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MONTEREY, CALIFORNIA

THESIS

**STUDY OF FEMALE JUNIOR OFFICER RETENTION
AND PROMOTION IN THE U.S. NAVY**

by

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March 2016

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**STUDY OF FEMALE JUNIOR OFFICER RETENTION AND PROMOTION IN
THE U.S. NAVY**

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ABSTRACT

The Military Leadership Diversity Commission of 2011 and top Navy leaders have stressed the importance of achieving gender integration in the military, making it one of Navy's top priorities. This study examines the promotion and retention rates of Navy officers, focusing on women of various racial/ethnic backgrounds. The study uses quantitative multivariate analysis to identify demographic and professional factors, such as gender, race/ethnicity, educational level, commissioning source, and Navy designator (military occupational specialty) to explain differences in outcomes of retention, promotion, and lateral transfers to another community. Using data on over 16,000 Navy officers commissioned from 1999 to 2003, the results from regression analyses show that women are less likely than men to stay in the Navy but show no difference in promotion rates to O-4 and lateral transfers to another community. Also, officers who obtain graduate-level education or transfer laterally to another community by 10 years of service have higher rates of retention and promotion. Thus, one approach toward retaining more women in the Navy is to expand their opportunities for graduate-level education and lateral transfer. Further research is needed to study the influence of these factors, particularly lateral transfers, on the stay-leave decisions of women.

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TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	BACKGROUND	1
B.	PROBLEM	1
C.	PURPOSE.....	2
D.	RESEARCH QUESTIONS.....	3
E.	SCOPE AND LIMITATIONS.....	3
F.	ORGANIZATION	4
II.	BACKGROUND	5
A.	INTRODUCTION.....	5
B.	DEPARTMENT OF DEFENSE SUPPORT	5
C.	NAVY DEMOGRAPHIC STATISTICS	7
1.	COMMISSIONING SOURCES.....	10
2.	GENDER	13
3.	LATERAL TRANSFERS	14
4.	JOB PERFORMANCE	15
III.	LITERATURE REVIEW	19
A.	OVERVIEW.....	19
B.	EARLY CAREER EFFECTS.....	19
C.	SURFACE WARFARE OFFICER RETENTION.....	25
D.	RETENTION AND PROMOTION OF HISPANIC OFFICERS.....	29
E.	SUMMARY	32
F.	IMPLICATIONS	33
IV.	DATA AND DESCRIPTIVE STATISTICS.....	35
A.	INTRODUCTION.....	35
B.	DATA DESCRIPTION	35
1.	DEPENDENT VARIABLES—DEFINING RETENTION AND PROMOTION	35
2.	INDEPENDENT VARIABLES	36
C.	SUMMARY STATISTICS.....	40
D.	T-TESTS OF DIFFERENCES IN GROUP MEANS	50
E.	SUMMARY	53
V.	MODELS AND RESULTS	55
A.	OVERVIEW.....	55

B.	METHODOLOGY	55
C.	ESTIMATION MODELS	55
1.	MSR RETENTION MODEL RESULTS	56
2.	TEN-YEAR RETENTION MODEL RESULTS	60
a.	<i>Results for all Officers</i>	61
b.	<i>Results with restricted sample of Officers who stay beyond MSR (n=11,910)</i>	64
3.	PROMOTION MODEL RESULTS.....	68
4.	LATERAL TRANSFER MODEL RESULTS	71
VI.	SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	77
A.	SUMMARY	77
B.	CONCLUSIONS	80
C.	RECOMMENDATION.....	80
	LIST OF REFERENCES.....	83
	INITIAL DISTRIBUTION LIST	87

LIST OF FIGURES

Figure 1.	MSR Retention Model	56
Figure 2.	10-Year Retention Model	60
Figure 3.	Promotion to O-4 Model.....	68
Figure 4.	Model of Lateral Transfer by 10 YOS	72

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LIST OF TABLES

Table 1.	Number of Male and Female Active Duty Members by Service Branch and Pay Grade	7
Table 2.	Percentage of Active Duty Male and Female Officers by Service Branch Trends: 2000–2014.....	8
Table 3.	Percentage of Active Duty Minority Enlisted members and Officers by Race and Service Branch	9
Table 4.	Hispanic Active Component Officer Gains by Service with Civilian Comparison Group, FY2003–FY2014.....	10
Table 5.	FY2014 Active Component Commissioned Officer Corps by Source of Commission, Service, and Gender	12
Table 6.	. FY2014 Active Component Commissioned Officer Corps by Source of Commission, Service, and Race/Ethnicity	13
Table 7.	FY2009 Active Component Officer Corps Percentages by Gender, Race, and Ethnicity Status	19
Table 8.	Estimated Percentage Point Differences in the Likelihood of Reaching Promotion and Retention Milestones for Female Officers	22
Table 9.	Likelihood of an Entry Cohort Reaching Promotion and Retention Milestones	24
Table 10.	Explanatory Variables Used in the SWO Retention Model.....	26
Table 11.	SWOs at YCS 3 by Cohort	27
Table 12.	Summary of the Relationship of Explanatory Variables to Retention by Gender.....	28
Table 13.	Estimated Percentage Point Differences in Career Outcomes for Hispanic Officers	31
Table 14.	Variable Definitions.....	39
Table 15.	Summary Statistics—Full Sample ($N=16,143$).....	41
Table 16.	Summary Statistics for Minimum Service Requirement Retention ($n=11,938$).....	43
Table 17.	Summary Statistics for 10-Year Retention ($n=8,563$)	45
Table 18.	Summary Statistics for Promotion to O-4 ($n=6,606$).....	48
Table 19.	Retention and Promotion Rates for Officers who Complete a Lateral Transfer by 10 YOS ($n=1,631$)	50
Table 20.	<i>T</i> -tests of Differences in Retention and Promotion for Female and Male Officers	50

Table 21.	<i>T</i> -tests of Differences in Retention and Promotion for Hispanic and Non-Hispanic Officers	51
Table 22.	<i>T</i> -tests of Differences in Retention and Promotion for Female and Male Officers from Commissioning to O-4 Promotion.....	51
Table 23.	<i>T</i> -tests of Differences in Retention and Promotion for Hispanic and Non-Hispanic Officers from Commissioning to O-4 Promotion.....	52
Table 24.	<i>T</i> -tests of Differences in Retention and Promotion for Lateral Transfers and Non-Lateral Transfers.	52
Table 25.	<i>T</i> -tests of Differences in Transition Outcomes for Female and Male Officers from Commissioning to O-4 Promotion.	53
Table 26.	MSR Retention Probit Model Results: Marginal Effects	57
Table 27.	Separate MSR Probit Model Results for Women and Men: Marginal Effects	59
Table 28.	10-Year Retention from Commissioning Probit Model Results: Marginal Effects.....	62
Table 29.	Separate 10-Year Retention from Commissioning Probit Model Results for Women and Men: Marginal Effects	64
Table 30.	10-Year Retention from MSR Retention Probit Model Results: Marginal Effects.....	66
Table 31.	10-Year Retention from MSR Retention Probit Model Results for Women and Men: Marginal Effects.....	67
Table 32.	Promotion to O-4 Probit Model Results: Marginal Effects	69
Table 33.	Promotion to O-4 Probit Model Results for Women and Men: Marginal Effects.....	71
Table 34.	Lateral Transfer by 10 YOS Probit Model Results: Marginal Effects.....	73
Table 35.	Lateral Transfer by 10 YOS Probit Model Results for Women and Men: Marginal Effects	74

LIST OF ACRONYMS AND ABBREVIATIONS

BUPERS	Bureau of Naval Personnel
CNA	Center for Naval Analyses
CWO	Chief Warrant Officer
DCO	Direct Commission Officer
DMDC	Defense Manpower Data Center
DOD	Department of Defense
FTS	Full-Time Support
FY	Fiscal Year
LDO	Limited Duty Officer
MLDC	Military Leadership Diversity Commission
MOS	Military Occupational Specialty
MSR	minimum service requirement
NROTC	Naval Reserve Officer Training Corps
OCS	Officer Candidate School
ODASD(MC&FP)	Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy
OUSD(P&R)	Office of the Under Secretary of Defense for Personnel and Readiness
RAND	Research and Development Corporation
RL	Restricted Line
SPEC	Special Operations Officer
SWO	Surface Warfare Officer
URL	Unrestricted Line
YCS	Years of Commissioned Service
YG	Year Group
YOS	Years of Service

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I. INTRODUCTION

A. BACKGROUND

In 2009, Congress asked the Military Leadership Diversity Commission (MLDC) to “conduct a comprehensive evaluation and assessment of policies that provide opportunities for the promotion and advancement of minority members of the Armed Forces” under the authority of the National Defense Authorization Act for Fiscal Year (FY) 2009 (Military Leadership Diversity Commission [MLDC], 2011, p. vii). Among other findings, the Commission confirmed that top military leaders were not representative of the nation’s general population or the military population they commanded (MLDC, 2011). The Commission proposed 20 recommendations for the services with the goal of obtaining high-level commitment to diversity, developing and maintaining diverse military leaders, and guaranteeing progress through policy goals and metrics that would allow the Department of Defense (DOD) to sustain diversity (MLDC, 2011).

Diversity goals are often met with challenges. However, women represent 50.1 percent of the total U.S. population (Census Bureau, 2014). The percentage of the overall population with a bachelor’s or higher degree has increased steadily from 26.2 percent in 2001 to 30.4 percent in 2011 (Census Bureau, 2012a). Also, the proportion of Hispanic Americans with a bachelor’s or higher degree has increased dramatically by over 80 percent, from 2.1 million in 2001 to 3.8 million in 2011, or 14.1 percent of the overall Hispanic population (Census Bureau, 2012a).

B. PROBLEM

The 2011 MLDC report brought to light the growing concern regarding underrepresentation of certain demographic groups in the military, specifically, women in the officer corps. Using data gathered from the Defense Manpower Data Center (DMDC), the MLDC (2011) report stated that, in September 2008, Navy female officers in pay grades O-1 through O-6 accounted for 15.4 percent of the total Navy officer corps.

At the same time, women comprised 6.9 percent of all Navy flag officers (pay grades 0-7 through 0-10).

The requirements of all services for an officer commission—including possession of a college degree, U.S. citizenship, weight, and a high level of health—tend to reduce the accession rates of women and minorities relative to those of White men (MLDC, 2011). Consequently, these current policies, combined with the relatively smaller number of eligible minorities from the general population, may be hurting minority officer representation in the military. Further, once commissioned in the military, the retention rates of mid-level female officers tend to be lower than those of their White male counterparts (MLDC, 2011). The 2011 MLDC report showed lower officer promotion rates for women and minorities throughout the services when compared with pay grade-specific averages. Specifically, Black (Hispanic and non-Hispanic) officers tended to have lower promotion rates than the average in all services. Likewise, Hispanic officers tended to have lower promotion rates in all services except the Army. And women in the Navy tended to have significantly lower promotion rates to O-4 and O-5 (MLDC, 2011). Ultimately, the combination of low promotion rates and retention rates has a long-lasting effect on population diversity in the officer corps. These rates should be documented and analyzed to study their effect on diversity in the military services, and more specifically among Navy officers.

C. PURPOSE

This study seeks to examine gender integration among Navy female junior officers through a quantitative analysis of their retention and promotion patterns. Since previous research shows that gender integration can vary significantly by race/ethnicity, this thesis also looks at differences between major racial and ethnic groups, including persons of Hispanic origin. The primary objective is to identify demographic characteristics, such as race/ethnicity, education, and commissioning source that might explain differences in career progression and longevity between female officers in general, minority female officers, and other major demographic groups in the Navy. The long-range goal of the study is to assist Navy policymakers as they strive to identify,

recruit, and retain the most talented and demographically diverse young women and men in the nation for the officer corps. Although this thesis focuses on junior officers, the findings should be useful in identifying issues and approaches toward retaining successful female officers throughout the officer corps.

D. RESEARCH QUESTIONS

The primary research questions are as follows:

- What are the retention and promotion rates of female junior officers in the Navy?
- What are the retention and promotion rates of female junior officers with different racial/ethnic backgrounds in the Navy?
- What factors contribute to explaining differences in the retention and promotion rates of female junior officers as compared with those of their male counterparts?

The secondary research questions are as follows:

- Do the retention and promotion rates of female junior officers in the Navy differ by community, commissioning source, or other selected characteristics?
- Do job-fit decisions, such as lateral transfers and separations, vary by gender and race/ethnicity among U.S. Navy junior officers?
- What factors contribute to explaining a junior officer's decision to transfer laterally or separate from service?

E. SCOPE AND LIMITATIONS

This study uses individual-level panel data provided by DMDC and the Bureau of Naval Personnel (BUPERS) for all Navy officers who were commissioned between 1999 and 2003. These commissioned officers are followed annually until 2013, or until separation. The data contain longitudinal files that follow the careers of officers from their initial commissioning date to 10-year promotion outcomes and beyond. This thesis uses multivariate analytical techniques to examine the effects of demographics, pre-commissioning factors, and job performance on the retention and promotion rates of female officers in the Navy. Variables include demographic characteristics such as age, marital status, and educational background. Variables also include professional

characteristics such as prior military service, source of commissioning,, and Navy designator/military occupational specialty (MOS).

F. ORGANIZATION

This study contains five chapters. Chapter I defines the problem, states the purpose, and identifies the primary and secondary research questions. Chapter II describes the military's trends in gender integration, promotion, and retention. Chapter III reviews selected literature on the topic of gender integration in the military. Chapter IV describes the variables used in the study. Chapter IV also includes summary and descriptive statistics. Chapter V details the multivariate models used in the study and explains the results. Chapter VI summarizes the results, provides conclusions, and offers a general recommendation based on the findings.

II. BACKGROUND

A. INTRODUCTION

This study focuses on the female population of the Navy with the goal of identifying demographic characteristics that might explain differences in retention and promotion between female officers and other identifiable population groups in the Navy. This chapter provides general background information on the Navy female officer population. It discusses the current DOD climate, military demographic statistics, and retention and promotion factors.

B. DEPARTMENT OF DEFENSE SUPPORT

The year 2015 saw significant progress in the role of women in the military. Women are no longer restricted from service in certain fields and designators/MOSs as they were in the past. Secretary of Defense Ashton Carter announced on December 3, 2015 that the military would be opening all positions to women by January 1, 2016, including ground combat forces (Pellerin, 2015). As Carter stated,

They'll be allowed to drive tanks, fire mortars and lead infantry soldiers into combat. They'll be able to serve as Army Rangers and Green Berets, Navy SEALs, Marine Corps infantry, Air Force parajumpers, and everything else that was previously open only to men. (Pellerin, 2015, p. 1)

Carter commented that, until 2013, women were not allowed to serve in around 10 percent of military positions, including nearly 220,000 jobs in armor, infantry, reconnaissance, and some special operations units (Pellerin, 2015).

Secretary Carter's announcement was the culmination of many leaders' hard work. Top military leadership has been supporting and working on the initiative to include women in all aspects of the military for several years. In 2013, Defense Secretary Leon E. Panetta and Chairman of the Joint Chiefs of Staff General Martin Dempsey announced the rescission of the 1994 Direct Ground Combat Definition and Assignment Rule for women and DOD's plan to remove gender-based barriers to all service communities and jobs (DOD, 2013).

The special operations warfare community followed suit. At the Women in Service Reviews meeting held by the Subcommittee on Military Personnel, Committee of Armed Services, House of Representatives, Admiral William McCraven, commanding officer of the Special Operations Command from 2011 to 2014, stated that he fully supported integrating women into special operations combat roles (*Hearing before the Subcommittee on Military Personnel*, 2013). McCraven acknowledged and supported the plan in place to remove all barriers to special warfare accession schools by January 1, 2016. The special operations forces in each service were on track to meet the established goals of gender integration, allowing women to apply for the same positions as men by 2016 (*Hearing before the Subcommittee on Military Personnel*, 2013).

A key part of gender integration in the military is officer accessions. Both women and men in the general population face certain obstacles in gaining a commission into the military. For example, one of the prerequisites for the commissioning of military officers is a four-year bachelor's degree (MLDC, 2011). Among all Americans in the age range of newly commissioned military officers, 25 to 29 years, 36 percent of women had a bachelor's degree or higher, compared with 28 percent of men (Census Bureau, 2011). This is not surprising, given that 56 percent of individuals attending college are women (Census Bureau, 2012b). These numbers suggest that a large pool of women could be eligible for the Navy's officer corps on the basis of their education.

Even though the eligible female portion of the general population is not being ignored by Navy recruiting efforts, few female Navy officers progress to senior pay grades. The Navy has been addressing this issue for quite some time, and its efforts have contributed toward a proportional increase of female officers in the Navy's officer corps, rising from 10.8 percent in 1990 to 17.3 percent in 2014 (Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy [ODASD(MC&FP)], 2014). The Navy continues to recruit, train and retain a high-performing and diverse force. As Secretary of the Navy Ray Mabus (2015) observed:

What we've always known is that the way we recruit, develop, retain and promote Sailors and Marines is critical to our success. To fight and win, we need a force that draws from the broadest talent pools, values health and fitness, attracts and retains innovative thinkers, provides flexible career paths, and prioritizes merit

over tenure. Whether we are talking about systems and tactics in the digital age or personnel management, we must evolve to meet the needs of the future battle space and the needs of our people. Today, we shift from “what-ifs” to what’s next. (p. 1)

The future impact of the military opening all of its positions to women is unknown. However, Navy recruitment is strong and should become stronger with this policy change. Therefore, the decreased level of women in senior officer pay grades can be examined as an internal issue related to retention and promotion.

