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THE EFFECTS OF DIVERSITY AMONG PEERS AND ROLE MODELS ON U.S. NAVY RETENTION

by

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THE EFFECTS OF DIVERSITY AMONG PEERS AND ROLE MODELS ON U.S. NAVY RETENTION

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LIST OF ACRONYMS AND ABBREVIATIONS

9/11	September 11, 2001
AD	Destroyer Tender
ADBD	Active Duty Base Date
AGF	Miscellaneous Command Ships
AOE	Fast Combat Support Ships
AS	Submarine Tender
CG	Cruiser
CMC	Command-Master-Chief
CO	Commanding Officer
CVN	Aircraft Carrier (Nuclear Propulsion)
DDG	Destroyers
DMDC	Defense Manpower Data Center
DOD	Department of Defense
DoN	Department of the Navy
D&I	Diversity and Inclusion
EAOS	End of Active Obligated Service
FY	Fiscal Year
JO	Junior Officer
LCC	Amphibious Command Ships
LCS	Littoral Combat Ships
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LOS	Length of Service
LPD	Amphibious Transport Dock
LPH	Amphibious Assault Ship (Helicopter)
LPM	Linear Probability Model
LSD	Dock Landing Ship
NEC	Navy Enlisted Classification
NPS	Naval Postgraduate School

OPNAV N1D	Office of the Chief of Naval Operations Office of Inclusion & Diversity
PC	Patrol Coastal Ship
SSN	Nuclear-Powered Submarine
SSBN	Nuclear-Powered Ballistic Missile Submarine
SSGN	Nuclear-Powered Guided Missile Submarine
SWO	Surface Warfare Officer
TIS	Time-in-service
UIC	Unit Identification Code
USN	United States Navy
XO	Executive Officer
YOS	Years of Service

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Finally, I am forever indebted to my parents, Fabio and Nohemy, for their lifelong sacrifice to provide my brothers and me with a better future. You selflessly sacrificed to allow me the opportunities and experiences that shaped me into the person I am today. This, too, would not have been possible without you, and I dedicate this accomplishment to you.

Cesar Serna, LT, MSC, USN

I thank God for giving me health to achieve this and I am most grateful to my amazingly selfless and loving wife, Yajaira Vazquez, for all the sacrifices she had to make. Her strength and unwavering support throughout this journey made it possible. Her devotion to our two daughters—especially while I spent countless hours at NPS—was instrumental to our success.

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Jesse Hernandez Rodriguez, LT, MSC, USN

I. INTRODUCTION

A. PURPOSE

In this thesis, we examine the relationship between Navy minority command leadership and peer effects on minority and non-minority retention for different Navy platforms. Previous studies, including Greene (2019) and Terranova (2019), found evidence for role-model effects on minority Sailor retention; however, while previous research efforts have been devoted to examining the diversity of leadership, they did not evaluate diversity peer effects and used a limited set of ships. We conduct a more comprehensive analysis using empirical data from fiscal years (FYs) 1995 to 2019, which evaluates how minority and non-minority personnel retention is influenced by diversity among command leadership, other role models, and peers. To expand on existing research, we used data from the Defense Manpower Data Center (DMDC) to analyze the aforementioned effects for Navy personnel in same-diversity dimensions while including additional platforms, communities, and mechanisms underlying any diversity effects. Our analysis may provide the information needed to support policies aimed to increase retention and promotion (advancement) opportunities among minorities. Ultimately, we aim to support the Navy's efforts to improve inclusion and diversity while maximizing talent within the Navy.

Our topic is important because our findings could help military manpower leaders understand diversity factors affecting retention, which helps them develop and implement effective policies conducive to the diversity gap closure and the selection and retention of the most qualified personnel. We expand on Greene (2019) by increasing the scope to include peer effects and a broader array of platforms in the Navy. Our results could inform us of the potentially beneficial effects of increasing diversity on retention and potentially help create policies that not only underscore the importance of leadership diversity but foster minority ascension, simultaneously achieving diversity and inclusion (D&I) goals set forth by the Department of the Navy (DoN) and maximizing retention outcomes.

B. BACKGROUND

Historically, the U.S. population majority had consisted of whites, and our military relied on the white demographic majority to meet its accession goals. However, national racial/ethnic minorities and female demographics have changed in the most recent decades with the latter currently representing 49% of the general population in the United States (Navy Personnel Command, 2019). Despite these increasingly evident changes in U.S. demographics, minorities remain underrepresented in the Navy, which not only contradicts Navy culture and its promise to recruit and retain personnel from a diverse group of applicants reflective of all segments of society (NOI, 2017), but also hinders the ability to meet recruitment goals and increase the long-term retention of the most capable personnel. Although the Department of Defense (DOD) and the Department of the Navy (DoN) have taken a proactive stance by creating D&I policies and strategic initiatives, policy makers need further understanding of specific contributing factors influencing naval personnel's retention decisions. Increasing understanding of the issue and accurately identifying contributing factors helps create effective D&I metrics that allow the implementation of the most effective policies conducive to the attainment of recruitment and retention goals. Most importantly, it allows the Navy to remain the most diverse, capable, and technologically advanced sea-based power in the world.

C. RESEARCH QUESTIONS

Our research questions are designed to help us understand how same-demographic peers and role models in leadership positions affect personnel retention in the Navy. Additionally, the questions guide our efforts to explain whether the effects vary by platform or dimension and the overall effects of greater diversity among leadership in the fleet.

- What is the effect of greater diversity among leadership and peers on retention of first-term minority and non-minority enlisted Sailors and naval officers?

D. SCOPE AND METHODOLOGY

After conducting a comprehensive review of available literature relevant to our study, we conduct an analysis of the effects of minority leadership and peer effects on first-term minority and non-minority personnel in the Navy, using a linear probability model (LPM) and ordinary least squares (OLS) regression analysis. To achieve that, we identify enlisted Sailors and naval officers that had their first operational assignment on one of several viable platforms ranging from midsize ships like destroyers (DDG), cruisers (CG), dock landing ships (LSD), amphibious transport dock (LPD), and amphibious command ships (LCC), to a sample of larger ships such as landing helicopter dock (LHD), landing helicopter assault (LHA), and nuclear-powered propulsion aircraft carriers (CVN), among others. Their first platform should be of average size to adequately capture variation over time across ships and within minorities among leadership and in order for a first termer to truly experience the complete effects of first-term peer and minority leadership effects.

To distinguish between "leadership" and "peers," we create a "treatment" file based on the percentage (by rank groups) of certain minority groups among personnel onboard a platform (ship/sub) at a given time period (month/quarter). We then merge the "subject" and "treatment" files to determine the average percentages of different minorities among leadership and peers for each subject's time on their first platform and estimate how their exposure to substantial diversity among leadership and peers affected their probability of retention. We conduct the analysis across platforms, aggregate the data, and examine how different types of diversity (racial/ethnic groups, females) affect personnel retention. Ship assignment is made without regard to the minority composition of leadership and the subject's prospective retention; therefore, the model we use is unlikely to be subject to common biases (omitted variable bias/reverse causality) and is likely to provide valid estimates of true causal effects.

E. ORGANIZATION OF STUDY

This is a five-chapter thesis. Chapter I is an introduction, background, and brief description of our research questions and methodology. Chapter II includes the literature review of available information on peer and role-model effects. Chapter III includes the

data analysis, variable description, methodology, and summary statistics. Chapter IV explains the results and findings from the OLS regression. Chapter V provides conclusions and recommendations based on our findings.

II. BACKGROUND AND LITERATURE REVIEW

This chapter provides an analysis recruitment, accession, retention, and diversity and inclusion, as well as prior research conducted on said subjects.

