent Children Year 6	1,497	0.41	0.49
White Non-Hispanic	1,497	0.68	0.47
Black Non-Hispanic	1,497	0.14	0.35
Asian	1,497	0.05	0.21
Hispanic	1,497	0.10	0.31
Other Unknown Race	1,497	0.03	0.18
Naval Academy	1,497	0.23	0.42
NROTC	1,497	0.33	0.47
OCS	1,497	0.41	0.49
Direct/Other Commissioning	1,497	0.02	0.16
STEM Degree	1,497	0.35	0.48
STEM Degree Unknown	1,497	0.05	0.22
Cohort FY99	1,497	0.19	0.39
Cohort FY00	1,497	0.22	0.41
Cohort FY01	1,497	0.21	0.40
Cohort FY02	1,497	0.19	0.40
Cohort FY03	1,497	0.19	0.39

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 46. Summary Statistics for Effect of EOOW Qualification on Top Quartile Relative Average Scores RL/Staff Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	2,280	0.26	0.44
Non-SWO Lateral Transfer Year 10	2,280	0.01	0.08
Non-EOOW SWO Lateral Transfer Year 10	2,280	0.07	0.25
EOOW SWO Lateral Transfer Year 10	2,280	0.03	0.17
Female	2,280	0.26	0.44
Married Year 6	2,280	0.74	0.44
Dependent Children Year 6	2,280	0.54	0.50
White Non-Hispanic	2,280	0.68	0.47
Black Non-Hispanic	2,280	0.13	0.34
Asian	2,280	0.08	0.27
Hispanic	2,280	0.07	0.25
Other Unknown Race	2,280	0.04	0.19
Naval Academy	2,280	0.06	0.24
NROTC	2,280	0.09	0.29
OCS	2,280	0.43	0.50
Direct/Other Commissioning	2,280	0.41	0.49
STEM Degree	2,280	0.49	0.50
STEM Degree Unknown	2,280	0.09	0.28
Cohort FY99	2,280	0.22	0.41
Cohort FY00	2,280	0.22	0.41
Cohort FY01	2,280	0.23	0.42
Cohort FY02	2,280	0.18	0.38
Cohort FY03	2,280	0.16	0.36

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 47. Summary Statistics for Effect of EOOW Qualification on Top Quartile Relative Average Scores RL-Only Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	625	0.27	0.45
Non-SWO Lateral Transfer Year 10	625	0.02	0.15
Non-EOOW SWO Lateral Transfer Year 10	625	0.22	0.41
EOOW SWO Lateral Transfer Year 10	625	0.10	0.30
Female	625	0.18	0.38
Married Year 6	625	0.74	0.44
Dependent Children Year 6	625	0.52	0.50
White Non-Hispanic	625	0.70	0.46
Black Non-Hispanic	625	0.12	0.33
Asian	625	0.06	0.24
Hispanic	625	0.07	0.26
Other Unknown Race	625	0.04	0.19
Naval Academy	625	0.12	0.32
NROTC	625	0.13	0.34
OCS	625	0.58	0.49
Direct/Other Commissioning	625	0.17	0.37
STEM Degree	625	0.39	0.49
STEM Degree Unknown	625	0.02	0.13
Cohort FY99	625	0.21	0.41
Cohort FY00	625	0.20	0.40
Cohort FY01	625	0.24	0.43
Cohort FY02	625	0.19	0.39
Cohort FY03	625	0.16	0.37

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

Table 48. Summary Statistics for Effect of EOOW Qualification on Top Quartile Relative Average Scores SWO Model

Variable	Obs.	Mean	Std. Dev.
Relative Average Top Quartile 6–10 YOS	1,106	0.29	0.45
EOOW Year 4	1,106	0.54	0.50
Female	1,106	0.14	0.35
Married Year 6	1,106	0.66	0.48
Dependent Children Year 6	1,106	0.43	0.50
White Non-Hispanic	1,106	0.69	0.46
Black Non-Hispanic	1,106	0.13	0.34
Asian	1,106	0.04	0.20
Hispanic	1,106	0.10	0.30
Other Unknown Race	1,106	0.03	0.18
Naval Academy	1,106	0.21	0.41
NROTC	1,106	0.33	0.47
OCS	1,106	0.42	0.49
Direct/Other Commissioning	1,106	0.04	0.19
STEM Degree	1,106	0.37	0.48
STEM Degree Unknown	1,106	0.02	0.14
Cohort FY99	1,106	0.20	0.40
Cohort FY00	1,106	0.22	0.42
Cohort FY01	1,106	0.22	0.42
Cohort FY02	1,106	0.19	0.39
Cohort FY03	1,106	0.17	0.37