C. NAVY DEMOGRAPHIC STATISTICS

The *2014 Demographics: Profile of the Military Community* study stated that there were 9,248 female officers and 45,192 male officers in the entire Navy that year, representing 17 percent and 83 percent, respectively (ODASD[MC&FP], 2014). This thesis focuses on Navy female junior officers in pay grades O-1 to O-3, who constitute 68 percent of all female officers. However, the total number of Navy female junior officers, 6,257, is quite small when compared with the 25,263 male junior officers. Table 1 shows the steep difference in the representation of Navy female officers in the O-1 to O-3 group compared with the O-4 to O-6 group. Navy female officers decrease by 54 percent (from 6,257 to 2,870), while men only decrease by 28 percent.

Table 1. Number of Male and Female Active Duty Members by Service Branch and Pay Grade

Pay Grade	Army		Navy		Marine Corps		Air Force		Total DoD	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
E1-E4	185,468	31,292	100,358	28,555	102,560	8,939	93,891	21,006	482,277	89,792
E5-E6	118,481	16,419	91,831	16,482	38,666	3,070	82,433	19,731	331,411	55,702
E7-E9	48,891	6,148	26,891	3,042	12,970	772	27,084	5,959	115,836	15,921
W1-W5	14,021	1,466	1,561	101	1,982	119	N/A*	N/A*	17,564	1,686
O1-O3	40,412	9,947	25,263	6,257	11,222	1,023	27,492	8,204	104,389	25,431
O4-O6	26,701	4,766	18,160	2,870	6,202	283	22,188	4,176	73,251	12,095
O7-O10	298	20	208	20	82	1	265	24	853	65
Total	434,272	70,058	264,272	57,327	173,684	14,207	253,353	59,100	1,125,581	200,692
	504,330		321,599		187,891		312,453		1,326,273	

Source: Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy. (2014). *2014 Demographics: Profile of the military community*. Washington, DC: Author.

In 2015, Secretary of the Navy Ray Mabus created the Talent Management Initiative, which is a list of initiatives designed to create a stronger, more diverse, and successful fighting force that recruits, trains, and retains the best individuals and provides flexible career paths (Mabus, 2015). Table 2, also drawn from *2014 Demographics: Profile of the Military Community* (ODASD[MC&FP], 2014), portrays the Talent Management Initiative from the Secretary of the Navy in action. Table 2 shows that there has been a steady increase in the female military officer population across all services since 2000. After the announcement from Secretary of Defense Ashton Carter that all military positions are open to women as of January 1, 2016, this population growth trend is expected to continue.

Table 2. Percentage of Active Duty Male and Female Officers by Service Branch Trends: 2000–2014

Year	Army		Navy		Marine Corps		Air Force		Total DoD	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
2000	86.0%	14.0%	85.3%	14.7%	94.8%	5.2%	82.9%	17.1%	85.6%	14.4%
2005	84.7%	15.3%	85.2%	14.8%	94.2%	5.8%	81.6%	18.4%	84.6%	15.4%
2010	84.0%	16.0%	84.4%	15.6%	94.0%	6.0%	81.3%	18.7%	84.3%	15.7%
2011	83.8%	16.2%	84.0%	16.0%	93.9%	6.1%	81.2%	18.8%	84.1%	15.9%
2012	83.8%	16.2%	83.7%	16.3%	93.8%	6.2%	80.8%	19.2%	83.9%	16.1%
2013	83.6%	16.4%	83.3%	16.7%	93.5%	6.5%	80.4%	19.6%	83.6%	16.4%
2014	83.4%	16.6%	83.0%	17.0%	93.2%	6.8%	80.1%	19.9%	83.3%	16.7%

Source: Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy. (2014). *2014 Demographics: Profile of the military community*. Washington, DC: Author.

Table 3, from *2014 Demographics: Profile of the Military Community*, shows the percentage of all active duty minority enlisted members and officers by race and service branch. The minority percentage of Navy officers is the second highest of all services at 20.5 percent. This table does not break out the percentage of Hispanics, since Hispanics may be of any race.

Table 3. Percentage of Active Duty Minority Enlisted members and Officers by Race and Service Branch

Service Branch	Black or African American		Asian		Native Hawaiian or Other Pacific Islander		Native American/ Alaska Native	
	Enlisted	Officers	Enlisted	Officers	Enlisted	Officers	Enlisted	Officers
Army	23.6%	13.1%	3.9%	5.2%	1.1%	0.6%	0.8%	0.5%
Navy	19.0%	7.9%	5.5%	4.6%	1.2%	0.5%	3.8%	0.8%
Marine Corps	11.3%	5.4%	2.5%	2.8%	1.1%	0.5%	1.1%	0.8%
Air Force	16.2%	5.9%	3.0%	4.3%	1.3%	0.5%	0.7%	0.5%
Total DoD	18.9%	9.3%	3.9%	4.6%	1.2%	0.5%	1.5%	0.6%

Service Branch	Multi-racial		Other/Unknown		Minority Total	
	Enlisted	Officers	Enlisted	Officers	Enlisted	Officers
Army	N/A*	N/A*	4.3%	7.3%	33.7%	26.6%
Navy	10.4%	3.0%	2.7%	3.7%	42.7%	20.5%
Marine Corps	1.0%	1.5%	3.8%	8.2%	20.8%	19.2%
Air Force	3.8%	1.9%	4.4%	5.9%	29.3%	19.0%
Total DoD	3.6%	1.3%	3.9%	6.2%	32.9%	22.5%

Source: Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy. (2014). *2014 Demographics: Profile of the military community*. Washington, DC: Author.

Table 4 shows that the proportion of Navy officer accessions who are of Hispanic origin rose to its highest level, 9.6 percent, during the twelve-year period (Office of the Under Secretary of Defense for Personnel and Readiness [OUSD(P&R)], 2015). It also shows that, from 2003 to 2014, the Navy led the way among all service branches in commissioning Hispanic officers, with a 3.8 percentage point increase (from 5.8 to 9.6 percent). The next closest service was the Marine Corps, with a 1.6 percentage point increase in accessing Hispanic officers during the same period. The Navy's growth even exceeded the percentage increase in available civilian Hispanic college graduates of 2.5 percentage points. This table demonstrates how the Navy is increasing its efforts to recruit available Hispanic civilians by exceeding the growth of eligible Hispanic officer candidates.

Table 4. Hispanic Active Component Officer Gains by Service with Civilian Comparison Group, FY2003–FY2014

GAINS FISCAL YEAR	SERVICE								CIVILIAN		
	ARMY		NAVY		MARINE CORPS		AIR FORCE		TOTAL DoD		COLLEGE GRADS ¹
	#	%	#	%	#	%	#	%	#	%	%
2003 ²	378	6.0	238	5.8	79	6.0	251	3.6	946	5.0	6.9
2004	367	5.8	295	5.2	93	7.4	203	3.5	958	5.0	6.9
2005	357	5.5	222	6.2	141	7.3	107	2.0	827	4.7	7.1
2006	381	5.7	227	6.1	97	6.1	68	1.5	773	4.7	7.5
2007	405	5.4	230	6.0	121	6.3	88	2.0	844	4.8	7.8
2008	388	5.2	272	6.8	105	5.7	77	1.9	842	4.8	8.0
2009	525	6.7	310	7.6	110	6.6	80	1.7	1,025	5.6	7.9
2010	471	6.1	319	7.6	97	5.5	631	1.9	976	5.3	8.4
2011	451	6.3	274	7.0	108	6.4	66	1.5	899	5.2	8.2
2012	395	6.5	312	7.7	110	7.4	70	1.5	887	5.5	8.7
2013	446	7.3	332	8.1	112	10.2	60	1.4	950	6.2	9.1
2014	383	6.9	385	9.6	104	7.6	47	1.1	919	6.1	9.4

Source: Office of the Under Secretary of Defense for Personnel and Readiness. (2015). Population representation in the military services. Arlington, VA: Author.

D. RETENTION AND PROMOTION FACTORS

This section includes a discussion of the various factors that affect retention and promotion among Navy officers.

1. COMMISSIONING SOURCES

A commissioning source is a path for an individual to receive a commission as an officer in the military. Some commissioning sources are offered at universities or military academies while individuals earn a bachelor's degree. Other commissioning sources are shorter indoctrination schoolhouses where qualified individuals are familiarized with the military service. The four primary commissioning sources for the Navy are the Naval Academy, Naval Reserve Officer Training Corps (NROTC), Direct Commission Officers (DCO) programs, and Officer Candidate School (OCS; MLDC, 2011).

The Naval Academy is one of the three primary military service academies. The Naval Academy is a four-year institution that offers a bachelor's degree and commission into the Navy or Marine Corps upon graduation. The Naval Academy prepares young men and women to be successful leaders of the highest quality in the Navy and Marines

Corps (Naval Academy, 2016). Applicants must be a high school graduate, meet basic academic and physical fitness standards, and be nominated by a member of Congress or the vice president or president of the United States (MLDC, 2011). Naval Academy graduates serve a minimum of five years in the Navy or Marine Corps (Naval Academy, 2016).

Civilian students attending a four-year university may enroll in the NROTC program if offered. NROTC programs provide scholarship opportunities for eligible students, so long as they are commissioned in the Navy or Marine Corps upon their graduation. On top of a normal class schedule, NROTC students must take military-related courses and attend mandatory NROTC events and exercises (MLDC, 2011).

OCS is a 12-week school designed to prepare officer candidates with no prior military experience for the rigors and stress of a career as a naval officer. To apply for Navy OCS, the individual must be a college graduate and meet the basic physical fitness assessment requirements of the Navy. Officer candidates attend classes and drill practice and complete physical fitness tests under the tutelage of a class leadership triad. The triad includes a Navy chief petty officer, a Marine Corps gunnery sergeant drill instructor, and an experienced Navy division officer. The leaders draw on their different backgrounds and experiences to shape the candidates into successful officers (Officer Training Command, 2015).

Finally, DCOs are individuals who do not fit into any of the previously mentioned commissioning tracks. Many DCOs are individuals from medical, legal, and religious professional backgrounds who compose the Navy's Staff Corps. These specialized Staff Corps officers have specific skills that are considered highly important to support mission success. DCOs attend one of three schools at Officer Training Command, Newport, RI. Active duty Staff Corps and some Restricted Line officers attend Officer Development School. Limited Duty Officers (LDOs) and Chief Warrant Officers (CWOs) attend LDO/CWO School. Reservists who are Staff Corps, Restricted Line, or LDO/CWO attend the DCO Indoctrination Course (Officer Training Command, 2016). These schools range from two to five weeks long and provide the basic training required to function successfully as newly commissioned naval officers (Officer Training Command, 2016).

As seen in Table 5, the three commissioning sources—the Naval Academy, NROTC, and OCS—all displayed similar percentages of men and women for the entire Navy officer corps as of FY2014 (OUSD[P&R], 2015). Only the DCO program showed a large difference, with 15.7 percent of men and 37.9 percent of women in the Navy’s officer corps commissioned via this source. This signifies that women are relatively more likely to be Staff Corps officers (medical, legal, and religious specialties) than men.

Table 5. FY2014 Active Component Commissioned Officer Corps by Source of Commission, Service, and Gender

<u>Percent</u>	<u>SOURCE OF COMMISSION¹</u>							<u>TOTAL</u>
	<u>Service Academy</u>	<u>ROTC Scholarship</u>	<u>ROTC Non-Scholarship</u>	<u>OCS/OTS</u>	<u>Direct Appointment</u>	<u>Other</u>	<u>Unknown</u>	
<u>NAVY</u>								
Males	21.1	18.4	1.6	21.6	15.7	0.09	21.5	100
Females	16.4	18.1	0.92	11.8	37.9	0	14.9	100
Total	20.3	18.4	1.5	19.9	19.5	0.07	20.4	100

Source: Office of the Under Secretary of Defense for Personnel and Readiness. (2015). Population representation in the military services. Arlington, VA: Author.

As seen in Table 6, the accession rates between Hispanics and non-Hispanics for each commissioning source were even more closely aligned than male and female officer commissioning source percentages. The largeset variation between Hispanics and non-Hispanics for commissioning sources was NROTC scholarship, which consisted of 14.6 percent Hispanics and 17.8 percent non-Hispanics.

Table 6. FY2014 Active Component Commissioned Officer Corps by Source of Commission, Service, and Race/Ethnicity

Percent	SOURCE OF COMMISSION ¹							
RACE/ ETHNICITY ²	Service Academy	ROTC Scholarship	ROTC Non- Scholarship	OCS/OTS	Direct Appointment	Other	Unknown	TOTAL
NAVY								
White	21.1	19.0	1.5	20.2	18.6	0.09	19.3	100
Black	13.6	14.5	1.3	19.4	19.2	0.03	31.9	100
AIAN ³	16.8	7.6	1.0	18.6	16.3	0	39.7	100
Asian	14.9	14.3	0.88	20.4	30.5	0.04	18.9	100
NHPI	20.7	20.2	1.7	13.6	25.2	0	18.6	100
Two or more ⁴	22.5	15.4	0.80	22.2	21.3	0	17.8	100
Unknown	21.7	20.6	1.9	11.5	24.5	0	19.9	100
TOTAL	20.3	18.4	1.5	19.9	19.5	0.07	20.4	100
Hispanic	23.6	14.6	1.3	19.5	17.5	0.05	23.5	100
Not Hispanic	20.7	17.8	1.5	20.7	18.4	0.08	20.8	100
Unknown	9.8	31.1	1.4	7.9	39.5	0	10.3	100
TOTAL	20.3	18.4	1.5	19.9	19.5	0.07	20.4	100

Source: Office of the Under Secretary of Defense for Personnel and Readiness. (2015). Population representation in the military services. Arlington, VA: Author.

2. GENDER

Several studies have noted that female officers were more likely than male officers to separate from service. For example, Asch, Miller, and Malchiodi (2012) showed that female officer retention was lower than male retention across all military services. Tick, Pema, Mehay, and Salas (2015) showed that Navy female officer retention at the Minimum Service Requirement (MSR) was 15 percent less than male retention, the largest difference among all services. Tick et al. (2015) also demonstrated that Navy female officers were 5 percent less likely to retain until the 10-year mark or O-4 board review than male officers. All of these differences were statistically significant.

Flexibility is one way the Navy is addressing the differences in retention and promotion rates related to gender. In an effort to increase female retention, Secretary of the Navy Ray Mabus tripled the Navy's policy on maternity leave from six weeks to eighteen weeks. Mabus stated,

In the Navy and the Marine Corps, we are continually looking for ways to recruit and retain the best people. We have incredibly talented women who want to serve, and they also want to be mothers and have the time to fulfill that important role the right way. We can do that for them. Meaningful

maternity leave when it matters most is one of the best ways that we can support the women who serve our country. This flexibility is an investment in our people and our Services, and a safeguard against losing skilled service members. (Office of the Chief of Information, 2012, p. 1)

The Navy hopes to retain officers who would have left the service due to work–life balance issues by increasing maternity leave and implementing a more flexible workforce.

3. LATERAL TRANSFERS

An officer's lateral transfer, or change from one career designator/MOS to another, is one option for flexibility that may be used to retain Navy female junior officers. Prior research has found that women have a higher likelihood to transfer laterally than do men (Kraus, Parcell, Reese, & Shuford, 2013). According to the previous statement, it is clear that Secretary Mabus highly values flexibility to support the Navy's talent management initiatives. Officers who are dissatisfied with their current community may be more likely to stay in the Navy if they are permitted to transfer laterally to another community that better aligns with their professional goals, values, and concept of work–life balance.

In a 2007 Naval Postgraduate School study, Ryan (2007) used data from Navy Lateral Transfer and Redesignation Boards held between 1996 and 2006. Ryan (2007) found that, of the 6,092 officers who applied for a lateral transfer, those who were not selected for lateral transfer were twice as likely to separate when compared with officers who were selected, with separation rates of 24 percent for selectees and 48 percent for those rejected. Also, of these applicants, minority officers both selected and not selected for lateral transfer were less likely to separate than non-minority officers. Variables determined to be statistically significant predictors of retention behavior were race, marital status, designator/MOS, and selection status (Ryan, 2007).

In another retention study focusing on the entire Surface Warfare Officer (SWO) community, Kraus et al. (2013) did not differentiate between separations from the Navy and lateral transfers in the SWO community, but made the recommendation to do so in future studies. This study is examined further in the Literature Review chapter. This

thesis examines more recent data that encompasses the entire active duty Navy officer corps to distinguish separations from the Navy versus lateral transfers between communities to provide the Navy with better insight into the career paths and career choices made by female officers.

4. JOB PERFORMANCE

The Fitness Report & Counseling Record form, NAVPERS 1610/2, is the Navy's official method to document and measure the job performance of an officer. The fitness report is given to active duty officers many times in their career as a regular report.

There are several types of fitness reports. A periodic report is given once a year at a specific time in order to be sent to the officer promotion board on time. A detachment of individual report is given when officers detach from their command and receive a new reporting senior, such as during a transfer, separation, or incarceration. A detachment of reporting senior report is given when the reporting senior detaches, normally in a change of command ceremony or retirement. A new reporting senior always calls for a fitness report to be performed (Chief of Naval Personnel, 2015).

The fitness report measures seven performance traits on a scale from 1.0 (lowest) to 5.0 (highest). The performance traits are (a) Professional Expertise, (b) Command or Organizational Climate/Equal Opportunity, (c) Military Bearing/Character, (d) Teamwork, (e) Mission Accomplishment and Initiative, (f) Leadership, and (g) Tactical Performance. A score of 1.0 signifies "below standards," 2.0 is "progressing," 3.0 "meets Navy standards," 4.0 is "above standards," and 5.0 "greatly exceeds standards." The scores of the individual are combined to compose the member trait average. The member trait average is used to compare to the summary group average, which is the average score that the reporting senior gave all other individuals in the summary group of similarly ranked individuals. Based on these scores, the reporting senior gives an individual one of five different promotion recommendations: (a) significant problems, (b) progressing, (c) promotable, (d) must promote, and (e) early promote (Chief of Naval Personnel, 2015).