A. BACKGROUND

Diversity and inclusion (D&I) is a military priority that ultimately affects national security and global affairs. The Navy has D&I problems that are partly attributed to a poor understanding of retention determinants. For the past two decades, the military has been attempting to improve the diversity of its personnel to more closely resemble the cultural, racial, and ethnic diversity of the American population. Although minority accession rates have been improving over time, gender and racial minorities are still generally underrepresented in the Navy, which poses a challenge for D&I efforts (NPC, 2019). To formulate recommendations in support of D&I efforts in the Navy, an in-depth understanding of the specific factors that currently contribute to accessions and stay/leave (retention) decisions in the Navy is required.

To actively address diversity issues, the Department of Defense developed the Diversity and Inclusion Strategic Plan in 2012 (DOD, 2012). In 2017, the DOD created a roadmap focusing on three strategic imperatives:

> A promise to recruit and access from a diverse group of applicants to secure a high-performing, innovative workforce that reflects all segments of society.
>
> A promise to cultivate an inclusive culture that accelerates opportunities to empower each individual's maximum impact, encourages innovation and collaboration, enhances developmental opportunities, and retains the best talent to enable uniformed and civilian personnel to contribute to their full potential.
>
> A promise to develop strategies to equip leaders with the ability to effectively manage diversity, be accountable, measure results, and refine approaches to engender a sustainable culture of inclusion. (Parker, 2017, pp. 4–7)

While the Navy's D&I policies and strategic roadmap have initiated comprehensive reform, there is still much work to be done to actually achieve a closer representation of U.S. demographics within the naval personnel and to ensure that each individual who has the willingness and skills to serve has the opportunity to serve. If the Navy wants to recruit, train, ascend, and retain talented and diverse personnel to address inequality and unfairness concerns and to reap the benefits of an all-inclusive force, it has to create enforceable policies that are designed with guidance from empirical analysis. In this thesis, we undertake such an empirical approach to investigate, statistically, whether minority role models and peer effects are areas that can generate useful insights to policy makers and Navy leadership in D&I efforts.

Historically, the Navy has been a reactive organization when it comes to the development and implementation of any major reform. When we look at early naval education development, for example, we observe that said development has been one of adaptation and response to changes in the character of war and in the operational challenges (DON, E4S, p. 26). In other words, the Navy has reacted to contemporary problems and done so while wading through Navy bureaucracy—in the form of senior leaders presenting unyielding resistance to expansions of educational programs, even when the situation warranted these changes, which were supported by empirical analyses. Therefore, it is important to recognize previous naval culture shortcomings to avoid repeating them and to dispel the notion that naval leadership is often uninterested in change or in progress. Learning from past experiences, the Navy is now willfully focusing on proactive solutions to imminent problems. This thesis uses historical personnel data to identify any supporting insights for the road forward regarding D&I efforts.

1. Demographic Highlights: Gender and Race/Ethnicity

The D&I imperatives and objectives attempt to improve diversity, inclusion, and retention in the Navy; however, to align the Navy's effort with the right strategies, policy makers need to clearly understand the current demographic disparities among service members. The most recent *Population Representation in the Military Services* report provides useful highlights of current demographic trends important for the development of

the most relevant D&I policies (Office of the Under Secretary of Defense, Personnel and Readiness [OUSDPR], 2017).

2. Gender Diversity and Inclusion

The military has experienced continued growth in female representation among its personnel (OUSDPR, 2017). (See Figures 1 and 2).

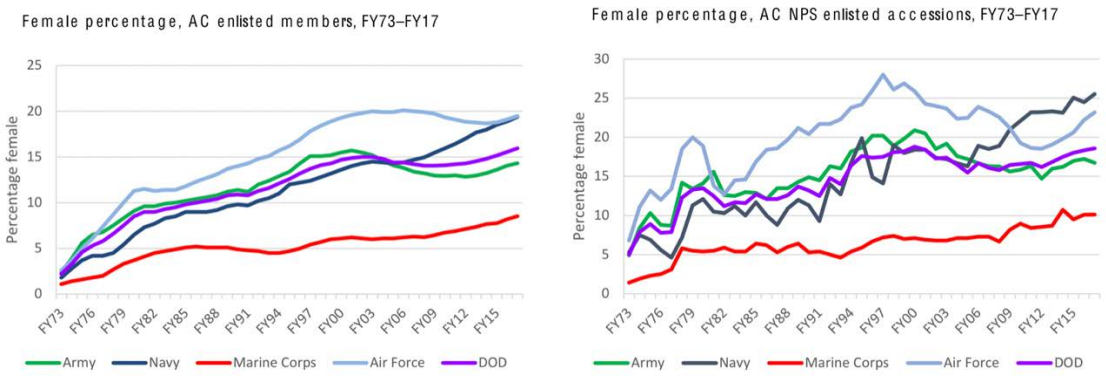

Figure 1. Historical Female Enlisted Percentages. Source: OUSDPR (2017).

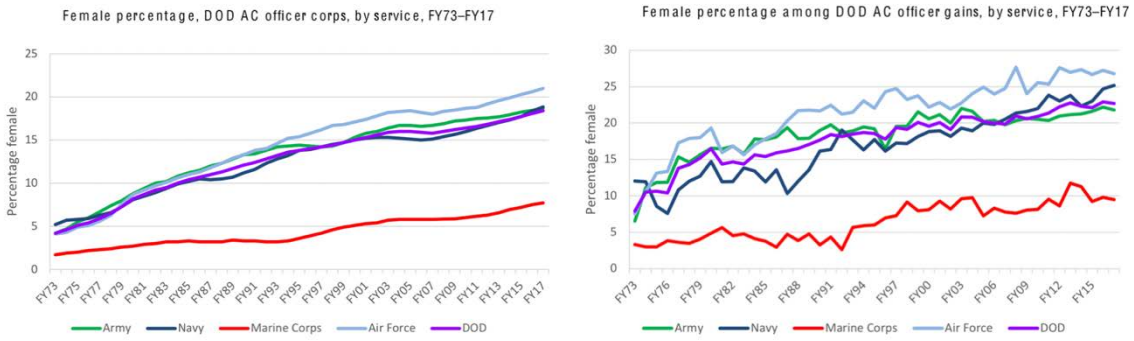

Figure 2. Historical Female Officer Percentage. Source: OUSDPR (2017).

In FY2017, the female representation across DOD services reached 16% for the first time and has continued to grow steadily (OUSDPR, 2017). In the Navy, that number increased to 21% in the enlisted community and 19% in the officer ranks (NPC, 2019).

However, although there has been an increase in women and minorities in the Navy, they are still underrepresented and therefore underutilized. (See Figure 3.)

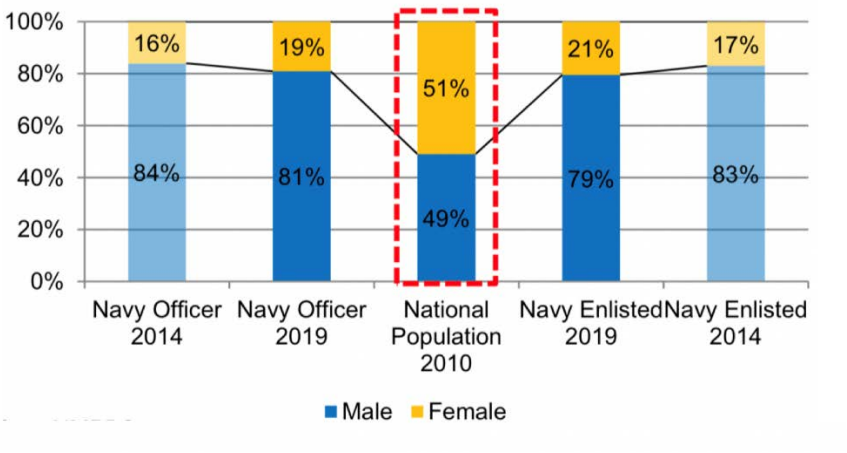

Figure 3. U.S. Navy Gender Diversity. Source: NPC (2019).