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

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APPENDIX B. FULL EOOW MODEL RESULTS

Table 49. Effects of EOOW Qualification on Ten-Year Retention

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 8	0.208*** (0.045)	0.02	0.209*** (0.050)	0.06		
Non-EOOW SWO Lateral Transfer Year 8	0.140*** (0.025)	0.07	0.161*** (0.029)	0.17		
EOOW SWO Lateral Transfer Year 8	0.267*** (0.033)	0.02	0.292*** (0.036)	0.07		
EOOW Year 4					0.181*** (0.015)	0.32
Female	-0.019 (0.014)	0.32	-0.041* (0.027)	0.22	-0.050*** (0.014)	0.25
Married Year 6	0.350*** (0.017)	0.49	0.369*** (0.027)	0.49	0.358*** (0.020)	0.32
Dependent Children Year 6	0.136*** (0.016)	0.34	0.060** (0.027)	0.33	0.141*** (0.022)	0.19
Black Non-Hispanic	0.054*** (0.019)	0.10	0.022 (0.033)	0.08	0.084*** (0.021)	0.10
Asian	0.031 (0.022)	0.07	0.079* (0.039)	0.05	0.043 (0.028)	0.05
Hispanic	0.007 (0.024)	0.07	0.010 (0.041)	0.08	0.029 (0.021)	0.11
Other Unknown Race	0.037 (0.027)	0.04	0.115** (0.046)	0.04	0.018 (0.032)	0.04
NROTC	-0.034 (0.028)	0.14	-0.069* (0.038)	0.18	0.028* (0.016)	0.42
OCS	0.135*** (0.025)	0.42	0.154*** (0.036)	0.50	0.247*** (0.020)	0.27
Direct/Other Commissioning	0.195*** (0.026)	0.37	0.140*** (0.042)	0.20	0.259*** (0.045)	0.02
STEM Degree	-0.050*** (0.014)	0.44	-0.042* (0.024)	0.37	-0.017 (0.014)	0.35
Unknown STEM Degree	-0.343*** (0.017)	0.26	-0.350*** (0.029)	0.22	-0.286*** (0.018)	0.15
Cohort FY99	-0.010 (0.019)	0.19	0.018 (0.032)	0.17	-0.001 (0.020)	0.19
Cohort FY00	-0.042** (0.018)	0.21	-0.050 (0.030)	0.20	-0.030 (0.019)	0.21
Cohort FY01	-0.008 (0.017)	0.23	0.005 (0.028)	0.23	-0.010 (0.019)	0.20
Cohort FY02	0.004 (0.018)	0.19	0.046 (0.029)	0.21	-0.014 (0.019)	0.20
constant	0.337*** (0.029)		0.338*** (0.043)		0.166*** (0.019)	
Observations	4,664		1,569		3,846	
R-Squared	0.404		0.42		0.406	
Mean Retention Rate	0.581		0.604		0.391	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 50. Effects of EOOW Qualification on O-4 Promotion Model