The scores and promotion recommendations for junior officers are used primarily at O-4 promotion boards to determine if individuals meet the requirements to promote and be successful in the next pay grade. A promotion board will review individuals' records during their promotion window, a period of time that individuals are eligible for promotion. The promotion window for O-4 is a two-year period from the range of 9 to 11 years of service. Officers who are not selected on their first promotion board will go through one more board, and sometimes a third board. All officers will go through at least two O-4 promotion boards (Chief of Naval Personnel, 2015).

During a promotion board, individuals are matched up to compete against other individuals of the same year group or commissioning year (Chief of Naval Personnel, 2015). Due to poor talent management forecasting and unexpected events, these methods can lead to unfair promotion practices. Promotion boards for officers are used as force shaping tools when manpower planners incorrectly forecast the personnel needs of the Navy, or an unexpected change in manning level occurs due to a war beginning or ending, which can lead to an increase or reduction in forces. This can affect the number of quotas that must be filled to meet future mission requirements. To fill vacancies and meet mission requirements based on quotas, promotion boards may promote at different rates for different year groups. In addition, the qualifications of individuals who are promoted can vary by year group. For example, a sustained superior-performing individual may not be promoted due to a forecasted excess of officers at higher pay grades because too many were promoted previously and/or not enough retired or separated from the Navy.

Secretary of the Navy Ray Mabus (2015) proposed to de-emphasize year groups and promotion windows in his Talent Management Initiative. Mabus (2015) recommended an altered promotion selection board process for 2016–2017 that would

- replace zones with weighted milestone achievements to ensure the best officers are promoted regardless of zone placement and prior selection board decisions (p. 2)
- propose legislation to eliminate officer management by year group to ensure performance determines timeline and eligibility for promotion and leadership assignments (p. 2)

- [allow] those who are not ready for promotion to continue to serve in same pay grade longer, or for those ready, to advance through the system faster (p. 2)

This proposed new system means that promotion would be based on merits, accomplishments, and professional success without the distraction of year groups and other aspects individuals cannot control. The current promotion practices frequently are based more on luck and timing than on the actual performance of the individual. The current promotion practices need to be examined to determine if they are influenced by gender or race/ethnicity.

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III. LITERATURE REVIEW

A. OVERVIEW

This thesis focuses on gender integration of female junior officers and female minority junior officers in the Navy. Therefore, this literature review includes the most recent studies that analyzed retention and promotion of Navy female officers and minority officers. This literature review examines the purpose, data sources, methodology, and results of each study.

B. EARLY CAREER EFFECTS

Asch et al. (2012) of Research and Development Corporation (RAND) sought to explore why there is an underrepresentation of women and of racial/ethnic minorities among senior military officers. As shown in Table 7, the proportions of women and Blacks, Asians, Hispanics, and other races decrease as military pay grade increases (Asch et al., 2012), meaning that these groups separate from the military at rates that are higher than those of White male officers.

Table 7. FY2009 Active Component Officer Corps Percentages by Gender, Race, and Ethnicity Status

Service	Accessions	O1 to O3	O4 to O6	General and Flag Officers	All Officers
Female	20.58	17.96	12.72	5.60	16.21
White	75.81	77.27	83.71	92.97	78.86
Black	9.19	8.90	8.13	5.82	8.74
Asian	4.93	4.01	2.53	0.44	3.74
Other, two or more, unknown	10.07	9.81	5.73	0.77	8.66
Hispanic	5.59	5.59	4.11	1.32	5.20

Source: Asch et al. (2012). A new look at gender and minority differences in officer career progression in the military. Santa Monica, CA: RAND.

The research conducted by Asch et al. (2012) focused on two contributing factors to the low levels of female and minority senior military officers' representation: promotion and retention rates relative to those of White men. The 2012 RAND study was a follow-up to a previous RAND study by Harrell and Miller from 1997 titled *New Opportunities for Military Women: Effects upon Readiness, Cohesion, and Morale*. Both RAND studies analyzed the effects on retention and promotion during early career and later career periods. This review focuses on the early career effects, since this thesis is centered on early career decisions of women in the military.

Asch et al. (2012) explored how lower promotion and retention rates of women and racial and ethnic minorities contribute to their underrepresentation in senior military pay grades. This topic was addressed using multivariate regression analysis employing individual data from the Proxy-Personnel Tempo file maintained by DMDC. This file contained longitudinal records on all active duty personnel by month from January 1993 through September 2010 and for the last month of each quarter going back to January 1988. These data tracked all personnel until they separated in that time period or until the end of the file in 2010. The study excluded officers who entered the Navy above the pay grade of O-1, such as officers in the legal, medical, and religious career fields. Asch et al. (2012) noted that this restriction eliminated a large portion of female officers from the study.

To separate the effects of gender, race/ethnicity, and occupation on career progression, Asch et al. (2012) controlled for the following background characteristics for officers: prior enlisted service, pay grade, months of serving before attaining current grade, commission source, occupation, deployment indicators based on pay records, and demographic information such as race/ethnicity, gender, education, and marital status. Retention and promotion milestones were defined for each cohort. Retention was defined as staying until the first promotion window of the next pay grade. Promotion was defined as being promoted within a pre-defined 36-month period centered on a six-month window for each pay grade. The authors estimated probit regressions and reported the marginal effects of all key variables.

Equation 1 shows the probit regression model used to estimate the effect of gender and minority status on career progression.

$$\Pr(\text{outcome}_j = 1) = F(D_i\delta + X_i\beta), \quad (1)$$

Where Pr signifies the probability of a given outcome, j signifies each of 10 promotion and retention outcomes from pay grades O-1 to O-6; i signifies individual officer i; D_i is a set of dummy variables for each race/ethnicity, and gender group for individual i; X_i is a set of control variables; and δ and β are coefficients that the authors sought to estimate.

The authors reported the marginal effects of race/ethnicity, and gender based on Equation 2:

$$F(D_i = 1 | \bar{X}_i\hat{\beta}) - F(D_i = 0 | \bar{X}_i\hat{\beta}). \quad (2)$$

Table 8 shows Asch et al.'s results regarding estimated differences for female officers. The estimated results differ across each female officer group. It was determined that the differences of the estimated effects were larger for later career officers; however, the differences were not always statistically significant. The majority of early career effects were found to be significant.

Table 8. Estimated Percentage Point Differences in the Likelihood of Reaching Promotion and Retention Milestones for Female Officers

Milestone	Percentage of White Male Officers Retained/ Promoted	Percentage Point Difference: Minority Female Officers – White Male Officers			
		White Females	Black Females	Hispanic Females	Other Minority Females
Promotion					
O1 to O2	98.5	−0.8***	−1.5***	−1.8***	−0.9***
O2 to O3	91.2	−2.5***	−0.2	−1.8**	−1.7***
O3 to O4	76.0	−3.2***	−3.9***	−1.8	−3.7**
O4 to O5	74.6	0.6	−6.8***	−6.4	−3.3
O5 to O6	46.9	3.4**	−7.7**	13.1	16.6**
Retention as					
O1	99.8	0.0	−0.1	−0.3***	−0.2***
O2	99.3	−0.4***	−0.2*	0.2	−0.2
O3	70.1	−10.9***	4.2***	−4.7**	−3.7**
O4	87.9	−3.5***	−0.5	2.5	−0.4
O5	81.4	−10.9***	−5.7**	−9.6	−8.8*

NOTE: *** = statistically significant from zero at the 1 percent level; ** = statistically significant from zero at the 5 percent level; * = statistically significant from zero at the 10 percent level.

Source: Asch, B. J., Miller, T., & Malchiodi, A. (2012). *A new look at gender and minority differences in officer career progression in the military*. Santa Monica, CA: RAND.

As Table 8 shows, in the early career period, Asch et al. (2012) found that female officers were less likely to promote to O-2, O-3, and O-4 than White men, with the exception of Black women, who promoted to O-3 at similar rates as White men. Excluding Black women, retention rates of O-3 female officers were lower than those of White men, with White women being the lowest. White O-3 female officers retained at 10.9 percentage points less than White O-3 male officers. Hispanic female officers' retention is 4.7 percentage points less than that of White male officers.

Black female officers experienced different promotion and retention rates than other female officer groups. Black women's promotion rate from O-2 to O-3 was only -0.2 percentage points less than that of White men, although the difference was not statistically significant. Asch et al. (2012) stated that this promotion rate suggests that Black women and White men have the same promotion rates.

The retention of Black O-3 female officers was 4.2 percentage points higher than that of White men and was statistically significant. This confirms that Black women had a higher retention rate at the O-3 level than did White, Hispanic, and other minority female officers when compared with White men (Asch et al., 2012). These results confirm the earlier RAND study (Harrell and Miller, 1997).

The 2012 RAND study also analyzed the rates of achieving the promotion milestone pay grades of O-4 and O-6. These results are displayed in Table 9. Overall, female entrants were less likely to achieve O-4 than male entrants. The factors of promotion and retention varied with groups and directly affected the attainment of milestones. As seen in Table 9, only 30.8 percent of White women who started as O-1 promoted to O-4. This was the lowest likelihood of all female groups for retaining and achieving the promotion to O-4 milestone. Black women experienced the highest retention and promotion rates from O-1 to O-4 at 45.3 percent, although this difference was not statistically significant. Hispanic and other minority women experienced mid-level retention and promotion rates from O-1 to O-4 at 36.4 percent and 37.2 percent, respectively.

Table 9. Likelihood of an Entry Cohort Reaching Promotion and Retention Milestones

	Percentage of Entering Officer Cohort Reaching:	
	O1 to O4 Promotion	O4 to O6 Promotion
Male officers		
White	45.4	23.6
Black	47.2***	19.5***
Hispanic	45.9	20.1
Other	48.4***	21.0
Female officers		
White	30.8***	18.8***
Black	45.3	15.6***
Hispanic	36.4***	23.1
Other	37.2***	26.8

NOTE: *** = statistically significant from zero at the 1 percent level; ** = statistically significant from zero at the 5 percent level; * = statistically significant from zero at the 10 percent level.

Source: Asch, B. J., Miller, T., & Malchiodi, A. (2012). *A new look at gender and minority differences in officer career progression in the military*. Santa Monica, CA: RAND.

An important outcome is that Asch et al. (2012) showed that White, Hispanic, and other women were less likely to promote to the significant O-4 milestone, which was also affected by retention up to the pay grade of O-4. However, the Asch et al. (2012) study encompassed the entire military officer corps and did not differentiate the military services from each other. The authors suggested that by showing the inclusion rates separately for each military service, analysts might be able to determine the effect of certain factors, such as the number of occupations partially closed to women, on the gender integration success of each service. Also, the authors acknowledged that this study was unclear on whether recent cohorts experienced the same career progression as cohorts described in the study because the data used were pooled from older cohorts starting in 1988 (Asch et al., 2012).

While the RAND study encompassed the entire military officer corps, this thesis focuses only on the Navy to better describe its specific promotion and retention

outcomes. Also, this thesis uses data from 1999 to 2013 so that the individuals from the first to the last of these cohorts experience similar career progression environments and characteristics.

C. SURFACE WARFARE OFFICER RETENTION

The report titled *Navy Officer Diversity and the Retention of Women and Minorities: A Look at the Surface Warfare and Aviation Communities* by Kraus et al. (2013) examined the expansion of minority officer representation in the Unrestricted Line (URL) community. The authors cited the newly-created 21st Century Sailor and Marine initiative, which emphasized personal readiness and “force wide combat effectiveness” (p. 7) as the driving force behind the study. Inclusion, one of the five themes of the 21st Century Sailor and Marine program, was the focus of this study. The Navy defines inclusion as “a Department with no barriers to opportunity” (21st Century Sailor, 2015). One drawback of this study was that it only measured the effects of promotion and retention on SWOs and aviators, rather than all Navy officers.

Kraus et al. (2013) noted that it is important to study the composition of URL leadership because it constitutes the largest portion of senior leadership in the Navy. By better understanding the URL community, Navy manpower planners will be able to affect significant changes on Navy personnel to positively influence promotion and retention among all demographics.

Kraus et al. (2013) defined SWO retention based on staying in the community until nine years of commissioned service (YCS), which is about halfway through a department head tour or second sea duty tour, given entrance into the SWO community by YCS 3. The authors called this YCS 3–9 retention (Kraus et al., 2013). The three factors that composed the SWO retention variables were selection to department head, transfers into the SWO community by YCS 3, and transfers out to the restricted line communities before YCS 9.

There were two main categories of explanatory variables based on personnel demographics and Navy career factors. Kraus et al. (2013) also attempted to assess the effect of crew composition on women and minorities in the SWO community. Finally,

the variable describing the pay differential between military personnel and civilians in similar fields was used to predict retention in different demographic groups. Table 10 lists the explanatory variables used by Kraus et al. (2013) in the SWO retention model.

Table 10. Explanatory Variables Used in the SWO Retention Model

Variable categories			
Demographic and background characteristics	Navy career variables	Crew composition ^b	Civilian opportunities
Race ^c	Year-group cohort	Female officers in crew	Relative military-civilian pay ^d
Ethnicity ^b	Accession source	Female officers' percentage of crew	
Marital and dependent status	Lateral into SWO	Minority officers in crew	
College major	Nuclear subspecialty	Minority officers' percentage of crew	
	Ship type		

a. See appendix B for detailed definitions of each variable.

b. The percentage of female officers in the crew is included in the female retention equation. (The presence of female officers in the crew is excluded from the female retention model because by definition the value of the variable is one for every observation.) The presence of female officers in the crew is tested in the male retention equation. (We also tested the percentage of women in the crew in the male retention equation.) For each race and ethnicity category, we include the percentage of minority officers in the crew in the minority officers' equations.

c. Race and ethnicity are included as explanatory variables in the male and female retention equations, but not in the race- and ethnicity-specific equations for male SWOs.

d. See appendix C for more information on the definition and creation of this variable

Source: Kraus, A., Parcell, A. D., Reese, D. L., & Shuford, R. W. (2013). *Navy officer diversity and the retention of women and minorities: A look at the surface warfare and aviation communities* (DRM-2013-U-005306-Final). Arlington, VA: Center for Naval Analysis (CNA).

The goal of the model was to identify statistically significant factors that determine YCS 3–9 retention. A separate retention model was estimated for each minority group. Kraus et al. (2013) did not take into account the difference between separations from the Navy and lateral transfers to another community. They used a logistic regression to model the probability that a sailor will stay or leave. Due to the small sample size of the minority groups, the authors were less confident in the size of their measured effects and only compared direction of effect and statistical significance.

The sample data were based on the records of all SWOs from year groups (YGs) 1990 to 2003 from the Navy's Officer Master File. The data were observed until the end of FY2012 to meet the requirements for YCS 3–9. As Table 11 shows, the SWO YGs were combined into four cohorts to increase the sample sizes of minorities. The first cohort, YG 90–93, was created because it captured the officers who were commissioned before the 1993 repeal of the Combat Exclusion Law, which restricted women from serving onboard warfighting ships (Kraus et al., 2013). All cohorts after 1993 experienced the beginning stages of gender integration on warfighting ships. These cohorts can be used to measure the stages of integration from infancy to maturation.

Table 11. SWOs at YCS 3 by Cohort

Gender and race/ ethnicity	YG cohort				Total
	90-93	94-97	98-01	02-03	
Women					
API	4	28	29	20	81
Black	5	48	81	64	198
Other/unknown	10	22	66	70	168
White	108	268	558	513	1,447
Hispanic	10	29	71	55	165
Subtotal	127	366	734	667	1,894
Men					
API	125	124	104	71	424
Black	257	261	283	210	1,011
Other/unknown	136	162	161	137	596
White	2,778	2,075	2,067	1,722	8,642
Hispanic	193	205	223	151	772
Subtotal	3,296	2,622	2,615	2,140	10,673
GRAND TOTAL	3,423	2,988	3,349	2,807	12,567

Source: Kraus, A., Parcell, A. D., Reese, D. L., & Shuford, R. W. (2013). *Navy officer diversity and the retention of women and minorities: A look at the surface warfare and aviation communities* (DRM-2013-U-005306-Final). Arlington, VA: Center for Naval Analysis (CNA).

Kraus et al. (2013) found that the following characteristics have the same effect on female and male SWO retention: college major, accession source, and nuclear subspecialty. The following characteristics were determined to have a different effect by gender: marital status/dependent status, and ship type. For example, the likelihood of

male SWO retention was increased if the man was married or had dependents (Kraus et al., 2013). However, female SWO retention showed no difference between single and married/with dependents, but this relationship was not statistically significant. Table 12 shows the direction of the effect and statistical significance for each characteristic.

Table 12. Summary of the Relationship of Explanatory Variables to Retention by Gender

	Compared to White				Compared to Cohort 2			Compared to "not"		
	API	Black	Hisp	O/U	C1	C3	C4	Sci & Eng	Lateral in	Nuclear
Women		+			—			—		
Men					—			—		
	Compared to USNA					Compared to single, no kids				
	NROTC	Enlisted to Officer	OCS	Other	Unknown	Single, kids	Mil spouse, no kids	Mil spouse, kids	Non-mil spouse, no kids	Non-mil spouse, kids
Women		+	+	N/A	N/A					
Men		+	+	+		+	+	+	+	+
	Compared to carriers				Female officer		Mil-civ pay differential			
	Amphib	CRUDES	Frigate	Support	Presence	Percentage				
Women	—			—	N/A		+			
Men		+				N/A	+			

Source: Kraus, A., Parcell, A. D., Reese, D. L., & Shuford, R. W. (2013). *Navy officer diversity and the retention of women and minorities: A look at the surface warfare and aviation communities* (DRM-2013-U-005306-Final). Arlington, VA: Center for Naval Analysis (CNA).