This demographic shift may indicate that some of the initiatives set forth as part of the D&I strategic plan and DOD policy changes that were designed to attract additional female personnel—such as opening all occupations to women and increasing numbers of female recruiters—are effective (NPC, 2019). Nevertheless, female personnel are still vastly underrepresented when considering they represent 51% of the U.S. population and comprise more than half of the American work force (NPC, 2019), and additional information about stay/leave influencers is required to appropriately tailor the intended policies.

3. Race Diversity

Racial and ethnic minority representation among the enlisted ranks in the Navy meets and exceeds their representation in the general U.S. population. Figure 4 shows that in FY2019, enlisted blacks, Asians, and multiracial individuals accounted for 19%, 6%, and 8%, compared to 13%, 5%, and 3%, respectively, of the civilian population benchmark (NPC, 2019).

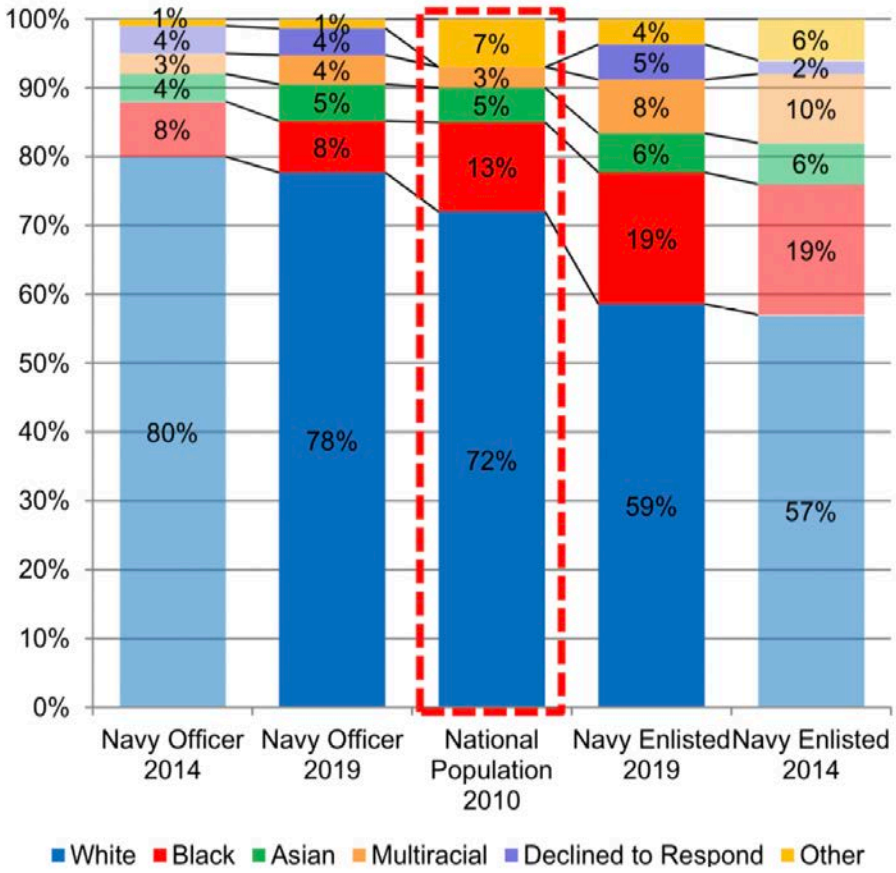

Figure 4. Racial Diversity of U.S. Officer and Enlisted Force. Source: NPC (2019).

Although Asian demographic representation is rapidly growing in the United States, they remain a relatively small percentage of the military (OUSDPR, 2017), which makes it difficult to evaluate their reenlistment determinants. Naval officer demographics tell a similar story. In FY2019, black and Asian officers accounted for 8% and 5%, respectively, of the active duty officer population, compared to their workforce representation in the general U.S. population of 13% and 5%, respectively, while multiracial officers accounted for 4%, as compared to 3% in the national population (NPC, 2019). These percentages point to several potential explanations: differences in measured and unmeasured characteristics among minority groups that could explain the difference in retention and promotion outcomes, and lack of opportunity for minorities to ascend to higher ranks, and therefore lack of leadership and role-model influence on same-dimension

minorities and other personnel. The low representation of some of these minority groups in leadership positions may infringe upon efforts to disseminate statistically the influencing factors determining their retention decisions.

4. Ethnic Diversity

Distinguishing between race and ethnicity and understanding the differences helps focus D&I efforts in specific areas. According to the Office of the Under Secretary of Defense for Personnel and Readiness (2017), the Office of Manpower and Budget requires federal agencies to use two ethnic categories: (1) Hispanic or Latino and (2) not Hispanic or Latino. While race may be categorized as white, black, or Asian, for example, ethnicity includes any subgroup within a race category, and because ethnicity and race are separate fields, an individual may be defined as a minority in both. Understanding the distinction between the terms "race" and "ethnicity" and the ways they overlap is important for policy-guiding analyses of demographics and the attainment of our intended goals.

A better understanding of minority group composition in the Navy could prevent the Department of the Navy (DoN) from inefficiently allocating resources to gender or racial/ethnic minorities' recruitment or retention incentives. For example, committing additional resources to the recruitment and retention of female minorities in some instances may not be appropriate, as suggested by Figure 5. That is, personnel data shows that minority women are more likely to serve in the military compared to minority men (OUSDPR, 2017). In other words, without the proper understanding of these issues, which could help create empirically-driven and targeted policies, financial and Human Resources, among other types, may be wasted or in efficiently allocated.

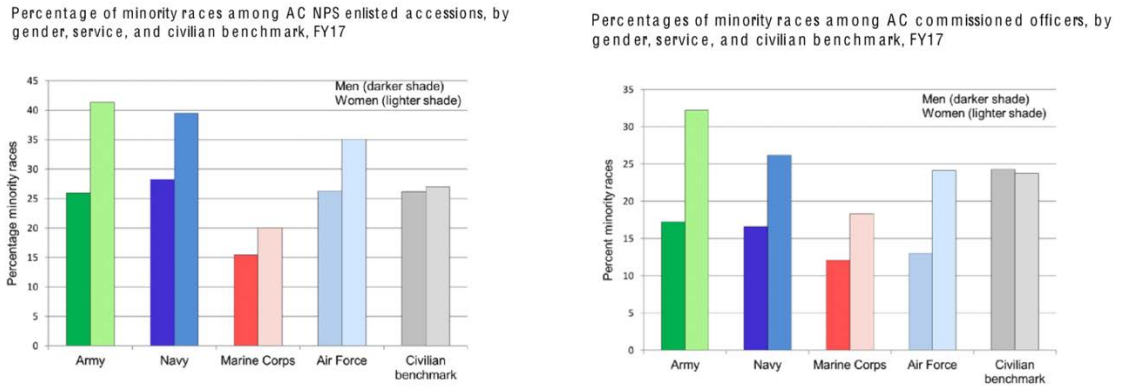

Figure 5. Enlisted and Officer Minorities Gender Comparison. Source: OUSDPR (2017).