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 10	-0.063* (0.037)	0.05	0.059 (0.038)	0.12		
Non-EOOW SWO Lateral Transfer Year 10	0.006 (0.027)	0.08	0.054 (0.034)	0.20		
EOOW SWO Lateral Transfer Year 10	0.025 (0.034)	0.04	0.072* (0.039)	0.10		
EOOW Year 4					0.090*** (0.020)	0.50
Female	0.015 (0.018)	0.25	0.065** (0.032)	0.17	0.045 (0.029)	0.15
Married Year 6	0.086*** (0.019)	0.72	0.087*** (0.030)	0.70	0.115*** (0.024)	0.63
Dependent Children Year 6	-0.030* (0.016)	0.52	0.021 (0.027)	0.48	0.012 (0.023)	0.41
Black Non-Hispanic	-0.058** (0.024)	0.12	-0.083** (0.042)	0.09	-0.036 (0.032)	0.14
Asian	-0.076*** (0.030)	0.08	-0.078 (0.055)	0.06	0.034 (0.044)	0.05
Hispanic	-0.036 (0.031)	0.07	-0.031 (0.044)	0.08	0.019 (0.031)	0.10
Other Unknown Race	0.031 (0.032)	0.04	0.047 (0.052)	0.04	-0.027 (0.058)	0.03
NROTC	0.043 (0.032)	0.11	0.052 (0.040)	0.15	-0.048* (0.028)	0.33
OCS	0.004 (0.031)	0.44	-0.017 (0.039)	0.53	0.033 (0.027)	0.41
Direct/Other Commissioning	0.000 (0.032)	0.38	-0.027 (0.049)	0.18	0.033 (0.071)	0.02
STEM Degree	-0.003 (0.016)	0.49	-0.038 (0.025)	0.42	0.043** (0.021)	0.35
Unknown STEM Degree	-0.208*** (0.030)	0.11	-0.164*** (0.054)	0.08	-0.299*** (0.056)	0.05
Cohort FY99	0.100*** (0.026)	0.20	0.230*** (0.044)	0.19	0.386*** (0.036)	0.19
Cohort FY00	0.078*** (0.026)	0.21	0.177*** (0.045)	0.19	0.402*** (0.035)	0.22
Cohort FY01	0.095*** (0.025)	0.24	0.229*** (0.042)	0.24	0.415*** (0.034)	0.21
Cohort FY02	0.107*** (0.026)	0.19	0.212*** (0.043)	0.21	0.265*** (0.038)	0.19
constant	0.726*** (0.040)		0.586*** (0.057)		0.345*** (0.040)	
Observations	2,774		1,001		1,497	
R-Squared	0.054		0.094		0.195	
Mean Promotion Rate	0.82		0.82		0.77	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the DMDC data set.

Table 51. Effects of EOOW Qualification on Top Quartile Relative Average Scores

Variables	(1) RL/Staff Model		(2) RL Model		(3) SWO Model	
	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$	Coefficient (SE)	$\bar{x}$
Non-SWO Lateral Transfer Year 6	0.219* (0.128)	0.01	0.281** (0.132)	0.02		
Non-EOOW SWO Lateral Transfer Year 6	0.029 (0.040)	0.07	0.075 (0.047)	0.22		
EOOW SWO Lateral Transfer Year 6	0.157*** (0.064)	0.03	0.242*** (0.071)	0.10		
EOOW Year 4					0.093*** (0.027)	0.54
Female	0.015 (0.023)	0.26	-0.021 (0.049)	0.18	0.072* (0.042)	0.14
Married Year 6	0.080*** (0.023)	0.74	0.049 (0.047)	0.74	0.012 (0.032)	0.66
Dependent Children Year 6	0.020 (0.022)	0.54	0.045 (0.044)	0.52	-0.011 (0.032)	0.43
Black Non-Hispanic	0.006 (0.028)	0.13	-0.002 (0.057)	0.12	-0.042 (0.040)	0.13
Asian	-0.081*** (0.031)	0.08	-0.158** (0.056)	0.06	-0.111* (0.058)	0.04
Hispanic	0.018 (0.038)	0.07	0.046 (0.072)	0.07	-0.050 (0.046)	0.10
Other Unknown Race	-0.008 (0.051)	0.04	0.117 (0.103)	0.04	-0.103 (0.067)	0.03
NROTC	0.000 (0.050)	0.09	-0.050 (0.076)	0.13	-0.063 (0.040)	0.33
OCS	-0.060 (0.043)	0.43	-0.033 (0.064)	0.58	-0.100** (0.040)	0.42
Direct/Other Commissioning	0.013 (0.044)	0.41	0.094 (0.077)	0.17	-0.084 (0.081)	0.04
STEM Degree	-0.036* (0.021)	0.49	-0.013 (0.038)	0.39	-0.007 (0.029)	0.37
Unknown STEM Degree	-0.179*** (0.031)	0.09	-0.019 (0.126)	0.02	-0.120 (0.075)	0.02
Cohort FY99	-0.018 (0.032)	0.22	-0.045 (0.063)	0.21	-0.070 (0.048)	0.20
Cohort FY00	-0.041 (0.031)	0.22	-0.132** (0.061)	0.20	-0.071 (0.047)	0.22
Cohort FY01	-0.038 (0.031)	0.23	-0.098* (0.060)	0.24	-0.052 (0.046)	0.22
Cohort FY02	-0.086*** (0.031)	0.18	-0.072 (0.063)	0.19	-0.051 (0.048)	0.19
constant	0.278*** (0.052)		0.261*** -0.087		0.363*** (0.054)	
Observations	2,280		625		1,106	
R-Squared	0.035		0.062		0.033	
*** p<0.01, ** p<0.05, *p<0.1						

As described in Chapter III, data for this table is compiled from the BUPERS-NAVPERSCOM data set.

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