As seen in Table 12, a plus or minus sign indicated a positive or negative statistically significant relationship between the explanatory variable and retention when compared with the control group. The control groups are above each group of variables in the “Compared to” headings. A blank cell signified that the relationship of the explanatory variable to retention was not statistically significant. Blue was significant at the 1 percent level; red was significant at the 5 percent level; and green was significant at the 10 percent level.

The military pay differential variable proved to have a positive and statistically significant effect on retention for all demographic groups. This signified that relative

military compensation played an important role in officer retention. Kraus et al. (2013) found no statistically significant evidence that ship crew composition affected the retention rates of female officers and minority male officers. However, the percentages of minorities were low due to small sample sizes. Therefore, there may not have been sufficient variation to measure the effects of crew composition with any confidence (Kraus et al., 2013).

Kraus et al. (2013) stated that the effects of marital and dependent status are “especially important for understanding female SWO retention” (p. 49). The authors recommended more research into marital and dependent status of female SWOs to better understand the relationship between life milestone decisions, such as the timing of marriage and having children, and the decision to leave the Navy. Another recommendation the authors made was to model the retention decision more precisely by differentiating the service members’ decision to lateral transfer to another community versus to leave the Navy altogether. This would be helpful to understand, because women have a higher likelihood to transfer laterally than do men (Kraus et al., 2013).

While Kraus et al. (2013) studied the effects of marital and dependent status of female SWOs, this thesis studies the effects of marital and dependent status to better understand female junior officer retention Navy-wide. This thesis adopts the second recommendation from Kraus et al. (2013) and differentiates and analyzes the service members’ decision to transfer laterally to another community versus to leave the Navy altogether.

D. RETENTION AND PROMOTION OF HISPANIC OFFICERS

The report titled *An Analysis of the Career Progression of Hispanic Military Officers* by Tick et al. (2015) assessed the career success of Hispanic officers across all branches of the military. The goal of the study was specifically to analyze the factors that affect retention and promotion of Hispanic Navy officers.

DMDC provided longitudinal data that observed all military officers who were commissioned between FY1999 and FY2003. The data were categorized into demographic and career-related characteristics for each individual officer at initial

commissioning and annually through FY2013 or until separation (Tick et al., 2015). Coast Guard officers, all officers who entered above the pay grade of O-1 (legal, medical, religious), and Limited Duty and Warrant officers were removed from the data to focus on traditional commissioned officers.

The authors used multivariate statistical analysis techniques to measure the variables' effects on promotion and retention. Many of the variables were binary (e.g., yes or no, 1 or 0). Therefore, probit regression models were used to measure the marginal effects of percentage point changes in the explanatory variables on the likelihood of promotion and retention. The authors chose four different career outcomes to measure Hispanic officer success in the Navy: (a) minimum service requirement (MSR) by Service; (b) 10-year retention; (c) promotion to O-4; and (d) fitness report scores (Tick et al., 2015).

Table 13 shows the results of the three different Navy models in the study by Tick et al. (2015). The results are displayed in rows 1–3. The pooled All Services retention model found that Hispanic officers had a higher likelihood of staying in the military than did White non-Hispanic officers. The retention gap was small, at 3 percent, and was primarily driven by Army and Marine Corps data. In the MSR model, the Navy MSR retention level for Hispanic junior officers was the lowest of the services, which may be of great concern to top Navy leadership. The estimates of the effect of Hispanic origin among officers on 10 years of service (YOS) retention and O-4 promotion were all small, at less than a 4.1 percent difference from White non-Hispanics. However, all these estimates were statistically insignificant, except for the Air Force at -3.8 percent. The authors gave no explanation for why these estimates may have been statistically insignificant. The authors noted that the differences for women and Blacks, when compared with White non-Hispanics, were large and statistically significant for each of their four models (Tick et al., 2015).

Table 13. Estimated Percentage Point Differences in Career Outcomes for Hispanic Officers

Career Outcomes	All Services (DMDC Data)	Army	Air Force	USMC	Navy	USMC (TFDW Data)
MSR Retention	+2.0	+6.6	N.S.	+7.1	-2.3 ^a	+5.9
10 YOS Retention	N.S.	N.S.	-3.8	N.S.	N.S.	+4.7
O-4 Promotion	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Fitness Report Scores	--	--	--	--	--	-1.9
N.S. = Not significant						
^a Significant at .10 level; all other percentage point differences are significant at either the .01 or .05 level						

Source: Tick, S., Pema, E., Mehay, S., & Salas, M. (2015). *An analysis of the career progression of Hispanic military officers* [Technical report]. Monterey, CA. Naval Postgraduate School.

The report by Tick et al. (2015) did not show results on Hispanic female officers since gender was not a focus of the study. The authors recognized this and recommended further study on the “male-female retention gap” in the Navy at MSR and the 10-year mark, which is significant. They recommended that a more in-depth study be conducted on the low MSR retention rates of Navy Hispanic junior officers. The authors also recommended more analysis on the experiences officers gained prior to commissioning and during their naval careers—such as college education, qualifications, and lateral transfers—as factors on retention and promotion (Tick et al., 2015).

This thesis attempts to address some of the recommendations made by Tick et al. (2015). It focuses on the “male-female retention gap” at significant career milestones for Navy female junior officers and Hispanic and minority female junior officers. This thesis also analyzes the effect of pre-commission factors, such as college education, and junior

officer job experiences, such as qualifications and lateral transfers, on promotion and retention.

E. SUMMARY

This literature review extracts findings and recommendations from recent studies on officer promotion and retention relevant to the focus of the thesis, female and minority female officer career progression in the Navy.

Asch et al. (2012) showed that White, Hispanic, and other women were less likely to promote to the significant O-4 milestone, which was partly affected by female retention rates to the pay grade of O-4. The authors recommended a follow-on study using more recent data so that all cohorts would have similar experiences throughout their careers, which would ensure continuity of promotion and retention effects in the study (Asch et al., 2012). Kraus et al. (2013) described the effects of marital and dependent status as “especially important for understanding female SWO retention” (p. 49). The authors recommended more research into the marital and dependent status of female SWOs to better understand life-milestone decisions, such as getting married, having children, and deciding to leave the Navy. Kraus et al. (2013) also recommended focusing a retention model around the decision to transfer laterally versus leave the Navy, as this was another career decision affecting retention and promotion, and women were more likely than men to transfer laterally.

Tick et al. (2015) found that there was a significant “male-female retention gap” at the MSR point and the 10-year mark. They also found that the Navy had the lowest retention rates of Hispanic junior officers among all services. The authors recommended further study on both female and Hispanic junior officer populations. Tick et al. (2015) also recommended analyzing experience level and lateral transfers as factors in modeling for retention and promotion. Finally, the authors recommended the use of multi-equation modeling to account for potential selection bias in single-equation models.

This thesis takes into account many of the recommendations from these prior studies. It attempts to implement the suggested statistical methods to improve the estimated retention and promotion effects of race/ethnicity in the Navy.

F. IMPLICATIONS

Several aspects helped to shape the approach used and the variables selected in this study. The primary and secondary thesis questions were derived after reading the literature in the area of Navy/Marine Corps retention and promotion, focusing on female and minority junior officers. The recommendations of those relevant studies were analyzed and helped to guide this thesis. Available data and time constraints were also critical factors in selecting thesis questions and the modeling approach. The data used in the present study are discussed in detail in the next chapter.

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IV. DATA AND DESCRIPTIVE STATISTICS

A. INTRODUCTION

This chapter provides data description, summary statistics, and descriptive statistics differences on the data used in this study to understand the methods and results. The data description provides general background and variable definitions. Summary statistics compare means between all variables from different samples within the same data set. Descriptive statistics differences compare variables of interest between groups such as gender and race/ethnicity.

B. DATA DESCRIPTION

This study uses a data set provided by DMDC. The data are comprised of all officers in the Navy who received a commission from FY1999 to FY2003, totaling 24,336 officers. The fiscal year for the Navy begins October 1 and ends September 30 of each year. These individuals were followed until separation from the military or the end of FY2013 to capture their entire junior officer career.

A number of variables, such as demographic background and professional characteristics, were obtained for each individual at the time of commissioning. Each year the variables were updated to show changes in marital status, number of dependents, and separation status.

The data were restricted to include only Active Duty, Full-Time Support (FTS), and Selected Reservists. LDOs, CWOs, and officers entering in pay grades above O-1, such as in the medical, legal, and religious corps, were removed. The final data set consists of 16,123 individuals.

1. DEPENDENT VARIABLES—DEFINING RETENTION AND PROMOTION

Table 14 lists the dependent variables used in the analysis including retention beyond the Minimum Service Requirement (MSR), retention to 10 years of service, and promotion to the rank of O-4.

MSR_Retention is defined as six completed years of service from the date of commissioning because five years is the average length of the obligation required for each of the commissioning sources and communities in the Navy. For example, of the two largest communities, Aviation has an eight-year commitment for officers after receiving designation as a naval aviator. Surface Warfare has a four-year commitment for officers upon commissioning through OCS and five years for Naval Academy and NROTC (Navy Cyber Space, 2016). Also, six years was chosen for *MSR_Retention* for continuity purposes because several previous studies use the same definition of retention.

The variable *10_Year_Retention* is calculated from the date of commissioning to the completion of 10 years of military service. If an individual stays until completing the 10th year, it shows their intent to be considered for promotion to O-4.

Promotion in rank is also analyzed as an important career outcome. *Promotion_O4* is defined as those officers who have successfully been promoted to O-4. Promotion from O-1 to O-2 and from O-2 to O-3 is not analyzed. Only promotion to O-4 is explored because it is considered the first truly competitive promotion board and a milestone for junior officers.

2. INDEPENDENT VARIABLES

Table 14 lists the independent variable groups as demographic, professional, transition, and cohort year. Demographic variables include age, gender, race, marital status, dependents, citizenship, and educational level. The race variables are defined as *Black_Non-Hispanic*, *White_Non-Hispanic*, *Hispanic*, *Asian*, and *Other_Unkn_Race* (other or unknown race). A change in marital status and number of dependents is recorded annually in the data. Marital status variables upon entry in the military are *Married* and *Not_Married*. Marital status variables at six YOS are *Married_6* and *Not_Married_6*. Dependent children at six YOS variables are *Dep_Children_6* and *No_Dep_Children_6*. Since most commissioned officers have a bachelor's degree, the two categories for educational level are *Grad_Education* and *No_Grad_Education*. These variables represent the officer's educational level acquired any time before or during his or her naval career.

Professional variables include prior military service, source of commissioning, months of service, and designator/MOS. Service members who have prior military service are identified by the variable *Prior_Service*. The commissioning source variables are *Academy*, *NROTC*, *OCS*, *Direct*, *Other_Commissioning*, *Unkn_Commissioning*. The officer designators/MOSs are Unqualified Line (*Unqual_Line*), Surface Warfare (*SWO*), Submarine (*SUB*), Aviation (*Aviator*), Special Operations (*SPEC*), Restricted Line (*RL*), and *STAFF*. Each designator/MOS signifies the officer's community upon commissioning. The data set combined Restricted Line and Staff as one community. For this study, *RL* and *STAFF* were separated because of the diversity of the designators/MOSs within each community. For example, *RL* contains Engineering Duty officers, while *STAFF* contains chaplains.

Transition variables include lateral transfers to another community, voluntary and involuntary separations, involuntary separations due to poor performance or misconduct, and unknown separations. The variables *Lat_Transfer_4*, *Lat_Transfer_6*, and *Lat_Transfer_10* are binary variables which indicate individuals who transferred to another community by years four, six, or ten, respectively. *Lat_Transfer_4*, *Lat_Transfer_6*, and *Lat_Transfer_10* were created by comparing changes between the officers' primary MOS upon commissioning (*Primary_MOS*) and their primary MOS at years four, six, or ten, respectively (*Primary_MOS_4*, *Primary_MOS_6*, and *Primary_MOS_10*). The variable *Non_Lat_Transfer* defines the rest of the population who did not complete a lateral transfer by 10 YOS.

Defining a lateral transfer was difficult due to the complexity of the four-digit designator/MOS codes that describe the officer's community. *Lat_Transfer_4*, *Lat_Transfer_6* and *Lat_Transfer_10* were created by observing changes in the first two digits that typically describe the community. However, many unrestricted line officers (*SWO*, *SUB*, *SPEC*) share the same first two digits of "11." Therefore, for officers who had a designator/MOS with "11" in the first two digits, the third digit was analyzed to determine community. The fourth digit designates the active duty, selected reserves, or FTS status with a "0," "5," or "7," respectively. All officers start their careers in a reserve or training status with their fourth digit as a "5." No code was written to separate active

duty from selected reserves or FTS due to the level of difficulty because individuals can change status from active duty to reservists multiple times in their career. This makes it difficult to categorize them as active duty or reservist.

Unqualified line officers are those who started their career with the designator/MOS “1105,” which indicates a training status. Unqualified line officers totaled 2,025 individuals. These officers were not counted in the lateral transfer coding because they were in an unrestricted line officer training status. After browsing much of the data, it was extremely rare to see an unqualified line officer who transferred laterally outside of his or her unrestricted line community.

For future studies, it is recommended that lateral transfer data be supplied directly from the Navy Personnel Command, which oversees all Navy re-designation and transfer boards. This would ensure the exact number of lateral transfers can be counted and the direction of the transfer identified (such as, from SWO to RL).

The Navy Military Personnel Manual defines separation as “a general term that includes discharge, release from active duty, release from custody and control of the Naval Service, transfer to the IRR (Individual Ready Reserve), and similar changes in active or Reserve status” (Navy Military, Personnel Manual, 2011, p. 5). The separation variables are *Volun_Separation*, *Involun_Separation*, *Poor_Performer*, and *Unknown_Sep*. These transition variables are used to measure job fit. An officer’s desire to transition may be associated with other factors, such as gender, race, designator/MOS, marital status, and dependents.

Five cohort dummy variables were created to represent commissioning year. These variables will help to capture any differences and changes in the year-to-year environment, such as economic fluctuations, military policies, and the impact of the Global War on Terror, which began in 2003.

Table 14. Variable Definitions

Variable	Definition
Dependent Variables	
MSR_Retention	= 1 if Months_in_Service >= 72; else 0
10_Year_Retention	= 1 if Months_in_Service >= 120; else 0
Promotion_O4	= 1 if promoted to O4; else 0
Independent Variables	
Demographic	
Age	Age of individual
Female	=1 if female; else 0
Male	=1 if male; else 0
Black_NonHisp	=1 if Black (race) & Non-Hispanic (ethnicity); else 0
White_NonHisp	=1 if White (race) & Non-Hispanic (ethnicity); else 0
Asian	=1 if Asian; else 0
Hispanic	=1 if Hispanic; else 0
Other_Unkn_Race	=1 if Race is not known; else 0
Married	=1 if married at time of entry; else 0
Not_Married	=1 if not married at time of entry; else 0
Married_6	=1 if not married in year 6; else 0
Not_Married_6	=1 if married in year 6; else 0
Dep_Children_6	=1 if dependents 6 years after commissioning; else 0
No_Dep_Children_6	=1 if no dependents 6 years after commissioning; else 0
Naturalized	=1 if naturalized U.S. citizen at entry; else 0
Grad_Education	=1 if Grad Education; else 0
No_Grad_Education	=1 if No Grad Education; else 0
Professional	
Prior_Service	=1 if prior enlisted; else 0
Academy	=1 if Source_of_Commission==B; else 0
NROTC	=1 if Source_of_Commission==G & H; else 0
OCS	=1 if Source_of_Commission==J; else 0
Direct	=1 if Source_of_Commission==M & N
Other_Commissioning	=1 if Source_of_Commission== E, F, K, L, X
Unkn Commissioning	=1 if Source_of_Commission==Z; else 0
Pay_Grade	O-1 through O-5, reported yearly
Months_in_Service	= (Separation_Date - Entry_Date)/30 days
Primary_MOS	Code identifying designator or Military Occupational Specialty
Primary_MOS_6	Code identifying designator or Military Occupational Specialty at year six of service
Unqual_Line	=1 if Unqualified Line Officer; else 0
SWO	=1 if Surface Warfare Officer; else 0
SUB	=1 if Submarine Officer; else 0
SPEC	=1 if Special Operations Officer; else 0
Aviator	=1 if Naval Pilot, otherwise; else 0
RL	=1 if Restricted Line; else 0
STAFF	=1 if Staff Community; else 0
Transition	
Lat_Transfer_4	=1 if lateral transfer complete from Primary_MOS to Primary_MOS_4; else 0
Lat_Transfer_6	=1 if lateral transfer complete from Primary_MOS to Primary_MOS_6; else 0
Lat_Transfer_10	=1 if lateral transfer complete from Primary_MOS to Primary_MOS_10; else 0
Non_Lat_Transfer	=1 if no lateral transfer complete by to YOS (Lat_Transfer_10==0)
Volun_Separation	=1 if voluntary separation; else 0
Involun_Separation	=1 if involuntary separation; else 0
Poor_Performer	=1 if involuntary separation due to poor performance or misconduct; else 0
Unknown_Sep	=1 if reason for separation is unknown
Cohorts	
Cohort_FY99	=1 if commissioned during fiscal year 1999; else 0

Variable	Definition
Cohort_FY00	=1 if commissioned during fiscal year 2000; else 0
Cohort_FY01	=1 if commissioned during fiscal year 2001; else 0
Cohort_FY02	=1 if commissioned during fiscal year 2002; else 0
Cohort_FY03	=1 if commissioned during fiscal year 2003; else 0

C. SUMMARY STATISTICS

This section shows the summary statistics for the selected full sample of 16,143 individual officers who received commissions from 1999 to 2003. The tables include means for and standard deviations for each variable. Each table represents a different subset of officers from the original data set. For example, Table 15 shows the summary statistics of the full sample ($N=16,143$), while Table 16 shows the summary statistics for officers who completed *MSR_Retention* ($n=11,938$).