Consequently, female racial minorities are overrepresented in the military—in all branches except the Marine Corps—compared to their ethnic group representation in the general U.S. population. Therefore, in this particular scenario, the Navy's concerns and resources should be focused on analyzing why, if female racial minorities are overrepresented in the military in comparison to their civilian equivalents, females are still underrepresented in the Navy at 24.1% of the total force (NPC, 2019). Perhaps the Navy has to invest additional resources for the recruitment of additional female racial minorities; however, that is unlikely if these minorities are already overrepresented when compared to their respective civilian ethnic groups. Conversely, Hispanic males have a greater representation in the civilian sector than among those who serve (OUSDPR, 2017, pp. 28–29), which could suggest that Navy efforts could effectively target the Hispanic male demographic. Nevertheless, these are the types of questions that require additional analysis to help create effective policies that mitigate existing D&I disparities. Lastly, funding and efforts would only be accurately targeted if the demographics issue and minority-group composition is well understood among policy-makers.

5. The Importance of Personal Experience: Role-Model and Peer Effects

As Hispanic minorities, we can also provide perspectives acquired through experiences in the Navy regarding same-category role-model and peer effects. In our experiences, we have noticed these effects being insignificantly negative and only

demonstrate what not to professionally emulate, rather than personally influencing retention decisions. In other words, our steadfast commitment to a higher calling—which is unobservable—remains unshaken by any negative minority peer and role-model influences we have experienced. However, determining whether these effects are due to heterogeneity within minority ethnic groups in the Hispanic community needs to be further explored. We come from working class families and our reasons to serve were mainly to serve our country, grow as leaders and professionals, and live a meaningful life. Therefore, even accounting for our negative experiences with Hispanic minority leadership and peers, our reasons for military service remain unchanged. This thesis focuses on many of the observable factors and characteristics that help explain to what extent, if any, minority and non-minority personnel are influenced to reenlist and remain in service.

B. LITERATURE REVIEW

Despite the Navy's interest in understanding the relationship between retention determinants for different demographic groups and whether they affect D&I, causal findings of stay/leave decisions made by service members are relatively scarce. There is a gap in the literature regarding the effects of minority role-model and peer effects on naval personnel retention. Most available role-model and peer effects studies are internally valid to the civilian sector with no reliable external validity that serves our military intents and purposes. Two recent studies—Greene (2019) and Terranova (2019)—separately evaluate the effects of an increase in the percentage of Navy minorities (blacks, Hispanics, and females) among leadership (E-6 to E-9, and O-4 to O-6) on first ship retention of minority junior-enlisted Sailors and of minority officers. They examine the effects of minority leadership on both same-minority groups' and non-minority groups' outcomes. However, their studies focus on a small subset of platforms and a relatively small subset of data that provide initial evidence that is inconclusive. As such, this is an area of interest that merits additional examination with an intent to provide further evidence on influencing factors affecting individual decision-making, particularly Navy stay/leave decisions. Given the scarcity of empirical research focused on minority role models and peer effects on individual decision-making, we discuss the two aforementioned studies on role-model

effects and review recent available studies examining peer effects for a better overall understanding of potential underlying causality.

1. Minority Differences in Career Progression for Enlisted Personnel

Greene (2019) evaluated retention decisions on the basis of diversity in the Navy. His study was one of the first and few to examine same-minority role-model effects on first-term enlisted Sailors' reenlistment decisions. His analysis examined stay/leave decisions made by first-term enlisted Sailors from the 1995 to 2018 Navy entry cohorts. To ensure sufficient interaction between junior Sailors and their leadership, he limited his observations to three reasonably sized but different platforms: CGs, DDGs, and LSDs, which allowed him to effectively measure role-model effects between enlisted Sailors and their leadership from 102 units. To correct for measurement error from the inability to individually identify and better isolate the effects of Command Master Chiefs (CMC) or top enlisted leader on the platforms, Greene identified all E-6 and above as leadership in order to capture CMC effects along with the command leadership and analyzed their effects on same minority junior Sailors' reenlistment decisions. To accurately measure the effects of same diversity leadership on all gender and racial minorities, Greene's analysis used the following two models with fixed effects for year and Unit Identification Code (UIC): (1) a separate effects model that only included the respective minority group he intended to evaluate (i.e., Hispanics); (2) a difference-in-difference model that included all Sailors (i.e., Hispanics and non-Hispanics). He evaluated the reenlistment decision for each Sailor stationed while also controlling for the UIC, year, whether the Sailor was a minority, and the percent of minority leadership. He also interacted the independent variable for whether a Sailor was a minority with the percent of minority leadership, which served as the key explanatory variable helping explain causality. The coefficient of interest, that is the likelihood that minority leadership would influence retention decisions, measured how minorities' decision to reenlist changed with different leadership, relative to the change in non-minorities' reenlistment decisions while under the same leadership.

The estimates of the models suggested that an increase of 10% in same minority command leadership does significantly influence the reenlistment decisions of minority

Sailors. Black Sailors were 2.3 percentage points more likely to reenlist under black enlisted command leadership; however, when separately compared to non-black Sailors under the same leadership or under black officer or command leadership, results were insignificant. Hispanic Sailors were 1.4 percentage points more likely to reenlist under same-minority role models from the officer command leadership when evaluated separately and compared to non-Hispanic Sailors. Most notably, under enlisted command leadership when compared to non-Hispanic Sailors under the same leadership, their probability of reenlistment increased by 1.9 percentage points. Conversely, all results regarding female service members were insignificant with the exception of a 5.2 percentage points lower likelihood of junior female enlisted Sailors reenlisting under female enlisted command leadership, compared to males under the same leadership.

Statistically significant results from Greene's 2019 study indicate that black Sailors responded positively to black enlisted command leadership more significantly than they did to black officer command leadership when compared to non-black Sailors. Hispanics responded positively to Hispanic officer command leadership both separately and compared to non-Hispanics but reenlisted at even higher rates under Hispanic enlisted command leadership. Lastly, females were less likely to reenlist under enlisted female command leadership compared to males under same leadership but otherwise were not significantly influenced.

Greene's 2019 results seem to indicate that minorities significantly react to same minority enlisted leadership at a greater rate than they do to same minority officer command leadership. One possible explanation for these results may be that, due to minority overrepresentation in the enlisted ranks, enlisted personnel see more opportunity in enlisted ascension and increase their performance to rise within the ranks and excel as a senior enlisted leader. Another possible explanation, using the same logic as in Glover, Pallais, and Pariente (2017), is that enlisted leadership has much more interaction with the enlisted ranks, compared to officer leadership of either the same minority or another diverse or non-diverse group, and that interaction allows for actual leadership and feedback to have either positive or negative self-reinforcing effects.

While the study conducted by Greene (2019) was a well-designed study, his results were limited by a few constraints. First, his analysis was limited to the evaluation of only three surface platforms, which could potentially raise questions about whether his estimated effects may be generalized to different platforms. This may be important to consider because a specific platform's population (from the three he evaluated) may differ from the average sample onboard the wide array of diverse platforms in the naval fleet. Additionally, his analysis may have captured unintended effects that could be separately attributed to minority peers' influence, which his study did not observe.

Second, Greene's (2019) study was limited by low variability and imprecise estimates that resulted from the small variation in the insufficient amount of racial/ethnic and gender minority command leadership directly overseeing junior Sailors. Additionally, there might be bias in the results because there was no accurate way to certainly measure the actual effect minority leadership has on Sailors' stay/leave decisions.

2. Minority Differences in Career Progression for Officers

Terranova (2019), using the same data as Greene (2019), replicated the analysis from Greene (2019) for line community surface officers who remained in service past their initial term of 7.5 years. His results were similar for Hispanic and female officers and suggest that minority role-model effects did not significantly affect retention for either of the two aforementioned officer minorities in the Navy surface warfare community, compared to non-racial/gender minority junior naval officers. Conversely, for the black officers' retention effects, his study results suggest that a one–percentage point increase in the percentage of black senior leadership (O-4 to O-6), decreases junior officer retention by 0.007 percentage points. Only the latter results, out of 21 results produced by the two econometric models used, were statistically significant.