Table 15 shows that, of all officers, 74 percent completed *MSR_Retention*, 53 percent completed *10_Year_Retention*, and 42 percent were promoted to O-4. Of the full sample, 18 percent are women. Regarding race, 7.1 percent are *Black_NonHisp*, 75.2 percent are *White_NonHisp*, 5.1 percent are *Asian*, 9.4 percent are *Hispanic*, and 3.1 percent are *Other_Unkn_Race*. *Married_6* represents 45 percent of the full sample, while 26 percent have children by their sixth YOS. Only 1.9 percent of officers are naturalized citizens. Graduate-level education had been attained by 37 percent of all officers either before or during their naval career. Not shown in Table 15 is that, for all officers who have a graduate degree, 43 percent were unfunded by the military. Prior military service members represent 21 percent of all officers. Regarding commissioning sources, *Academy* officers represent 24 percent, *NROTC* officers represent 26.5 percent, and *OCS* officers represent 32.4 percent of all officers. Surface Warfare and Aviation are the largest officer communities, representing 23.3 percent and 28.5 percent, respectively. Lateral transfers by four, six, and ten YOS represent 7.5 percent, 8.6 percent, and 10.1 percent of the full sample, respectively. The number of officers who separated before 2013 totaled 10,299. Voluntary separations, involuntary separations, and separations due to poor performance are 82.2 percent, 11.9 percent, and 4.6 percent of the full sample,

respectively. Each of the five cohort years represents roughly 20 percent of the full sample.

Table 15. Summary Statistics—Full Sample ($N=16,143$)

Variable	Obs.	Mean	Std. Err.
Dependent Variables			
MSR_Retention	16143	0.7395	0.0035
10_Year_Retention	16143	0.5305	0.0039
Promotion_O4	16143	0.4198	0.0039
Independent Variables			
Demographic			
Age	16096	24.8423	0.0275
Female	16143	0.1842	0.0031
Male	16143	0.8158	0.0031
Black_NonHisp	16143	0.0711	0.0020
White_NonHisp	16143	0.7525	0.0034
Asian	16143	0.0506	0.0017
Hispanic	16143	0.0940	0.0023
Other_Unkn_Race	16143	0.0318	0.0014
Married	16143	0.1813	0.0030
Not_Married	16143	0.8187	0.0030
Married_6	16143	0.4528	0.0039
Not_Married_6	16143	0.5472	0.0039
Dep_Children_6	16143	0.2643	0.0035
No_Dep_Children_6	16143	0.7343	0.0035
Naturalized	16143	0.0193	0.0011
Grad_Education	16143	0.3708	0.0038
No_Grad_Education	16143	0.6293	0.0038
Professional			
Prior_Service	16143	0.2099	0.0032
Academy	16143	0.2412	0.0034
NROTC	16143	0.2652	0.0035
OCS	16143	0.3236	0.0037
Direct	16143	0.0784	0.0021
Other_Commissioning	16143	0.0712	0.0020

Variable	Obs.	Mean	Std. Err.
Unkn Commissioning	16143	0.0204	0.0011
Months_in_Service	16143	109.4141	0.3603
Unqual_Line	16143	0.1254	0.0026
SWO	16143	0.2329	0.0033
SUB	16143	0.0976	0.0023
SPEC	16143	0.0166	0.0010
Aviator	16143	0.2848	0.0036
RL	16143	0.0591	0.0019
STAFF	16143	0.1836	0.0031
Transition			
Lat_Transfer_4	16143	0.0750	0.0021
Lat_Transfer_6	16143	0.0858	0.0022
Lat_Transfer_10	16143	0.1010	0.0024
Volun_Separation	10299	0.8227	0.0038
Involun_Separation	10299	0.1199	0.0032
Poor_Perfomer	10299	0.0462	0.0021
Unknown_Sep	10299	0.0112	0.0010
Cohorts			
Cohort_FY99	16143	0.1834	0.0031
Cohort_FY00	16143	0.2078	0.0032
Cohort_FY01	16143	0.2108	0.0032
Cohort_FY02	16143	0.2058	0.0032
Cohort_FY03	16143	0.1922	0.0031

Table 16 shows the summary statistics for officers who completed MSR_Retention (MSR stayers). Officers who did not complete MSR were dropped from the sample used for this table. Several statistics have changed in comparison to the full sample shown in Table 14 due to the new sample. The mean for 10_Year_Retention has increased from 53 percent to 71 percent among MSR stayers and the mean for Promotion_O4 has increased from 42 percent to 56 percent. Women have decreased from 18 percent to 14 percent of the new sample, which indicates they have a lower MSR retention rate than men. The representation of all races has remained relatively constant. Married_6 has increased from 45 to 60 percent, and Dep_Children_6 has increased from

26 percent to 35 percent. The increase in married officers and dependents at six YOS is natural as more people tend to start families around this time in their lives (late 20s and early 30s). SWO has decreased from 23 percent to 20 percent. Aviation has increased from 28 percent to 31 percent. The change in the proportional sizes of the communities suggests that retention has affected SWO negatively and has affected Aviation positively. All other communities remained relatively constant.

Table 16. Summary Statistics for Minimum Service Requirement Retention
(*n*=11,938)

Variable	Obs.	Mean	Std. Err.
Dependent Variables			
MSR_Retention	11938	1.0000	0.0000
10_Year_Retention	11938	0.7173	0.0041
Promotion_O4	11938	0.5570	0.0046
Independent Variables			
Demographic			
Age	11910	25.0628	0.0333
Female	11938	0.1464	0.0032
Male	11938	0.8536	0.0032
Black_NonHispanic	11938	0.0721	0.0024
White_NonHispanic	11938	0.7532	0.0040
Asian	11938	0.0483	0.0020
Hispanic	11938	0.0952	0.0027
Other_Unkn_Race	11938	0.0312	0.0016
Married	11938	0.1965	0.0036
Not_Married	11938	0.8035	0.0036
Married_6	11938	0.6044	0.0045
Not_Married_6	11938	0.3956	0.0045
Dep_Children_6	11938	0.3525	0.0044
No_Dep_Children_6	11938	0.6473	0.0044
Naturalized	11938	0.0213	0.0013
Grad_Education	11938	0.4781	0.0046
No_Grad_Education	11938	0.5220	0.0046

Variable	Obs.	Mean	Std. Err.
Professional			
Prior_Service	11938	0.1999	0.0037
Academy	11938	0.2536	0.0040
NROTC	11938	0.2407	0.0039
OCS	11938	0.3372	0.0043
Direct	11938	0.0715	0.0024
Other_Commissioning	11938	0.0773	0.0024
Unkn Commissioning	11938	0.0199	0.0013
Months_in_Service	11938	131.2624	0.2749
Unqualified Line Off	11938	0.1322	0.0031
SWO	11938	0.2034	0.0037
SUB	11938	0.1016	0.0028
SPEC	11938	0.0184	0.0012
Aviator	11938	0.3147	0.0043
RL	11938	0.0550	0.0021
STAFF	11938	0.1747	0.0035
Transition			
Lat_Transfer_4	11938	0.0968	0.0027
Lat_Transfer_6	11938	0.1150	0.0029
Lat_Transfer_10	11938	0.1362	0.0031
Volun_Separation	6161	0.8044	0.0051
Involun_Separation	6161	0.1553	0.0046
Poor_Perfomer	6161	0.0302	0.0022
Unknown_Sep	6161	0.0101	0.0013
Cohorts			
Cohort_FY99	11938	0.1969	0.0036
Cohort_FY00	11938	0.2165	0.0038
Cohort_FY01	11938	0.2129	0.0038
Cohort_FY02	11938	0.1962	0.0036
Cohort_FY03	11938	0.1775	0.0035

Table 17 displays only the data for the sample of officers who completed *10_Year_Retention* (10-year stayers). Officers who did not complete *10_Year_Retention* were dropped from the sample used for this table. In comparison with Table 16,

promotions to O-4 have increased from 56 to 77 percent for 10-year stayers. Women decreased from 14 to 13 percent, indicating that retention is negatively affecting the female population. *Black_NonHisp* and *Asian* percentages have slightly increased, while all other races have slightly decreased, indicating that Blacks and Asians retain at higher rates from MSR to 10 YOS. *Married_6* years has increased from 60 to 67 percent. *Dep_Children_6* has increased from 35 to 42 percent. This shows that officers with families at 6 YOS are more likely to retain to 10 YOS. The same retention trend among officer communities continues. *SWO* decreased from 20 to 19 percent and *Aviation* increased from 31 to 34 percent. In fact, *STAFF* increased from 17 percent (Table 16) to 20 percent (Table 17), surpassing *SWO* as the second largest community that completes *10_Year_Retention*. *SUB* decreased from 10.2 to 7.2 percent, suggesting a retention problem between *MSR_Retention* and *10_Year_Retention*.

Table 17. Summary Statistics for 10-Year Retention ($n=8,563$)

Variable	Obs.	Mean	Std. Err.
Dependent Variables			
MSR_Retention	8563	1	0
10_Year_Retention	8563	1	0
Promotion_O4	8563	0.7715	0.0045
Independent Variables			
Demographic			
Age	8542	25.6188	0.0417
Female	8563	0.1334	0.0037
Male	8563	0.8666	0.0037
Black_NonHisp	8563	0.0798	0.0029
White_NonHisp	8563	0.7509	0.0047
Asian	8563	0.0489	0.0023
Hispanic	8563	0.0875	0.0031
Other_Unkn_Race	8563	0.0329	0.0019
Married	8563	0.2289	0.0045
Not_Married	8563	0.7711	0.0045
Married_6	8563	0.6714	0.0051
Not_Married_6	8563	0.3286	0.0051

Variable	Obs.	Mean	Std. Err.
Dep_Children_6	8563	0.4171	0.0053
No_Dep_Children_6	8563	0.5829	0.0053
Naturalized	8563	0.0251	0.0017
Grad_Education	8563	0.6157	0.0053
No_Grad_Education	8563	0.3843	0.0053
Professional			
Prior_Service	8563	0.2204	0.0045
Academy	8563	0.2222	0.0045
NROTC	8563	0.2196	0.0045
OCS	8563	0.3641	0.0052
Direct	8563	0.0832	0.0030
Other_Commissioning	8563	0.0874	0.0031
Unkn Commissioning	8563	0.0236	0.0016
Months_in_Service	8563	146.9861	0.1896
Unqualified Line Off	8563	0.1085	0.0034
SWO	8563	0.1928	0.0043
SUB	8563	0.0729	0.0028
SPEC	8563	0.0196	0.0015
Aviator	8563	0.3408	0.0051
RL	8563	0.0640	0.0027
STAFF	8563	0.2015	0.0043
Transition			
Lat_Transfer_4	8563	0.1106	0.0034
Lat_Transfer_6	8563	0.1378	0.0037
Lat_Transfer_10	8563	0.1857	0.0042
Volun_Separation	2888	0.6870	0.0086
Involun_Separation	2888	0.2725	0.0083
Poor_Perfomer	2888	0.0284	0.0031
Unknown_Sep	2888	0.0121	0.0020
Cohorts			
Cohort_FY99	8563	0.1878	0.0042
Cohort_FY00	8563	0.2031	0.0044
Cohort_FY01	8563	0.2095	0.0044
Cohort_FY02	8563	0.2078	0.0044
Cohort_FY03	8563	0.1919	0.0043

Table 18 shows the summary statistics for officers who were promoted to O-4. Those who did not complete promotion to O-4 were dropped from the sample used for this table. Only 13 percent of the sample population is female, while the total female population upon commissioning was 18 percent in Table 15, suggesting retention is negatively affecting women.

The representation of most races remained relatively constant throughout each career outcome, suggesting retention from the full sample data to *10_Year_Retention* has been stable. Hispanics have increased from 8.7 percent in Table 17 to 9.3 percent in Table 18, indicating that Hispanics are promoted to O-4 at a higher rate than non-Hispanics. *Married_6* has increased from 67 to 70 percent. *Dep_Children_6* has increased from 41 to 44 percent, suggesting promotions to O-4 rates are higher for officers with families.

For the most part, each community's *Promotion_O4* rates were similar to its *10_Year_Retention* rate. However, *Aviator* representation decreased from 34 to 30 percent, suggesting promotion to O-4 is particularly difficult for aviators.

The percentage change in lateral transfers from the full data sample in Table 15 to officers who were promoted to O-4 in Table 18 is interesting. Officers who completed *Lat_Transfer_6* increased from 8.6 percent (Table 15) to 14.9 percent (Table 18). Officers who completed *Lat_Transfer_10* increased from 10.1 percent (Table 15) to 21.1 percent (Table 18).

Another interesting variable that changed from the full data sample in Table 15 to officers who were promoted to O-4 in Table 18 is *Grad_Education*. Officers who completed *Grad_Education* increased by roughly 31 percentage points from 37.1 percent (Table 15) to 68.5 percent (Table 18). This shows the trend that a higher percentage of officers who are promoted to O-4 obtain a Master's degree than do all officers from the full sample.

Table 18. Summary Statistics for Promotion to O-4 ($n=6,606$)

Variable	Obs.	Mean	Std. Err.
Dependent Variables			
MSR_Retention	6606	1	0
10_Year_Retention	6606	1	0
Promotion_O4	6606	1	0
Independent Variables			
Demographic			
Age	6591	25.6127	0.0466
Female	6606	0.1323	0.0042
Male	6606	0.8677	0.0042
Black_NonHispanic	6606	0.0769	0.0033
White_NonHispanic	6606	0.7477	0.0053
Asian	6606	0.0489	0.0027
Hispanic	6606	0.0933	0.0036
Other_Unkn_Race	6606	0.0333	0.0022
Married	6606	0.2333	0.0052
Not_Married	6606	0.7667	0.0052
Married_6	6606	0.7006	0.0056
Not_Married_6	6606	0.2994	0.0056
Dep_Children_6	6606	0.4357	0.0061
No_Dep_Children_6	6606	0.5643	0.0061
Naturalized	6606	0.0256	0.0019
Grad_Education	6606	0.6854	0.0057
No_Grad_Education	6606	0.3146	0.0057
Professional			
Prior_Service	6606	0.1629	0.0045
Academy	6606	0.2171	0.0051
NROTC	6606	0.2130	0.0050
OCS	6606	0.3753	0.0060
Direct	6606	0.0870	0.0035
Other_Commissioning	6606	0.0898	0.0035
Unkn Commissioning	6606	0.0179	0.0016
Months_in_Service	6606	151.5684	0.1979
Unqualified Line Off	6606	0.1246	0.0041
SWO	6606	0.1920	0.0049

Variable	Obs.	Mean	Std. Err.
SUB	6606	0.0713	0.0032
SPEC	6606	0.0210	0.0018
Aviator	6606	0.3073	0.0057
RL	6606	0.0659	0.0031
STAFF	6606	0.2180	0.0051
Transition			
Lat_Transfer_4	6606	0.1214	0.0040
Lat_Transfer_6	6606	0.1491	0.0044
Lat_Transfer_10	6606	0.2109	0.0050
Volun_Separation	1376	0.8488	0.0097
Involun_Separation	1376	0.1148	0.0086
Poor_Perfomer	1376	0.0211	0.0039
Unknown_Sep	1376	0.0153	0.0033
Cohorts			
Cohort_FY99	6606	0.2100	0.0050
Cohort_FY00	6606	0.2262	0.0052
Cohort_FY01	6606	0.2290	0.0052
Cohort_FY02	6606	0.2024	0.0049
Cohort_FY03	6606	0.1325	0.0042

The increase in *Lat_Transfer_10* from 10.1 percent of the full sample to 21.1 percent of officers who were promoted to O-4 is 11 percentage points. This suggests that officers who complete a lateral transfer are more likely to retain to 10 YOS and to be promoted to O-4.

Table 19 shows the retention and promotion rates of lateral transfer officers. Table 19 shows that 99.7 percent of lateral transfers complete *MSR_Retention*, 97.5 percent complete *10_Year_Retention*, and 86.7 percent are promoted to O-4. These rates are much higher when compared with the rates of the full sample, where 74 percent completed *MSR_Retention*, 53 percent completed *10_Year_Retention*, and 42 percent were promoted to O-4.

Table 19. Retention and Promotion Rates for Officers who Complete a Lateral Transfer by 10 YOS ($n=1,631$)

Variable	Obs.	Mean	Std. Err.
MSR_Retention	1631	0.9969	0.0014
10_Year_Retention	1631	0.9749	0.0039
Promotion_O4	1631	0.8670	0.0084

D. T-TESTS OF DIFFERENCES IN GROUP MEANS

A two sample *t*-test is performed to determine if the population means are equal or different between two groups (Snedecor and Cochran, 1989). *T*-tests are used in this section to analyze differences in the means between male and female and Hispanic and non-Hispanic. Table 20 displays *t*-tests of differences in retention and promotion between males and females for 10_Year_Retention based on MSR stayers. Also, *Promotion_O4* is measuring promotion to O4 for those who completed 10 years. Table 20 shows that both the *MSR_Retention* rate and the *10_Year_Retention* rate are lower for women than for men. Both differences are statistically significant.

Table 20. *T*-tests of Differences in Retention and Promotion for Female and Male Officers

Variable	Female	Male	<i>T</i> -test
MSR_Retention	0.5880	0.7737	21.13***
10_Year_Retention	0.6533	0.7283	6.43***
Promotion_O4	0.7653	0.7724	0.53

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 21 shows the differences between Hispanics and non-Hispanics for 10_Year_Retention based on officers who survived beyond MSR. Also, *Promotion_O4* is measuring promotion to O-4 for officers who completed 10 years of service. Table 21 shows that the *10_Year_Retention* rate is lower for Hispanics than for non-Hispanics,

while the *Promotion_O4* rate is higher for Hispanics. Both differences are statistically significant.

Table 21. *T*-tests of Differences in Retention and Promotion for Hispanic and Non-Hispanic Officers

Variable	Hispanic	Non-Hispanic	T-test
MSR_Retention	0.7478	0.7386	-0.80
10_Year_Retention	0.6653	0.7232	4.24***
Promotion_O4	0.8030	0.7682	-2.24***

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 22 shows the *t*-test of differences between women and men for the full sample of newly commissioned officers. Table 22 shows large differences between female and male officers for each career outcome. Women are less likely to retain to MSR, less likely to retain to 10 YOS, and less likely to be promoted to O-4. All of these differences are statistically significant at the 1 percent level.

Table 22. *T*-tests of Differences in Retention and Promotion for Female and Male Officers from Commissioning to O-4 Promotion

Variable	Female	Male	T-test
MSR_Retention	0.5880	0.7737	21.13***
10_Year_Retention	0.3841	0.5635	17.87***
Promotion_O4	0.3058	0.4455	14.02***

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 23 shows the differences between Hispanics and non-Hispanics for the full sample of newly commissioned officers. In other words, *Promotion_O4* represents those promoted to O-4 from the entire sample. Table 23 shows that the *10_Year_Retention* rate is lower for Hispanics than non-Hispanics and is statistically significant. However, the differences in *MSR_Retention* and *Promotion_O4* are not statistically significant.

Table 23. *T*-tests of Differences in Retention and Promotion for Hispanic and Non-Hispanic Officers from Commissioning to O-4 Promotion

Variable	Hispanic	Non-Hispanic	T-test
MSR_Retention	0.7478	0.7386	-0.80
10_Year_Retention	0.4975	0.5341	2.80***
Promotion_O4	0.4081	0.4211	0.99

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 24 shows the *t*-test of differences between lateral transfers (*Lat_Transfer_10*) and non-lateral transfers (*Non_Lat_Transfer*) for the full sample of newly commissioned officers. Table 24 shows large differences between lateral and non-lateral transfers for each career outcome. Lateral transfers are more likely to retain to MSR, more likely to retain to 10 YOS, and more likely to be promoted to O-4. All of these differences are statistically significant at the 1 percent level.

Table 24. *T*-tests of Differences in Retention and Promotion for Lateral Transfers and Non-Lateral Transfers.

Variable	Lat_Transfer_10	Non_Lat_Transfer	T-test
MSR_Retention	0.9969	0.7106	-25.47***
10_Year_Retention	0.9749	0.4805	-39.73***
Promotion_O4	0.8670	0.3695	-40.50***

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 25 shows the *t*-test of differences in transition outcomes between women and men for the full sample of newly commissioned officers. Table 25 shows statistically significant differences in all outcomes except *Poor_Performer*. Women are less likely to complete *Lat_Transfer_10*, more likely to separate voluntarily, and less likely to separate involuntary.

Table 25. *T*-tests of Differences in Transition Outcomes for Female and Male Officers from Commissioning to O-4 Promotion.

Variable	Female	Male	T-test
Lat_Transfer_10	0.0908	0.1033	2.04**
Volun_Separation	0.8378	0.8184	-2.13**
Involun_Separation	0.1053	0.1240	2.42**
Poor_Performer	0.0498	0.0452	-0.92

*** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent

Table 24 shows that 97 percent of officers who complete *Lat_Transfer_10* will retain to 10 YOS. Table 25 shows that 10.3 percent of men complete *Lat_Transfer_10*. However, only 9 percent of women complete *Lat_Transfer_10*. Therefore, increasing opportunities for women to complete a lateral transfer by 10 YOS should increase their retention rates.

E. SUMMARY

The data show differences in means between both dependent and independent variables throughout the selected samples. The summary statistics show female representation decreases with each of the career outcomes from 18 percent of the full sample to 13 percent promoting to O-4, suggesting a problem with retention. Table 20 proves the poor female retention with *t*-tests of differences for *MSR_Retention* with women at 58 percent and men at 77 percent, and *10_Year_Retention* with women at 65 percent and men at 72 percent. These differences are magnified in Table 22, which shows the differences between women and men for the full sample of newly commissioned officers.

Representation of the races was relatively constant throughout the career outcomes, suggesting that retention for most races is stable. Hispanics are the only racial group to increase their representation from career outcomes *10_Year_Retention* to *Promotion_O4*, suggesting that Hispanics have a higher promotion rate. This is shown in

Table 21 with *t*-tests of differences for *Promotion_O4* for Hispanics at 80 percent and non-Hispanics at 77 percent.

The largest changes in community representation from the full sample to *10_Year_Retention* were seen consistently in *SWO* and *Aviator*. *SWO* retention decreased from 23 to 19 percent and *Aviator* retention increased from 28 to 34 percent. From *MSR_Retention* to *10_Year_Retention*, *STAFF* increased from 17 to 20 percent and *SUB* decreased from 10 to 7 percent. Most communities' *Promotion_O4* rates were representative of *10_Year_Retention*, except *Aviator*. *Aviator* representation went from 34 percent of *10_Year_Retention* to 30 percent of *Promotion_O4*, suggesting that O-4 is more difficult for aviators to achieve when compared with other communities.

Lateral transfers have positive effects on all three career outcomes: *MSR_Retention*, *10_Year_Retention*, and *Promotion_O4*. Table 24 shows these large positive effects by displaying the *t*-test of differences in means between lateral transfers and non-lateral transfers. For example, 97 percent of officers who complete *Lat_Transfer_10* will complete *10_Year_Retention*. Table 25 shows that more men complete *Lat_Transfer_10* than women. Therefore, the Navy may be able to increase retention rates of women by increasing opportunities for women to complete a lateral transfer by 10 YOS.

V. MODELS AND RESULTS

A. OVERVIEW

Chapter IV displays descriptive statistics of the variables that affect retention, promotion, and career choices such as lateral transfers. In some cases, these differences are large and statistically significant. However, the t-test method does not control for the effects of other factors on these selected outcomes. Chapter V uses multivariate statistical analysis methods to control for these other factors in order to examine the independent effects of each explanatory variable.

B. METHODOLOGY

Multivariate regression models are used to estimate the effects of independent variables on selected dependent variables. The dependent variables in this study are: (a) MSR retention; (b) 10-year retention; (c) promotion to O-4; and (d) lateral transfer by 10 YOS. All dependent variables are binary, meaning an outcome of “1” is successful and an outcome of “0” is unsuccessful. Therefore, a probit or logit model is the most appropriate estimation technique. A probit estimation model provides the direction or sign for the effect of each independent variable on the dependent variable. However, the coefficients for each independent variable in a probit regression are difficult to interpret. Therefore, statistical software is used to obtain the partial derivative of each coefficient, which provides the marginal effects of a one unit change of each variable on the probability of each outcome (Wooldridge, 2009).

C. ESTIMATION MODELS

All models in this study are probit estimation models because all dependent variables are binary. For the results of each model, this study focuses on the direction (+ or -), magnitude (marginal effect), and statistical significance of the estimated coefficients for each independent variable. Unless otherwise noted, the reference group for each model is *Male, White non-Hispanic*, not married at 6 YOS, no dependent

children at 6 YOS, no graduate education, *OCS*, *Aviator*, and cohort 1999. The reference group may change slightly when the specification of the model changes.

1. MSR RETENTION MODEL RESULTS

The first probit retention model (Figure 1) estimates the probability that an officer is retained beyond MSR or up to 6 YOS. Aviation officers were removed from the sample because their MSR after completion of flight school is eight years for pilots and six years for naval flight officers. All *Aviators* would be obligated past the MSR variable defined as six years for this study and, thus, all would be defined as retained. The variable *STAFF* is the new control group for communities because *Aviator* has been dropped. Demographic and professional characteristics are included in the model. *Lat_Transfer_4* is included in the model to determine the effects on MSR retention for officers who completed a lateral transfer by year four.

Figure 1. MSR Retention Model

$$\text{Model1: Pr}(MSR \text{ Retention}) = 1 | X) = \beta_0 + \beta_1(Demographic) + \beta_2(Professional) + \beta_3(Lat_Transfer_4) + \beta_4(Cohorts) + \mu$$

Table 26 shows the results of the MSR retention model. The sample contains 11,523 observations from the 16,143 in the original sample due to the deleting of aviators. The average MSR retention rate for the sample is 70.9 percent. The results in Table 26 show no statistically significant differences in race regarding the probability of staying beyond MSR. All of the following factors discussed are statistically significant at the 10 percent level or better.

Among the demographic variables, women are 1.9 percentage points (2.7 percent measured at the mean sample MSR retention rate of 70.9 percent) less likely to stay beyond MSR. Officers who are married by six YOS are 30.9 percentage points (43 percent) more likely to retain beyond MSR. Officers with dependent children at six YOS are 9.6 percentage points (14 percent) more likely to complete MSR, and officers who

obtain a graduate degree are 20.2 percentage points (29 percent) more likely to complete MSR. This could be correlated to the additional time that an officer is obligated to serve after receiving his or her degree, which is typically two to three years.

Among the professional variables, *NROTC* graduates are 3.3 percentage points (5 percent) less likely, while *Academy* graduates are 2.6 percentage points (4 percent) more likely to stay beyond MSR as compared with *OCS* graduates. *SWO*, *SUB*, and *SPEC* officers are all more likely to complete MSR than *STAFF* officers. Officers who complete a lateral transfer by year 4 are 11.2 percentage points (16 percent) more likely to stay beyond the MSR obligation, suggesting that these officers are more satisfied in their newer communities. However, officers who complete a lateral transfer are obligated to serve at least two more years on active duty, which also could affect the retention pattern observed in Table 26 (Dailey, 2013).

Among cohort years, *Cohort_FY01*, *Cohort_FY02*, and *Cohort_FY03* are all less likely to stay beyond MSR than *Cohort_FY99*. This could be a result of the economic expansion period from November 2001 to December 2007. This economic expansion period would have made employment opportunities outside of the military more readily available; for example the unemployment rate was 4.7 percent in November 2007 (Vlasenko, 2015).

Table 26. MSR Retention Probit Model Results: Marginal Effects

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Age	0.0017 (0.0011)	Other_Commissioning	0.0075 (0.0184)
Female	-0.0189** (0.0074)	Unkn_Commissioning	0.0055 (0.0337)
Hispanic	0.0011 (0.0099)	SWO	0.0243*** (0.0087)
Black_NonHisp	0.0160 (0.0099)	SUB	0.0764*** (0.0069)
Asian	0.0053 (0.0121)	SPEC	0.0639*** (0.0106)
Other_Unkn_Race	-0.0283 (0.0193)	RL	-0.0168 (0.0135)
Married_6	0.3091*** (0.0103)	Unqual_Line	0.0607*** (0.0085)

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Dep_Children_6	0.0958*** (0.0099)	Lat_Transfer_4	0.1123*** (0.0059)
Naturalized	0.0051 (0.0224)	Cohort_FY00	-0.0072 (0.0094)
Grad_Educ	0.2015*** (0.0079)	Cohort_FY01	-0.0325*** (0.0106)
NROTC	-0.0332*** (0.0093)	Cohort_FY02	-0.0482*** (0.0119)
Academy	0.0257*** (0.0088)	Cohort_FY03	-0.0634*** (0.0131)
Direct	-0.0241* (0.0132)	Observations	11,523
		Mean Retention Rate	0.709

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The MSR retention sample is further divided into sub-samples of *Female* and *Male* officers. The MSR retention model is re-estimated for each sub-group to identify differences in the effects of explanatory variables between men and women. For all following sub-samples of *Female* in each of the estimation models, the dummy variable for the *SUB* community was dropped from the model because *Female* officers were not allowed to serve on submarines from 1999 to 2003. The results are presented in Table 27.

The average probability of MSR retention for women is 56.3 percent and for men is 75 percent, a gap of nearly 19 points. The *Female* sub-sample has 10 factors that are identified as statistically significant. However, the *Male* sub-sample has 14 factors that are statistically significant. The common statistically significant variables for both sub-samples were *Married_6*, *Depn_Children_6*, *Grad_Educ*, *NROTC*, *Unqual_Line*, *Lat_Transfer_4*, *Cohort_FY02*, and *Cohort_FY03*. The directions of the effects are the same for each of these variables.

The magnitude of the effects of many of the independent variables differs substantially between men and women. Among the demographic variables, married *Female* officers are 42.7 percentage points (76 percent) more likely to retain to MSR than non-married *Female* officers, whereas, married *Male* officers are 28 percentage points (37 percent) more likely to retain to MSR. *Female* officers with dependent children are 21.1 (38 percent) percentage points more likely to complete MSR, whereas men with

dependent children are only 7.6 percentage points (10 percent) more likely to complete MSR than *Male* officers without dependent children. A graduate degree increases a woman's probability to complete MSR by 36.7 percentage points (65 percent); in contrast, a man's retention probability increases by 16.2 percentage points (22 percent).

Among the professional variables, receiving a commission through NROTC decreases the likelihood a woman will retain beyond MSR by 11.8 percentage points (21 percent), but reduces a man's by only 2.1 percentage points (3 percent). Women who start in the community *Unqual_Line* are 15.9 percentage points (28 percent) more likely to stay to six years whereas men are just 4.6 percentage points (6 percent) more likely to stay. Women who complete a lateral transfer by 4 YOS are 31.3 percentage points (56 percent) more likely to stay to MSR, while men are 7.8 percentage points (10 percent) more likely to stay. While *Other_Unkn_Race* men retain at the same rate as White non-Hispanic men, *Other_Unkn_Race* women are 13.8 percentage points (25 percent) less likely to complete MSR than White non-Hispanic women. Note that *Othr_Unkn_Race* represents 3.1 percent of the total officer population.

Table 27. Separate MSR Probit Model Results for Women and Men:
Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	0.0032 (0.0037)	0.0011 (0.0011)	Unkn_Commissioning	0.1065 (0.0925)	-0.0173 (0.0380)
Hispanic	-0.0079 (0.0363)	0.0012 (0.0093)	SWO	0.0403 (0.0296)	0.0250*** (0.0082)
Black_NonHisp	0.0488 (0.0336)	0.0078 (0.0098)	SUB	n/a n/a	0.0608*** (0.0065)
Asian	0.0463 (0.0382)	-0.0015 (0.0120)	SPEC	0.1123 (0.1468)	0.0503*** (0.0082)
Other_Unkn_Race	-0.1375* (0.0712)	-0.0135 (0.0173)	RL	-0.0348 (0.0468)	-0.0066 (0.0122)
Married_6	0.4265*** (0.0196)	0.2798*** (0.0122)	Unqual_Line	0.1592*** (0.0304)	0.0462*** (0.0080)
Dep_Children_6	0.2110*** (0.0340)	0.0764*** (0.0096)	Lat_Transfer_4	0.3126*** (0.0163)	0.0780*** (0.0057)
Naturalized	0.1235** (0.0578)	-0.0184 (0.0254)	Cohort_FY00	0.0196 (0.0317)	-0.0115 (0.0091)
Grad_Educ	0.3670*** (0.0191)	0.1618*** (0.0084)	Cohort_FY01	-0.0363 (0.0334)	-0.0294*** (0.0105)

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
NROTC	-0.1180*** (0.0355)	-0.0211** (0.0085)	Cohort_FY02	-0.0629* (0.0372)	-0.0429*** (0.0118)
Academy	-0.0601 (0.0440)	0.0289*** (0.0076)	Cohort_FY03	-0.0724* (0.0380)	-0.0603*** (0.0134)
Direct	-0.0110 (0.0360)	-0.0600*** (0.0190)			
Other_Commissioning	0.0341 (0.0645)	-0.0009 (0.0182)	Observations	2,524	8,999
			Mean Retention Rate	0.563	0.750

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

2. TEN-YEAR RETENTION MODEL RESULTS

The second probit retention model (shown in Figure 2) estimates the probability that an officer who enters the Navy in the 1999-2003 cohorts is retained until 10 YOS. *Aviators* are included in the sample, but omitted from the regression model as the control group for Navy communities. Demographic and professional characteristics are included in the model. *Lat_Transfer_6* is included to analyze the effects on 10-year retention of completing a lateral transfer by year six.

The first two tables (Table 28 and 29) display the results of the model using the full sample from the time of commission without dropping any observations. The third and fourth tables (Table 30 and 31) display the results of the model using a sample restricted to officers who stayed beyond MSR, or six years of service. Thus, the second model effectively models the decision to stay between 6 YOS and 10 YOS.

Figure 2. 10-Year Retention Model

$$\text{Model 2: } \Pr(10 \text{ Year Retention}) = 1 | X) = \beta_0 + \beta_1(\text{Demographic}) + \beta_2(\text{Professional}) + \beta_3(\text{Lat_Transfer_6}) + \beta_4(\text{Cohorts}) + \mu$$

a. Results for all Officers

The sample contains 16,096 observations, and has a 10-year retention rate of 53.1 percent. The results in Table 28 show no statistically significant differences in race regarding the likelihood to retain to 10 YOS. All of the following factors discussed are statistically significant at the 10 percent level or better.

Among the demographic variables, age at commissioning positively affects 10-year retention. For each additional year of age at commissioning, 10-year retention increases by 2.1 percentage points (4 percent). Women are 6.2 percentage points (12 percent) less likely to retain to 10 YOS. Officers who are married by 6 YOS are 29.6 percentage points (56 percent) more likely to complete 10 YOS. Officers with dependent children at 6 YOS are 15.1 percentage points (28 percent) more likely to stay to 10 YOS. Being a naturalized citizen increases an officer's chances of staying to 10 YOS by 6.7 percentage points (13 percent). Officers who obtain a graduate degree are 52.7 percentage points (99 percent) more likely to complete 10 YOS than are officers who do not have a graduate degree. Once again, this is most likely correlated with the additional time incurred after an officer receives a degree, which is typically two to three years.