Although Terranova (2019) provided some initial insight, the study was limited by data constraints with respect to End of Active Obligate Service (EAOS) and Additional Qualification Designator (AQD) information, which made identifying officers' additional duties, including being a commanding officer, difficult and potentially caused measurement error in estimated results. Additionally, there was a concern with the external

validity of his study since it was restricted to surface warfare officers (SWOs) from only two surface platforms, which excluded a large amount of UICs that would have been more reflective of the fleet and yielded results that are more accurate. Lastly, the results may be biased because females have generally been underrepresented in the SWO community, and more variation from a female sample size would be needed to strengthen the case for causal interpretation.

Lower female retention is not exclusive to the enlisted ranks. In line with Greene's (2019) female retention results, Asch, Miller, and Malchiodi (2012) presented evidence of female underrepresentation in upper leadership ranks, resulting from lower rates of promotion and retention relative to those for white males. The 2012 study used monthly data instead of annual data used in earlier work and found that women perceived themselves to have limited occupational roles and were concerned about harassment and family obligations. Similarly, black officers had difficulty forming same-minority peer and mentor relationships and were more likely to receive assignments unrelated to their military occupations. Like earlier studies, the Asch et al. (2012) study found that black men are less likely to be promoted up to and including O-4 but are more likely to stay given promotion. Additionally, the study suggests that white women, compared to white men, are 14.6 percentage points less likely to reach O-4, while the results for black women, relative to white men, were not statistically significant. For long-term career progression, their analysis indicates that female officer career progression differences, relative to white male officers, are attributable to both retention and promotion and that minority men, on average, are as likely or, in the case of black and other minority men, more likely to reach the O-4 milestone than white men. However, they found that black men are less likely to achieve O-6 than white men because of differences in career progression in the grades O-4 to O-6. These results are in line with other studies and may offer a partial explanation for female and minority retention trends in the officer ranks. While the Asch et al. (2012) study was one of the first to include additional racial minorities other than blacks, it suffered from small sample sizes for Hispanic women and an inadequate amount of control variables (e.g., command experience, access to mentors and peer networks, entry characteristics,

etc.) to help account for other factors that might explain differences in career progression, especially by gender and minority status.

It might be worthy to note that none of the previous studies reviewed here—Greene (2019), Terranova (2019), nor Asch et al. (2012)—had a way to determine whether a Sailor or naval officer left as an attrite (leaving before the end of obligated service), converted from enlisted to officer through an in-service commissioning source, or willfully decided not to remain in service at the end of obligated service. Differentiating between these could be important when determining the extent to which external influences (minority peers and role models) affect individuals' leave/stay decisions, as the outcome would reflect different behaviors that could help explain causality. The importance lies in the assumption that attriting (as opposed to not reenlisting) is usually not a service member's decision and may be unaffected by external influences. If we assume that the decision to remain in service is being largely influenced by peers, separation could be broadly defined to include any type of separation, but it would come at the expense of not capturing important variations in individual behaviors.

3. Individual Decision-Making Determinants in Different Settings

The role-model effects study conducted by Greene (2019), which is discussed in depth in this literature review, found significant role-model effects on individual decision-making in the Navy—particularly reenlistment decisions. The findings showed that females and black minorities were more likely to remain in service as a result of having worked under same minority leadership; in fact, Greene's (2019) results showed that even non-minorities were positively influenced to reenlist by minority leadership.

Another paper evaluating stay/leave decision-making in the Navy is Golan, Greene, and Perloff (2010). The Golan et al. (2010) study titled *U.S. Promotion and Retention by Race and Sex* is one of the most comprehensive evaluations of reenlistment decision determinants for enlisted Sailors in the Navy. While other studies only evaluate one factor potentially influencing reenlistment decisions, Golan et al. (2010) included multiple observable variables (demographics, economic conditions, peacetime versus wartime, performance, abilities, etc.) in their analysis to help explain different factors affecting

stay/leave decisions. They used annual cross-sectional data ranging from January 1997 to May 2008 to observe E-4 through E-7 Sailors in the Navy in all occupational specialties. They determined that race and gender are factors affecting retention and promotion in the Navy. Their results suggest that racial minorities and multiracial personnel have a lower probability of being promoted and higher probabilities of retention, compared to white personnel. Moreover, the study concluded that the gap between promotion probabilities for whites and those of other races was greater post-9/11 and that promotion probabilities differ by gender across pay grades. Additionally, their study revealed that females are more likely to stay in the Navy at E-4 but less likely at E-5 and E-6. Lastly, their results suggested that males have a greater likelihood to be promoted to the next pay grade up to E-5, but E-6 females have a greater likelihood to be promoted whether the nation is at peace or war. They also highlighted that increased rates of promotion improve Sailor retention, even at higher rates when there are less civilian employment opportunities. They also determined that Navy policies (e.g., vacancies, time in rank, time at sea, sea duty status, retention bonuses, and retention targets) had less of an effect on retention than the state of the civilian labor markets at a given time.

Most recently, Gershenson, Hart, Lindsay, & Papageorge (2017), in a study similar to the ones conducted by Kofoed and McGovney (2017) and Dee (2005), sought to shed light on prevalent disparities between minorities and non-minorities in academic settings. While the latter two studies evaluated how same-dimension minority matching influenced a cadet occupational choice at West Point and a student's academic achievement in middle school, respectively, Gershenson et al. (2017) study attempted to identify the long-run impact of same-race random assignment to a same-race teacher on educational attainment for eighth-graders. This study found that same-dimension minority matching, particularly black elementary school teachers with black male students, increased long-run educational attainment—particularly for low-income families (Gershenson et al., 2017). This study was limited by the evaluation of only black male racial minority and could benefit from the addition of gender minority as well as ethnic minority in order to give us a better and more accurate understanding of academic achievement determinants.

We use the aforementioned studies, evaluating individual decision-making determinants in different settings, to inform what observable characteristics and other variables are best suited to be included in this study's retention models.

C. MINORITY PEER EFFECTS

Peer effects have been extensively studied in various settings, such as academia, the workplace, social decisions, and so on, with various findings. The study conducted by Oosterbeek & van Ewijk (2014) examined gender peer effects on the academic achievement of first-year university students. Their study evaluated economics and business students in a public university in Amsterdam and found that, contrary to findings from previous studies evaluating peer effects in primary and secondary education, the increase in the percentage of female students at the university level did not (with the exception of math courses) significantly affect male students' performance (measured by the number of credits they would take during the first year) and did not affect female students at all. Similarly, Griffith and Rask (2014), Foster (2006), and Carrell, Fullerton, and West (2009) found either small or no peer effects in higher education. Conversely, the results from Sacerdote (2001) suggest that peers, in the form of freshman-year roommates, influenced individual academic achievements and decisions to join social organizations. Dahl, Loren, and Mogstad (2014) found peer effects in program participation in the workplace as colleagues and family members in the organization were more likely to participate in parental leave programs as a result of peer participation. Dahl et al., stated, "*Coworkers and brothers are 3.5 and 4.7 percentage points, respectively, more likely to take paternity leave if their peer father was eligible for paternity leave around the reform cutoff (p. 2071)"*.

They speculated that having an idea of potential repercussions or consequences from observing their colleagues go through the process was likely the mechanism. Duncan et al. (2005) gave evidence of peer effects on individual decision-making in social settings (e.g., alcohol consumption, drug usage, sexual activity, fraternity participation). The aforementioned studies, among many others available, exhibited contrasting signs on peer effects; therefore, there is insufficient evidence to fully support either argument.

Few previous works focused on military personnel and peer effects on military personnel decisions. Even fewer studies evaluated peer effects within minority groups among active-duty personnel. Two recent peer effects studies were aligned with the focus of our thesis on decision-making determinants within the Navy. One such study, Veith (2017), specifically evaluated the influence of peer effects in military settings. Using panel data provided by Navy Personnel Command, containing demographic information on 46,708 members and monthly snapshots derived from 7 million observations, Veith (2017) evaluated how peer effects influenced financial decisions—particularly how Navy enlisted members made financial decisions regarding their retirement pension plan between 2006 and 2011. His results support the notion that not only peers but also the command environment have a strong influence on individual financial decisions—choosing a particular retirement plan—made by military enlisted members in the Navy.

More closely related to our thesis is the 2013 study by Kraus et al., in which they attempted to understand the retention of female and minority male officers from the Surface Warfare Officer (SWO) community. They estimated the effects of observable characteristics on female SWO retention compared to male SWO retention with the same observable characteristic. They also estimated the effects of observable characteristics on minority male SWO retention compared to white male SWO retention with the same observable characteristics. Kraus et al. also examined minority male and female SWO retention with the inclusion of crew composition variables in their retention models, which was motivated by previous research on the effect of workgroup composition on retention in the civilian sector. Their approach included two basic categories of explanatory variables: demographic crew composition and Navy career (measuring relative military-civilian pay to capture the retention effects of demographic differences in civilian opportunities). Kraus et al. study focused on the SWO community to a greater extent than the aviation community because it is part of the unrestricted line community (which is highly visible Navy leadership), it has the largest female and majority representation (which represents the most appropriate environment for studying female and minority retention), and it was sufficiently large to merit its own study and report (Kraus et al., 2013).

Focusing on the surface and aviation communities, Kraus et al. estimated the models separately by gender, and for each male race and ethnicity group. They evaluated different factors affecting U.S. Navy diversity and gender and racial minority retention. Their primary objective was to understand whether and how determinants of SWO retention vary by gender and, among men, by race and ethnicity. They focused on identifying factors that affect female and male SWO retention differently and estimated the effects of crew composition on female SWO retention. They found that female SWOs were less likely to retain than male SWOs when controlling for marital/dependent status and ship type on retention of women and men in the SWO community. They found no evidence that the gender composition of the officer crew had an effect on female SWO retention, but were unsure if it was influenced by the low crew composition variation and low percentage of women in the officer crew. They also found that females were more likely to lateral transfer from SWO to different communities. Lastly, they found no effects from the minority male composition on the retention of either minority males or white males within that SWO group.

Kraus et al. showed mixed effects on minority retention from changes in the share of same-dimension minorities in the workplace. However, they found there were more differences in effects of factors from SWO retention when they compared male/female SWO retention than minority and majority male SWO retention (p. 55). Their results ultimately suggested that retention is determined similarly for minority and majority male SWOs, and the few differences they found may have resulted from male minority SWO sample sizes (p. 56).

The aviation community analysis conducted in that same study performed by Kraus et al., in 2013, was limited by time and resources, which reduced the amount of explanatory variables in this portion of their study. Their results suggested that minority male aviators retain at rates at least as high as those for white men, while female retention rates have been roughly half those of men's rates (p. 95). Additionally, the study found that race/ethnicity, accession source, and marital/dependent status have different effects on retention for each gender (p. 102). Their results suggested that racial minorities are more likely to remain in service while gender minorities were less likely to remain in service,

compared to their respective counterparts. Moreover, married male SWOs were more likely to remain in service compared to single male SWOs, while married female SWOs did not remain in service at a different rate than single female SWOs. Lastly, they found that platform type and college major had a similar effect on minority and white male retention, as science majors and propeller platform pilots were less likely to retain due to better civilian opportunities and inconclusive reasons, respectively.

Although the Kraus et al. (2013) study is comprehensive for the SWO community, a separate study may be warranted for the aviation community. Moreover, their study suffered from the same inadequacy as Navy retention studies previously discussed in this literature review. They could admittedly improve understanding of the effect of marital and dependent status on both genders' retention in the SWO community if they accounted for voluntary and involuntary decisions to leave the Navy.

Our study is similar in nature to demographically matched role-model effects studies, but we examine the effects it has on retention decisions in a military setting—the U.S. Navy surface and submarine fleet. We contribute to existing literature by focusing on separately measuring minority peer effects on a variety of platforms and evaluating a substantially larger amount (compared to previous studies) of both enlisted and officer observations from the surface and submarine fleet. In other words, methodologically, we follow Greene (2019) and Terranova (2019) with the addition of richer data, an evaluation of a broader set of platforms, and a particular focus on minority leadership and peer effects from various communities on different platforms. By using a separate-effects econometric model, we isolate the minority role model and peer effects that would otherwise be diluted by using a difference-in-difference model. A particular benefit unique to our study within a military environment is the exogenous group formation that automatic assignments made by centralized personnel systems provide. The random assignments help eliminate endogenous effects stemming from jointly determined outcomes and reduce self-selection bias. In other words, we would otherwise have difficulty separating the effects the group has on the individual from the effect the individual has on the group (Vigdor & Nechyba, 2007) and distinguishing peer effects from selection effects (Sacerdote, 2001). Our

approach mitigates any potentially biased unintended effects that would otherwise weaken our case for causality.

D. DIFFERENCE-IN-DIFFERENCE APPROACH

To highlight the importance of selecting the right econometric model, we review two recent studies that independently used different regression models to look at racial diversity effects in different settings. One study used a separate-effects model to look at role-model effects by evaluating how same-race matching affected an individual's decision to select the same career as their role model, whereas the second study used a difference-in-difference model to evaluate the effects of having a racially biased manager on the employee's performance.

Kofoed and McGovney (2017) used data from the Office of Economic and Manpower Analysis and randomly assigned tactical officers (role models) to cadets at West Point to examine the effect of same-dimension minority (gender, race, ethnicity) on occupation choice in the Army. The authors concluded that female gender-match increased the probability of the cadet choosing her role model's occupation as one of her top three choices by 15.9 percentage points. In addition, race matching increased the probability of a black cadet choosing his/her role model's occupation as first choice by 6.1 percentage points; conversely, Hispanic cadets did not have statistically significant results.

While the Kofoed and McGovney (2017) study is valid, one potential weakness is that their estimated treatment effect may be positively biased. That is, the estimates from their interaction variable "Female Cadet*Female Tactical Officer" could be lower if female cadets did not demonstrate a proclivity for certain military professions, even before attending West Point. Over half of female cadets choose an occupation in one of the following fields: military intelligence, medical service corps, engineering, and adjutant general, which largely coincided with their same-gender tactical officer's, not because of their tactical officer's gender and role-model influence, but because of females' proclivity to these professional fields, which incidentally increased the likelihood that their tactical officers belonged to one of them. In other words, regardless of their tactical officer's gender and role-model influence, females were prone to select one of the aforementioned

occupations. Under that assumption, the study results would be upward biased because they did not observe females' propensity to choose specific career paths, which would have produced estimated effects closer to zero.

In their study, Kofoed and McGovney (2017) used a separate-effects econometric model. One potential reason explaining their model selection is that they wanted to examine whether there is a diversity effect for non-minorities, as they could have been positively or negatively affected by more females, and the authors would want to capture these effects separately. In other words, the model Kofoed and McGovney used was needed to eliminate confounding factors stemming from a difference-in-difference model—such as the diversity effects an increase of females would cause on non-minority males. Conversely, a study conducted by Glover et al. (2017), which was thoroughly discussed by Greene (2019), used a difference-in-difference model because they were not concerned with bias neutrality since the employees were randomly assigned to shifts and had fixed effects, so they compared their individual selves to a higher or lower percent of biased managers.