Among the professional variables, *Academy* graduates are 4.1 percentage points (8 percent) more likely to stay up to 10 years. *SWO*, *SUB*, *RL*, *STAFF*, and *Unqual_Line* are all less likely to complete 10 YOS than *Aviators*. Officers who complete a lateral transfer by year 6 are 29.7 percentage points (56 percent) more likely to stay until 10 YOS, suggesting that these officers are more satisfied with their job fit in their new communities. However, officers who complete a lateral transfer are obligated to serve at least two more years on active duty, which could affect the retention results (Dailey, 2013).

Among cohort years, *Cohort_FY02* and *Cohort_FY03* are more likely to retain to 10 YOS than *Cohort_FY99* by 7.9 percentage points (15 percent) and 9.5 percentage points (18 percent), respectively. This is most likely a result of the recession in 2008 that followed the economic expansion period from November 2001 to December 2007 (Vlasenko, 2015). This economic downturn would have decreased employment

opportunities outside of the military, thus making retention a more appealing option for most service members.

Table 28. 10-Year Retention from Commissioning Probit Model Results:
Marginal Effects

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Age	0.0210*** (0.0019)	Unkn_Commissioning	-0.0924** (0.0377)
Female	-0.0618*** (0.0135)	SWO	-0.2451*** (0.0141)
Hispanic	-0.0153 (0.0179)	SUB	-0.2988*** (0.0164)
Black_NonHisp	0.0163 (0.0197)	SPEC	0.0092 (0.0366)
Asian	-0.0156 (0.0236)	RL	-0.1815*** (0.0220)
Other_Unkn_Race	0.0302 (0.0279)	STAFF	-0.1400*** (0.0179)
Married_6	0.2956*** (0.0105)	Unqual_Line	-0.1416*** (0.0194)
Dep_Children_6	0.1505*** (0.0133)	Lat_Transfer_6	0.2967*** (0.0129)
Naturalized	0.0674* (0.0385)	Cohort_FY00	0.0004 (0.0159)
Grad_Educ	0.5267*** (0.0073)	Cohort_FY01	0.0244 (0.0160)
NROTC	-0.0158 (0.0143)	Cohort_FY02	0.0789*** (0.0161)
Academy	0.0414*** (0.0159)	Cohort_FY03	0.0949*** (0.0168)
Direct	0.0090 (0.0228)		
Other_Commissioning	0.0002 (0.0206)	Observations	16,096
		Mean Retention Rate	0.531

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The 10-year retention model is re-estimated for the *Male* and *Female* sub-samples to identify differences in the effects of explanatory variables between men and women. The results are presented in Table 29.

The average probability of 10-year retention for women is 38.4 percent and for men is 56.4 percent, a gap of 18 points. The *Female* sub-sample has 12 factors that are

identified as statistically significant and the *Male* sub-sample has 13 factors that are statistically significant. The common statistically significant variables for both sub-samples are *Age*, *Married_6*, *Depn_Children_6*, *Grad_Educ*, *Unkn_Commissioning*, *SWO*, *RL*, *STAFF*, *Lat_Transfer_6*, *Cohort_FY02* and *Cohort_FY03*. The directions of the effects are the same for each of these variables.

Once again, the magnitude of the effects of several of the independent variables differs substantially between men and women. Among the demographic variables, for women each additional year of age increases 10-year retention by 2.4 percentage points (6 percent) and increases retention for men by 1.8 percentage points (3 percent). Married women are 25.9 percentage points (67 percent) more likely to stay to 10 YOS than non-married *Female* officers, while married men are 29.7 percentage points (53 percent) more likely to stay to 10 years. *Female* officers with dependent children are 23 percentage points (60 percent) more likely to complete 10 YOS, whereas men with dependent children are 13.8 percentage points (25 percent) more likely to complete 10 YOS. A graduate degree increases a woman's probability of completing 10 YOS by 59.5 percentage points (155 percent) and a man's by 50.6 percentage points (90 percent).

Among the professional variables, women who start in the *SWO* community are 22 percentage points (77 percent) less likely to stay to 10 years. By contrast, men who start in the *SWO* community are 24 percentage points (43 percent) more likely to stay. Women and men who start in the *RL* and *STAFF* are less likely to stay to 10 years than their *Aviator* counterparts. Women who complete a lateral transfer by 6 YOS are 49.3 percentage points (128 percent) more likely to stay to 10 YOS, while men are only 25 percentage points (44 percent) more likely to stay. In both *Cohort_FY02* and *Cohort_FY03* women and men are more likely to retain to 10 YOS than women and men from *Cohort_FY99*.

The following variables for the *Male* and *Female* sub-samples are not statistically significant; however, the results should be noted. All races stay to 10 YOS at the same rate as White non-Hispanic men and women. This suggests that retention across races is relatively stable. Women who graduate from *NROTC* stay at a rate of 5.9 percentage points (15 percent) below those who graduate from *OCS*. This may suggest that women

from *NROTC* have lower job satisfaction in the Navy and/or more civilian employment opportunities than women from *OCS*. Men who graduate from the *Academy* stay at a rate of 4.6 percentage points (8 percent) above *OCS* graduates. Further, this may suggest that men from the *Academy* have higher job satisfaction from the Navy and/or fewer employment opportunities than men from *OCS*.

Table 29. Separate 10-Year Retention from Commissioning Probit Model
Results for Women and Men: Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	0.0243*** (0.0038)	0.0188*** (0.0021)	Unkn_Commissioning	-0.1430* (0.0742)	-0.0827** (0.0408)
Hispanic	0.0154 (0.0403)	-0.0225 (0.0194)	SWO	-0.2199*** (0.0304)	-0.2403*** (0.0157)
Black_NonHisp	0.0649 (0.0413)	-0.0051 (0.0222)	SUB	n/a	-0.3062*** (0.0174)
Asian	-0.0044 (0.0457)	-0.0154 (0.0265)	SPEC	-0.0821 (0.2006)	0.0059 (0.0362)
Other_Unkn_Race	-0.0535 (0.0604)	0.0462 (0.0295)	RL	-0.1482*** (0.0433)	-0.1787*** (0.0248)
Married_6	0.2588*** (0.0271)	0.2971*** (0.0115)	STAFF	-0.0952** (0.0372)	-0.1487*** (0.0206)
Dep_Children_6	0.2302*** (0.0428)	0.1381*** (0.0139)	Unqual_Line	-0.0482 (0.0465)	-0.1568*** (0.0212)
Naturalized	0.1387 (0.0861)	0.0458 (0.0431)	Lat_Transfer_6	0.4930*** (0.0316)	0.2500*** (0.0143)
Grad_Educ	0.5952*** (0.0189)	0.5057*** (0.0080)	Cohort_FY00	0.0185 (0.0370)	-0.0059 (0.0172)
NROTC	-0.0593* (0.0350)	-0.0082 (0.0152)	Cohort_FY01	0.0150 (0.0365)	0.0234 (0.0172)
Academy	-0.0117 (0.0427)	0.0460*** (0.0167)	Cohort_FY02	0.1073*** (0.0391)	0.0699*** (0.0172)
Direct	-0.0276 (0.0387)	0.0122 (0.0288)	Cohort_FY03	0.1250*** (0.0407)	0.0838*** (0.0180)
Other_Commissioning	0.0246 (0.0540)	-0.0091 (0.0218)	Observations	2,968	13,128
			Mean Retention Rate	0.384	0.564

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

**b. Results with restricted sample of Officers who stay beyond MSR
(n=11,910)**

Table 30 displays the results of the 10-year retention model using only officers who stayed beyond their MSR. The magnitude of these effects should be different

between the samples because of the different officers used in Tables 28 and Table 30. The differences between the effects of two sample sizes are discussed in this section.

The MSR retention sample contains 11,910 observations, 4,186 fewer than sample used for Table 28. The sample of MSR stayers has a 10-year retention rate of 71.7 percent, which is 19 percentage points more than for the full sample of all new entrants. The results in Table 30 also show no statistically significant differences in race regarding their likelihood to retain to 10 YOS, except for *Unkn_Other* who are 4.5 percentage points (6 percent) more likely to retain to 10 YOS. All of the following factors discussed are statistically significant at the 10 percent level or better.

The full sample of all year groups (Table 28) has 16 factors that are identified as statistically significant and the MSR stayers sample (Table 30) has 17 factors that are statistically significant. The common statistically significant variables for both samples are *Age*, *Female*, *Married_6*, *Depn_Children_6*, *Naturalized*, *Grad_Educ*, *SWO*, *SUB*, *RL*, *STAFF*, *Unqual_Line*, *Lat_Transfer_6*, *Cohort_FY02* and *Cohort_FY03*. The directions of the effects are the same for each of these variables in both samples.

The magnitudes of the effects are larger for most variables in Table 28 using the full sample when compared with the results in Table 30 using the MSR stayers sample. Only *Age*, *Cohort_FY02*, and *Cohort_FY03* have larger effects in the MSR stayers sample (Table 30) as compared with the full sample (Table 28).

The effect of *Age* on completing 10-year retention is greater in the MSR retention sample because each additional year in *Age* has been shown to have a positive effect on retention in all other models (Tables 28–31). The *Age* effect was heightened after dropping officers who did not complete MSR retention because they are typically younger officers. *Cohort_FY02* and *Cohort_FY03* have larger effects on completing 10-year retention in the MSR retention sample (Table 30) because the officers who were dropped for not staying until MSR retention were not present in the sample to feel the negative effects of the economic recession in 2008 (Vlasenko, 2015). The remaining officers felt those effects and reacted by staying to 10 YOS at higher rates.

Table 30. 10-Year Retention from MSR Retention Probit Model Results:
Marginal Effects

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Age	0.0226*** (0.0017)	Unkn_Commissioning	-0.0462 (0.0405)
Female	-0.0603*** (0.0133)	SWO	-0.1811*** (0.0152)
Hispanic	-0.0006 (0.0149)	SUB	-0.3077*** (0.0193)
Black_NonHisp	0.0127 (0.0170)	SPEC	0.0035 (0.0303)
Asian	-0.0113 (0.0210)	RL	-0.0584** (0.0242)
Other_Unkn_Race	0.0447** (0.0217)	STAFF	-0.0683*** (0.0182)
Married_6	0.0661*** (0.0096)	Unqual_Line	-0.0959*** (0.0186)
Dep_Children_6	0.0656*** (0.0102)	Lat_Transfer_6	0.1328*** (0.0095)
Naturalized	0.0539* (0.0300)	Cohort_FY00	0.0095 (0.0127)
Grad_Educ	0.3822*** (0.0076)	Cohort_FY01	0.0466*** (0.0122)
NROTC	-0.0004 (0.0122)	Cohort_FY02	0.1067*** (0.0112)
Academy	0.0026 (0.0136)	Cohort_FY03	0.1293*** (0.0109)
Direct	0.0440** (0.0196)		
Other_Commissioning	-0.0040 (0.0181)	Observations	11,910
		Mean Retention Rate	0.717

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The 10-year retention from the MSR retention sample is divided into sub-samples of *Female* and *Male* to identify differences in the effect of explanatory variables between the men and women. The results are presented in Table 31. Again, the MSR sample (Table 31) is compared with the full sample (Table 29) regarding the 10-year retention model. The differences between the effects of two sample sizes are discussed in this section.

Women and men who are MSR stayers have a 10-year retention rate of 65 percent and 73 percent, respectively. These 10-year retention rates of women, at 27 percentage

points, and men, at 9 percentage points, are higher than those of the full entry cohort sample. The results in Table 31 also show no statistically significant differences in race regarding an officer's likelihood to retain to 10 YOS, except for *Unkn_Other* at 5.7 percentage points (7 percent) more likely to retain to 10 YOS. All of the following factors discussed are statistically significant at the 10 percent level or better.

The full sample from commissioning (Table 29) has 26 factors that are identified as statistically significant, whereas the model using the MSR stayers (Table 31) has 23 factors that are statistically significant. The common statistically significant variables for both samples are *Age*, *Depn_Children_6*, *Grad_Educ*, *SWO*, *Lat_Transfer_6*, *Cohort_FY02* and *Cohort_FY03*. The directions of the effects are the same for each of these variables in both samples.

In all instances, the magnitudes of the effects are larger for the statistically significant variables in Table 29 than in Table 31, except *Age*, *Cohort_FY02*, and *Cohort_FY03*. The reasons for these differences are the same as described from Tables 28 and 30, which are the *Age* effect and the effect of the economic environment.

Table 31. 10-Year Retention from MSR Retention Probit Model Results for Women and Men: Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	0.0267*** (0.0045)	0.0218*** (0.0019)	Unkn_Commissioning	-0.2551** (0.1169)	-0.0110 (0.0410)
Hispanic	0.0323 (0.0419)	-0.0065 (0.0160)	SWO	-0.1298*** (0.0409)	-0.1871*** (0.0165)
Black_NonHisp	0.0605 (0.0413)	-0.0002 (0.0192)	SUB	n/a	-0.3068*** (0.0194)
Asian	-0.0404 (0.0515)	-0.0024 (0.0228)	SPEC	-0.1141 (0.2668)	0.0007 (0.0298)
Other_Unkn_Race	-0.0006 (0.0729)	0.0514** (0.0221)	RL	-0.0138 (0.0634)	-0.0620** (0.0264)
Married_6	0.0168 (0.0260)	0.0748*** (0.0104)	STAFF	0.0312 (0.0428)	-0.0885*** (0.0210)
Dep_Children_6	0.0947*** (0.0340)	0.0588*** (0.0107)	Unqual_Line	-0.0135 (0.0516)	-0.1057*** (0.0199)
Naturalized	0.0791 (0.0713)	0.0470 (0.0342)	Lat_Transfer_6	0.2314*** (0.0232)	0.1124*** (0.0107)
Grad_Educ	0.4245*** (0.0203)	0.3746*** (0.0082)	Cohort_FY00	0.0125 (0.0382)	0.0083 (0.0134)

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
NROTC	-0.0372	0.0054	Cohort_FY01	0.0304	0.0478***
	(0.0417)	(0.0127)		(0.0376)	(0.0128)
Academy	-0.0226	0.0058	Cohort_FY02	0.1379***	0.1014***
	(0.0488)	(0.0141)		(0.0340)	(0.0117)
Direct	-0.0384	0.0756***	Cohort_FY03	0.1633***	0.1223***
	(0.0470)	(0.0221)		(0.0336)	(0.0115)
Other_Commissioning	0.0119	-0.0090	Observations	1,746	10,164
	(0.0568)	(0.0191)	Mean Retention Rate	0.653	0.728

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

3. PROMOTION MODEL RESULTS

The third probit model (see Figure 3) estimates the probability that an officer will be promoted to the grade of O-4. Demographic and professional characteristics are controlled in the model. *Lat_Transfer_6* is included to show the effects on promotion to O-4 for officers who completed a lateral transfer by year six. This helps to display the results of officers' job-fit decisions and how it affects their probability of promotion to O-4. Only officers who completed 10-year retention are included in the sample to provide a more accurate measure by using only those who are available for and eligible for promotion to O-4.

Figure 3. Promotion to O-4 Model

$$\text{Model3: } \Pr(\text{Promotion to O-4}) = 1 | X) = \beta_0 + \beta_1(\text{Demographic}) + \beta_2(\text{Professional}) + \beta_3(\text{Cohorts}) + \mu$$

The sample contains 8,542 of the 16,143 original officers. The O-4 promotion rate for the sample is 78 percent. All of the following factors discussed are statistically significant at the 10 percent level or better.

Among the demographic variables, each additional year in *Age* at commissioning decreases the probability of promotion by 1.1 percentage points (2 percent). Black and Asian officers are less likely to be promoted to O-4 by 4.7 (6 percent) and 5.4 percentage

points (7 percent), respectively. Officers who are married at six YOS have a higher probability to be promoted than do those who are not married by six years.

Among the professional variables, officers who obtain a graduate degree are 20.4 percentage points (26 percent) more likely to be promoted to O-4. All commissioning sources except *Other* (not statistically significant) are less likely to attain O-4 than *OCS*. Across designators/MOSs, *SPEC* officers, *STAFF* officers, and *Unqualified Line* officers are more likely to attain O-4 than *Aviators*. Officers who complete a lateral transfer by six YOS are 13.3 percentage points (17 percent) more likely to achieve the grade of O-4. *Cohort_FY02* and *Cohort_FY03* are all less likely to promote to O-4 than *Cohort_FY99*. This is most likely a result of the higher retention rates displayed by these cohorts due to the recession, which began in 2008 (Vlasenko, 2015). Higher retention means an officer would face more competition for promotion than in other cohort years.

Table 32. Promotion to O-4 Probit Model Results: Marginal Effects

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Age	-0.0116*** (0.0017)	Unkn_Commissioning	0.0516** (0.0229)
Female	-0.0069 (0.0141)	SWO	-0.0050 (0.0135)
Hispanic	-0.0220 (0.0184)	SUB	-0.0124 (0.0186)
Black_NonHisp	-0.0468** (0.0186)	SPEC	0.1133*** (0.0188)
Asian	-0.0540** (0.0247)	RL	-0.0052 (0.0214)
Other_Unkn_Race	-0.0077 (0.0268)	STAFF	0.1094*** (0.0128)
Married_6	0.0912*** (0.0116)	Unqual_Line	0.0861*** (0.0151)
Dep_Children_6	0.0170 (0.0112)	Lat_Transfer_6	0.1329*** (0.0092)
Naturalized	0.0164 (0.0293)	Cohort_FY00	0.0021 (0.0157)
Grad_Educ	0.2035*** (0.0100)	Cohort_FY01	0.0055 (0.0155)
NROTC	-0.0346** (0.0143)	Cohort_FY02	-0.0706*** (0.0173)
Academy	-0.0493*** (0.0166)	Cohort_FY03	-0.3044*** (0.0211)

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Direct	-0.0503** (0.0235)		
Other_Commissioning	-0.0012 (0.0174)	Observations	8,542
		Mean Retention Rate	0.772

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The promotion to O-4 sample is divided into sub-samples of men and women. The promotion model is re-estimated to identify differences in the effects of explanatory variables between men and women. The results are presented in Table 33.