E. NAVY MINORITY RECRUITMENT AND RETENTION

Understanding recruitment and retention determinants improves the accuracy of accession mission goals and the overall effectiveness of inclusion and diversity policies. In an attempt to shed light on these issues, Golan et al. (2010) concluded that the civilian labor market influenced a Sailor's retention decision to a much greater extent than Navy policies had. Additionally, results suggest that unless the Navy increases its size, D&I, and respective promotion probabilities, it will lose much of its enlisted personnel during favorable economic conditions. Moreover, according to Nishii (2009), treating everyone as insiders, regardless of demographic identity, is hypothesized to reduce the likelihood that in-groups and out-groups will form, which will potentially reduce turnover and increase retention. The Nishii study summarizes the hypothesized role of inclusion in the following way:

> When structural and status relationships within the organization legitimize socio-historical status beliefs, they perpetuate stereotyping and bias related to that cultural identity ... To the extent that organizational factors like

> climate for inclusion delegitimize socio-historical status hierarchies within the local context, a particular identity characteristic can lose its psychological meaning so that it no longer triggers social categorization processes that result in conflict. (Nishii, 2009, p. 65)

Feeling like an insider irrespective of demographic, however, is not as simple as it sounds. In the study conducted by Kraus et al. (2013), results indicate that being a female in a recently integrated but still male-dominated workplace comes with additional challenges that are not there for the male counterparts. This results, in part, from few if any same-gender (minority) mentors being available in the community and even fewer occupying higher ranks. In addition to females feeling as if they were constantly under the microscope and experiencing sexual harassment and discrimination, the study also stated that

> In all four studies, female respondents felt hampered by not having positive female role models and mentors to help them navigate the intricacies of the SWO career path, especially issues related to family planning and work/life balance. This is the direct result of the fact that there are very few women in the community, and even fewer women in senior ranks. (Kraus et al., 2013, p. 22)

To create and enforce the diversity and inclusion required to retain the best and most capable personnel, the organizational climate and culture, as well as the organization's policies and procedures, will have to be revised and overseen by a diverse group of senior leaders, as proposed by Greene, 2019.

F. SUMMARY

Similarity and social contact theories indicate that people like to be, and work, with people who are like themselves, because the demographic matching fosters frequent communications, high social integration, and a desire to maintain group affiliation, which—among other things—may reduce turnover (Kraus et al., 2013). If that holds true, merely increasing minority proportions within a group should increase minority retention; however, the studies conducted do not necessarily support that notion, and some have actually provided results that are more in line with social categorization and social identity theories, which predict a negative relationship between increased minority presence and changes in minority retention (Kraus et al., 2013). While there is empirical evidence to

support both theories, the lack of conclusive evidence necessitates additional research to foster further understanding of the factors that influence individual decision-making processes.

Few studies have specifically evaluated role-model effects in the Navy, and even fewer have studied peer effects on individual decisions to remain in naval service. Available studies lack a broad scope, adequate sample sizes for minority groups, or a specific focus on the influence that peer effects have on retention. Closely related studies evaluating role-model effects in alternate settings have indicated there might be correlation between minority role-model effects and minority academic achievement, occupational choice, and program participation. The most recent studies specifically looking at Navy retention provide inconclusive results, and the data and methodology used in the experiments can be improved upon. To test the external validity of Kofoed and McGovney (2017) and expand on Greene (2019), Terranova (2019), and Kraus et al., (2013), we estimate minority role model and peer effects in different occupational settings, using a greater amount of comprehensive data, while increasing the scope by including a wider array of platforms from both the surface and submarine communities, and including both enlisted and officer personnel. Our results seek to increase understanding of the implications of increased diversity on different fleet platforms and communities. Lastly, to evaluate both the relative effects for the minorities, as well as full effects, separately, we examine peer influence on retention, compared to non-minorities under the same leadership.

G. LIMITATIONS

An important question is whether instrumental variables in minority peer effects studies are endogenous. If the peer group consists of workers in similar positions within the platform, that might make them more likely to compete with each other for promotions for a limited number of openings at the higher rank. Promotion rates, in turn, may determine whether a Sailor is allowed to remain in service. Peer influence may be negatively correlated with retention via increased competition for promotions. Therefore, assuming a hierarchical structure and internal competition for promotions makes an instrumental

variable potentially endogenous. Lastly, we are not considering neither national, nor the sailor home of record's economic environment as an observable variable, which can create bias and/or measurement error.

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III. DATA AND METHODOLOGY

In this chapter, we present the data set used in this thesis and provide descriptive statistics. This study uses longitudinal files of individual-level data on Navy personnel sourced from the Defense Manpower Data Center (DMDC). We received the data in two different files: one for enlisted personnel and one for officers. The data consists of quarterly observations on all service members between FY1995 and FY2019. The data set includes the population of all Navy ships.

We used the unit identification code search system (UICSS) website hosted by DMDC to cross-reference all UICs in the data, and the Naval Vessel Registry to identify and validate the all decommissioned ships.

A. SAMPLE CRITERIA

Our data includes observations that begin in March 1995, six months into FY1995. We observe each Sailor in the data set quarterly, for at least 72 months. This means that an active-duty member would have to have an Active Duty Base Date (ADBD) of October 1, 1994, or later, to account for basic training and A-school timeframes, in order to be observed in our data set. Since we want to observe reenlistment decisions, the data set includes service members who joined as late as June 2013, to give them enough time to decide to reenlist.

Another prerequisite for our sample is that a Sailor has to have been assigned to either a medium- or large-size ship as his/her first duty assignment. We maintain separate samples for both ship sizes. We decided to leave out small ships due to the lack of variation in the data. Furthermore, we require each Sailor to have at least seven quarterly observations, or at least 18 months plus one day on one ship, because we want each member of the sample to have enough exposure to the demographics on the ship. Finally, our data includes Sailors with four-, five-, and six-year obligation contracts, but we only consider those with a four-year obligation.

For the purpose of our study, we define medium-size ships as those with a crew greater than or equal to 300 Sailors but fewer than 600 Sailors. In contrast, we define large-

size ships as those with a crew greater than or equal to 600 Sailors. Hence, the makeup of both medium and large-ship platforms is as follows:

- Medium-size ships: Amphibious command ships (LCC), amphibious transport dock (LPD), Dock Landing Ships (LSD), Cruisers (CG), miscellaneous command ships (AGF), fast combat support ships (AOE), destroyers (DDG), nuclear-powered submarines (SSN), nuclear-powered ballistic missile submarines (SSBN), nuclear powered guided missile submarines (SSGN)

- Large-size ships: Nuclear-powered aircraft carrier (CVN), Landing Helicopter Assault (LHA), Landing Helicopter Dock (LHD), destroyer tenders (AD), submarine tenders (AS), Amphibious Assault Ship (Helicopter) (LPH)

B. DESCRIPTIVE STATISTICS

The number of observations remaining in our samples after applying all restrictions to our data are as follows:

- Officers: Medium-size ships sample (8,062 observations)

- Enlisted: Medium-size ships sample, including submarines (133,298 observations) and large-size ships sample (117,713 observations)

Figure 6 details the reenlistment rate among first-term enlisted Sailors from 1995 to 2019, broken down by gender and racial/ethnicity category. The reenlistment rate for first-term females is 5.0 percentage points lower than first-term males. Similarly, the reenlistment rate for first-term blacks is 8.1 percentage points higher than non-blacks, and first-term Hispanics reenlist at a rate of 1.2 percentage points higher than non-Hispanics.