The average probability of promotion to O-4 for 10-year stayers is 76.5 percent for women and 77 percent for men. The *Female* sub-sample has 10 factors that are identified as statistically significant and the *Male* sub-sample has 12 factors that are statistically significant. The statistically significant variables that are common for both sub-samples are *Age*, *Married_6*, *Grad_Educ*, *STAFF*, *Lat_Transfer_6*, and *Cohort_FY03*.

Among the demographic variables, Black men and Asian men are 4.4 percentage points (6 percent) and 7 percentage points (9 percent), respectively, less likely to be promoted than their White counterparts. It is important to note that Black and Asian women differed from White women in Table 32. However, the differences for the same women in Table 33 are not statistically significant. Obtaining a graduate degree during an officer's career increases his or her probability of promotion to O-4 by 25 percentage points (32 percent) for women and 20 percentage points (26 percent) for men.

Among the professional variables, women who are commissioned through *NROTC* and both men and women who are commissioned through the *Academy* are promoted to O-4 at lower rates than their *OCS* counterparts. *STAFF* men and women are more likely to attain O-4 than *Aviators*. Women and men who complete a lateral transfer by 6 YOS are 17.3 percentage points (22 percent) and 12.6 percentage points (16 percent), respectively, more likely to achieve the grade of O-4.

Table 33. Promotion to O-4 Probit Model Results for Women and Men:
Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	-0.0170*** (0.0040)	-0.0098*** (0.0018)	Unkn_Commissioning	0.0689 (0.0683)	0.0490** (0.0243)
Hispanic	0.0214 (0.0435)	-0.0291 (0.0202)	SWO	0.0672* (0.0350)	-0.0139 (0.0146)
Black_NonHisp	-0.0582 (0.0410)	-0.0436** (0.0210)	SUB	n/a n/a	-0.0148 (0.0188)
Asian	0.0388 (0.0493)	-0.0706** (0.0280)	SPEC	0.0456 (0.1640)	0.1098*** (0.0194)
Other_Unkn_Race	0.0545 (0.0660)	-0.0208 (0.0295)	RL	0.0838* (0.0472)	-0.0211 (0.0237)
Married_6	0.0615** (0.0266)	0.0966*** (0.0129)	STAFF	0.2357*** (0.0392)	0.0951*** (0.0142)
Dep_Children_6	0.0198 (0.0338)	0.0161 (0.0120)	Unqual_Line	0.1273*** (0.0343)	0.0799*** (0.0165)
Naturalized	0.0222 (0.0674)	0.0153 (0.0327)	Lat_Transfer_6	0.1734*** (0.0229)	0.1263*** (0.0101)
Grad_Educ	0.2501*** (0.0275)	0.2000*** (0.0108)	Cohort_FY00	0.0455 (0.0384)	-0.0039 (0.0171)
NROTC	-0.1807*** (0.0502)	-0.0136 (0.0147)	Cohort_FY01	-0.0088 (0.0418)	0.0092 (0.0166)
Academy	-0.0993* (0.0598)	-0.0367** (0.0172)	Cohort_FY02	-0.0042 (0.0425)	-0.0802*** (0.0189)
Direct	-0.0676 (0.0485)	-0.0749** (0.0295)	Cohort_FY03	-0.0880* (0.0510)	-0.3380*** (0.0229)
Other_Commissioning	-0.0300 (0.0539)	0.0016 (0.0185)	Observations	1,141	7,401
			Mean Retention Rate	0.765	0.773

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4. LATERAL TRANSFER MODEL RESULTS

The last probit retention model (Figure 4) estimates the probability that an officer has completed a lateral transfer by 10 YOS. Demographic and professional characteristics are controlled for in the model. The full data sample is used from commissioning, except Unqualified Line ($n=2,000$) officers who were dropped due to the difficulty in determining their initial community upon commission. Most Unqualified Line officers are assigned the designator/MOS code “1105,” and then, at a later, undeterminable point, are assigned to their actual community.

Figure 4. Model of Lateral Transfer by 10 YOS

$$\text{Model 4 : Pr}(\text{Lateral Transfer by 10 YOS}) = 1 | X) = \beta_0 + \beta_1(\text{Demographic}) + \beta_2(\text{Professional}) \\ + \beta_3(\text{Cohorts}) + \mu$$

Table 34 shows the results of the lateral transfer model. The sample contains 14,072 observations with an average lateral transfer rate of 11.6 percent. It should be noted that women transfer laterally at rates similar to those of men. This is contrary to the recent study by Kraus et al. (2013), which states that women complete lateral transfers at higher rates than men. All of the following factors discussed are statistically significant at the 10 percent level or better.

Among the demographic variables, all races complete lateral transfer by 10 YOS at higher rates than Whites. Officers who are married by six YOS are 8.5 percentage points (73 percent) more likely to transfer laterally than single officers. This suggests that officers with spouses choose to transfer laterally to improve job-fit, work-life balance, and quality of life.

It should be pointed out that lateral transfers are the result of both supply and demand factors. Officers who desire to transfer represent the supply aspect, while the receiving communities must approve the transfer in based on their requirements (demand) (Monroe and Cymrot, 2004). Among the professional variables, *SWO* and *RL* are more likely to transfer laterally than *Aviators* by 5.9 (51 percent) and 25.9 percentage points (223 percent), respectively. This suggests that lateral transfer is being chosen for job-fit decisions in the *SWO* and *RL communities*. Transfers in these communities most likely represent lateral moves away from the communities (Monroe and Cymrot, 2004). Apparently, *RL* has more flexibility to transfer laterally than any other community as displayed by the high rate of lateral transfer. The transfers in the *RL community* most likely represent mostly those who are laterally transferring in to the community rather than out of the community.

Table 34. Lateral Transfer by 10 YOS Probit Model Results: Marginal Effects

VARIABLES	Marginal Effect	VARIABLES	Marginal Effect
Age	-0.0034*** (0.0009)	Other_Commissioning	-0.0146* (0.0089)
Female	0.0041 (0.0070)	Unkn_Commissioning	-0.0470*** (0.0123)
Hispanic	0.0390*** (0.0115)	SWO	0.0590*** (0.0082)
Black_NonHisp	0.0236** (0.0104)	SUB	0.0154 (0.0098)
Asian	0.0681*** (0.0152)	SPEC	0.0079 (0.0204)
Other_Unkn_Race	0.0330* (0.0171)	RL	0.2591*** (0.0189)
Married_6	0.0847*** (0.0063)	STAFF	-0.0320*** (0.0078)
Dep_Children_6	0.0078 (0.0065)	Cohort_FY00	-0.0060 (0.0078)
Naturalized	-0.0124 (0.0152)	Cohort_FY01	0.0085 (0.0080)
Grad_Educ	0.0868*** (0.0059)	Cohort_FY02	-0.0151** (0.0074)
NROTC	-0.0172*** (0.0065)	Cohort_FY03	-0.0104 (0.0079)
Academy	-0.0080 (0.0078)		
Direct	0.1082*** (0.0171)	Observations	14,072
		Mean Retention Rate	0.116

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The lateral transfer sample is divided into sub-samples of men and women. The lateral transfer model is re-estimated to identify differences in the effect of explanatory variables between the men and women. The results are presented in Table 35.

The average probability of lateral transfer for women is 10.2 percent and for men it is 11.9 percent. The *Female* sub-sample has 10 factors that are identified as statistically significant. However, the *Male* sub-sample has 17 factors that are statistically significant. The statistically significant variables that are common for both sub-samples are *Age*, *Hispanic*, *Asian*, *Married_6*, *Grad_Educ*, *NROTC*, *Direct*, *RL*, and *STAFF*.

Among the demographic variables, *Hispanic* women are 6.3 percentage points (62 percent) more likely to transfer laterally than White women. Hispanic men transfer laterally at 3.4 percentage points (29 percent) more than White men. *Asian* women and men have a higher probability of transferring laterally by 6.1 percentage points (60 percent) and 7.3 percentage points (61 percent), respectively, than their White counterparts. Finally, *Black* men transfer laterally more than White men by 2.4 percentage points (21 percent). Men and women who are married by 6 YOS have a higher probability to transfer laterally by 10 YOS than officers who are not married. This may suggest that officers choose to transfer laterally for a better work–life balance.

Among the professional variables, *SWO* males are 6.4 percentage points (54 percent) more likely to transfer laterally than *Aviators*. *RL* women and men are more likely to transfer laterally than their *Aviator* counterparts. However, *STAFF* men and women are less likely to complete a lateral transfer by 10 YOS than their *Aviator* counterparts.

Table 35. Lateral Transfer by 10 YOS Probit Model Results for Women and Men: Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	-0.0076*** (0.0018)	-0.0026** (0.0010)	Other_Commissioning	-0.0086 (0.0216)	-0.0166* (0.0097)
Hispanic	0.0633** (0.0260)	0.0337*** (0.0128)	Unkn_Commissioning	-0.0379 (0.0269)	-0.0466*** (0.0141)
Black_NonHisp	0.0217 (0.0195)	0.0235* (0.0122)	SWO	0.0115 (0.0157)	0.0636*** (0.0092)
Asian	0.0605** (0.0293)	0.0726*** (0.0177)	SUB	n/a n/a	0.0213** (0.0104)
Other_Unkn_Race	0.0412 (0.0351)	0.0299 (0.0194)	SPEC	0.0272 (0.1090)	0.0095 (0.0216)
Married_6	0.1077*** (0.0164)	0.0787*** (0.0069)	RL	0.0792** (0.0333)	0.2857*** (0.0210)
Dep_Children_6	-0.0068 (0.0152)	0.0113 (0.0073)	STAFF	-0.0758*** (0.0172)	-0.0254*** (0.0089)
Naturalized	0.0472 (0.0437)	-0.0275* (0.0154)	Cohort_FY00	-0.0144 (0.0155)	-0.0045 (0.0089)
Grad_Educ	0.1177*** (0.0162)	0.0817*** (0.0064)	Cohort_FY01	0.0081 (0.0169)	0.0080 (0.0090)
NROTC	-0.0456*** (0.0130)	-0.0140* (0.0074)	Cohort_FY02	-0.0025 (0.0160)	-0.0186** (0.0082)

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Academy	-0.0464***	0.0003	Cohort_FY03	0.0235	-0.0183**
	(0.0118)	(0.0091)		(0.0189)	(0.0087)
Direct	0.0648**	0.1276***	Observations	2,653	11,419
	(0.0258)	(0.0219)	Mean Retention Rate	0.102	0.119

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

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VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter begins with a brief synopsis of the study, summarizing the problem, purpose, background, literature review, approach, and results. This is followed by a general statement of conclusions. Finally, recommendations for further research are provided.

A. SUMMARY

The 2011 MLDC report provided substantial evidence of underrepresentation of certain demographic groups in the military, specifically, women in the officer corps. The report also observed that senior leaders in the armed forces were not demographically representative of the national population or even of those who were serving in the military. More specifically, the MLDC found that mid-level female officers stayed in the military at lower rates than did their male counterparts. At the same time, women and minorities had lower promotion rates when compared with pay grade-specific averages, while Black and Hispanic officers were promoted at rates that were lower than those of their White counterparts. Further, the MLDC found that women in the Navy had significantly lower promotion rates than did men (MLDC, 2011).

The broad objective of the present study is to assist policy makers in achieving levels of gender integration desired by the MLDC and Navy leaders. The study focuses on the retention and promotion rates of female junior officers in the Navy, recognizing from previous research that these rates may differ significantly by race/ethnicity. By analyzing retention and promotion, the study can identify certain factors that may influence the earlier career outcomes of women and their ultimate decision to leave or remain in the Navy for a full (20-year or longer) career.

The military services as a whole, and particularly the Navy, have become increasingly diverse over the recent past. In January 2016, these efforts were aided by a major policy change in the Department of Defense that allowed women to serve in ground combat occupations. Additionally of note, from 2003 to 2014, the Navy has been

a leader among all military services in recruiting persons of Hispanic origin for its officer corps.

Gender integration of the officer corps is an important topic of study, as several studies have shown female-male differences in rates of retention and promotion. For example, Asch et al. (2012), using data from as far back as 1988, found that women's retention and promotion rates were lower than those of men across all military services. The authors recommended further study using more recent data so officer cohorts would experience similar retention and promotion environments.

In another study, Tick et al. (2015) conducted a cross-service study on officer retention and promotion rates using all service data from 1999 to 2013. Tick et al. (2015) found a significant "male-female retention gap," with Navy female officers 15 percent less likely to stay to MSR than their male counterparts. This constituted the largest male-female difference in retention among all services. Further, the authors found that Navy female officers were 5 percent less likely than male officers to stay until the 10 YOS.

Regarding job-fit decisions, Kraus et al. (2013) found that women in the Navy had a higher likelihood to transfer laterally than did men. This could signify several problems, for example, that women have lower job-fit satisfaction than men. This finding is important, considering that officers who transfer laterally tend to be more likely to stay in the Navy (Ryan, 2007).

The present study uses a DMDC-provided data set. The data include all officers in the Navy who were commissioned from FY1999 to FY2003, totaling 24,336 officers. These junior officers were then tracked until separation from the military or the end of FY2013 to capture their entire early career. The study employs multivariate regression model estimates to describe the effects of independent variables on a dependent variable outcome. The dependent variables or desired outcomes in this study are: (a) MSR retention; (b) 10-year retention; (c) promotion to O-4; and (d) lateral transfer by 10 YOS. A probit model is the most appropriate estimation technique because all dependent variables are binary. A probit estimation model provides the direction or sign for the effect of each independent variable on the dependent variable.

The main results of data analysis show that the probability of retention beyond MSR for women is 2.7 percent less than that of men. At 10 YOS, the retention differences between women and men increase, with women being 12 percent less likely than men to stay to 10 YOS. In general, race/ethnicity had no effect on retention rates. Officers who are married by 6 YOS, have dependent children by 6 YOS, or obtain a graduate-level education before or during their naval career have a higher probability of retention to 6 and 10 YOS. By community, *SWO* officers have the lowest retention rates at 10 YOS, which confirms the findings of Kraus et al. (2013). Officers who transfer laterally are more likely to retain to 10 YOS.

For promotion to O-4, women and men are promoted at similar rates. At the same time, Black men and Asian men are promoted at rates that are lower than those of White men. All other races are promoted at rates that are similar to those of their White counterparts. Officers who are married by six YOS or obtain a graduate-level education before or during their naval career are promoted to O-4 at higher rates. *OCS Female* and *Male* graduates are promoted at the highest rate of officers from all commissioning sources. *STAFF* women are promoted to O-4 at a rate that is higher than that of officers in any other gender and designator/MOS combination.

A possible issue with the promotion to O-4 estimates is that, for MSR stayers, promotion to O-4 and retention to 10 YOS could be correlated because the promotion to O-4 window centers around 10 YOS from the date of commissioning. An individual's decision to stay to the 10 YOS mark could be influenced by her or his perceived likelihood to be promoted to O-4. Future research could address this endogeneity issue using multiple-equation models.

For lateral transfers by 10 YOS, women and men have similar rates of transfer, at around 11 percent. This differs from previous research (Kraus et al., 2013), which found that women tend to transfer laterally more often than men. Hispanic women and men, Asian women and men, and Black men are all more likely to complete a lateral transfer than their White counterparts. Officers who are married by six YOS are 73 percent more likely to transfer laterally than unmarried officers. *RL* women and men, *STAFF* women and men, and *SWO* men all complete lateral transfers at higher rates than their *Aviator*

counterparts. Further, *SWO* women show no differences in lateral transfer rates when compared with *Aviator* women.

B. CONCLUSIONS

Clearly, the lower retention rates of women constitute a significant problem for policy makers and Navy leaders who strive to achieve improved gender integration. The study's findings point to several possible factors affecting the retention rates of women, such as marital status, educational level, and lateral transfer opportunities. This may suggest that officers with spouses choose to stay in the Navy longer to support a family. Also, married officers may use lateral transfer as a job-fit decision to improve their quality of life or work-life balance. Officers who achieve a graduate-level education might retain to 10 YOS at higher rates because they are signaling their desire to be promoted to O-4 by attending graduate school. Also, although officers (married or unmarried) who choose a lateral transfer are assumed to be signaling some level of dissatisfaction with their current community, they tend to show a greater willingness to stay in the Navy once they are selected to transfer laterally.

These factors also affect men in similar directions (+/-) and magnitudes (marginal effects). There were no instances where both estimated results for men and women were found to be significant and in different directions. This means that it may not be easy to find a separate and distinctive factor that Navy policy makers can focus on solely for women.

C. RECOMMENDATION

An important diversity goal is to increase the number and proportion of women in senior officer positions in the Navy. The Navy could simply promote more women. However, as the present study shows, the promotion rates to O-4 between women and men are already very similar for junior officers who remain in the Navy for 10 years of service. With equity and fairness in promotions, there is little need to differentially change promotion rates. The Navy could simply recruit a larger number of women per cohort commissioning year to accomplish this. However, this approach would fail to address the deeper problem: retention.

The most effective way to improve gender integration and increase the representation of women in top leadership positions is through policies and programs that focus on retaining women. The number of women in higher positions in the Navy will only increase by raising the retention rate of women to a point that is at least equal to the rate of their male counterparts. The present study shows that graduate education and lateral transfers are associated with higher retention rates, regardless of gender. Consequently, further study should search for an approach that would increase the opportunities for women to obtain graduate education or complete lateral transfers. The study would need to be comprehensive, identifying new initiatives that would benefit retention while minimizing associated costs or unintended consequences, such as shifting gender representation in certain Navy communities. In the end, as the MLDC observes, improved representation of women in the higher echelons of Navy leadership would have a long-lasting, positive impact on organizational effectiveness and, ultimately, the nation's security.

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