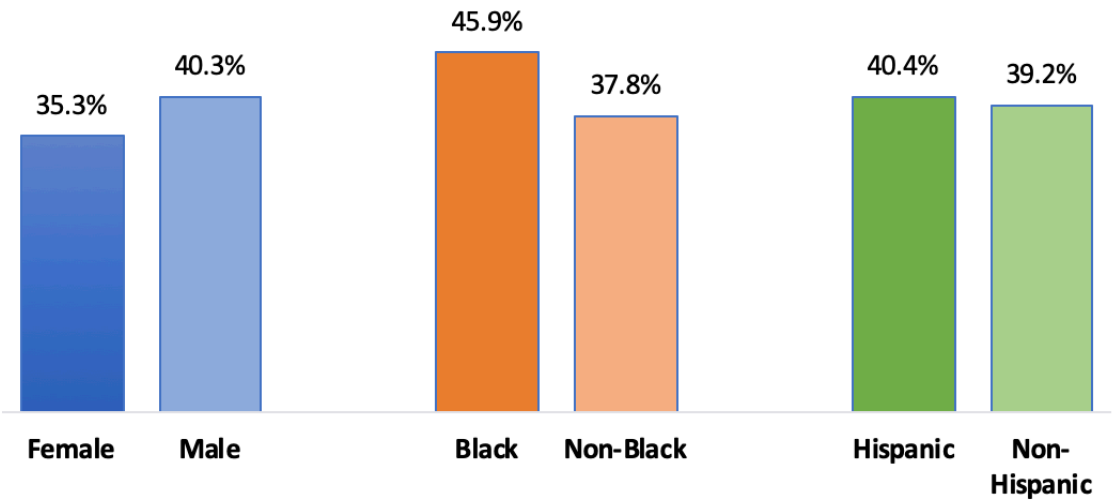

Figure 6. Enlisted First-Term Retention (1995-2019) by Diversity Category

Figure 7 details the retention rate among first-term officers from 1995 to 2019, broken down by gender and racial/ethnicity category. The retention rate for first-term females is 3.8 percentage points lower than first-term males. Similarly, the retention rate for first-term blacks is 2.3 percentage points lower than non-blacks, and first-term Hispanics continue in the Navy at a rate of 1.9 percentage points lower than non-Hispanics.

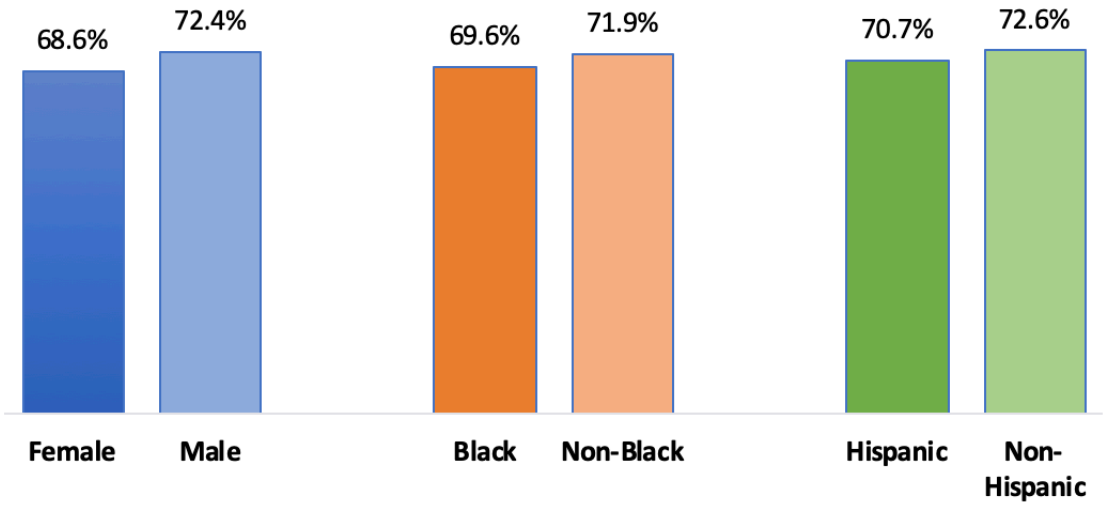

Figure 7. Officer First-Term Retention (1995-2019) by Diversity Category

C. VARIABLE DESCRIPTIONS

Our study is designed to estimate the effects of diversity on retention among three groups: peers, intermediate supervisors, and senior-level supervisors.

1. Enlisted Model

The definitions for the three groups used in this study are as follows:

- Peers: Everyone in their first-term of service regardless of rank. We use the length of service (LOS) of up to 48 months as a proxy for first-term Sailors.
- Intermediate supervisors: Members in rank E-5 with LOS 7 to 16 years and E-6 with LOS of 7 to 22 years. The upper bounds on the LOS of E-5 and E-6 recognize the Navy's high-year tenure policy in place as of the date of writing this paper.
- Senior-level supervisors: Members in ranks E-7 to E-9, regardless of LOS.

2. Officer Model

For the officer model, the definitions for the three groups used in this study are as follows:

- Peers: Officers with LOS of 48 months or less.
- Intermediate supervisors: Officers in ranks O-3 and O-4 with more than 85 months after their date of commission.
- Senior-level supervisors: Officers in ranks O-5 and O-6, regardless of LOS.

For officers, we originally defined role models as members in ranks O-3 and O-4 with seven or more years of LOS, and all O-5 and O-6 members, regardless of LOS. One flaw to the design of this role-model definition is that it may not capture prior-enlisted officers correctly. A prior-enlisted junior O-3 (who can have seven years of LOS) can be

wrongly categorized as a role model. To correct for this measurement error, we submitted a new request to DMDC to ask for date of commission as part of our data set. We believe that a better definition for role models in ranks O-3 and O-4 is captured by officers with more than 85 months after their date of commission. Therefore, we corrected our model after we received the new data from DMDC.

Expanding the scope of the study, we use data on Sailors from several Navy platforms, in addition to the three evaluated by Greene (2019). Using the same logic, we choose platforms in a way that allows for sufficient interaction between junior personnel and leadership and permits adequate sample size to effectively observe minority role-model and peer effects between the two groups.

It is worthwhile to highlight that we include submarines as part of the medium-size ships model makeup. Our study includes a total of 294 UICs for our medium-size ships model. This includes currently-retired ships. We define peers for medium-size ships as first-term Sailors onboard the same UIC.

For large-size ships, we define peers as Sailors E-1 to E-4 in the same rating. Enlisted immediate supervisors are also based on within rating counts. We believe this definition accounts for reasonable daily interaction of the sample members with their supervisors, as well as among their peers. We studied 30 UICs for our large-size ships model.

3. Dependent Variable

The dependent variable for this study is based on the variable *retain*, which takes a binary form of 0 or 1, with the value of 1 if a first-term Sailor reenlists (first term officers stay in the Navy past first obligation), and a value of 0 otherwise. We use the change in End of Active Obligated Service (EAOS) of at least 36 months as a signal that the Sailor reenlisted or stayed in the Navy, since Officers do not reenlist.

4. Explanatory Variables

As mentioned before, we have three different minority categories in our study: female, black, and Hispanic. We use the groups of peers, immediate supervisors, and

senior-level supervisors to define our treatment variables. As a result, we end up with three key explanatory variables in this study: the average percentage of a given diversity dimension among first-term peers, the average percentage of the same diversity dimension among immediate-level role models, and the average percentage of the same diversity dimension among senior-level role models.

Figure 8 shows that the percentage of females in our sample decreases by three percentage points from peers to immediate role models, and by two percentage points from immediate-level to senior-level role models. The percentage of blacks in our sample increases by three percentage points from peers to immediate role models. It decreases sharply by nine percentage points from immediate-level to senior-level role models. The percentage of Hispanics in our sample decreases by five percentage points from peers to immediate role models. It decreases sharply by four percentage points from immediate-level to senior-level role models. In other words, the results show that the percentage of females and Hispanics decreases as they move up in rank.

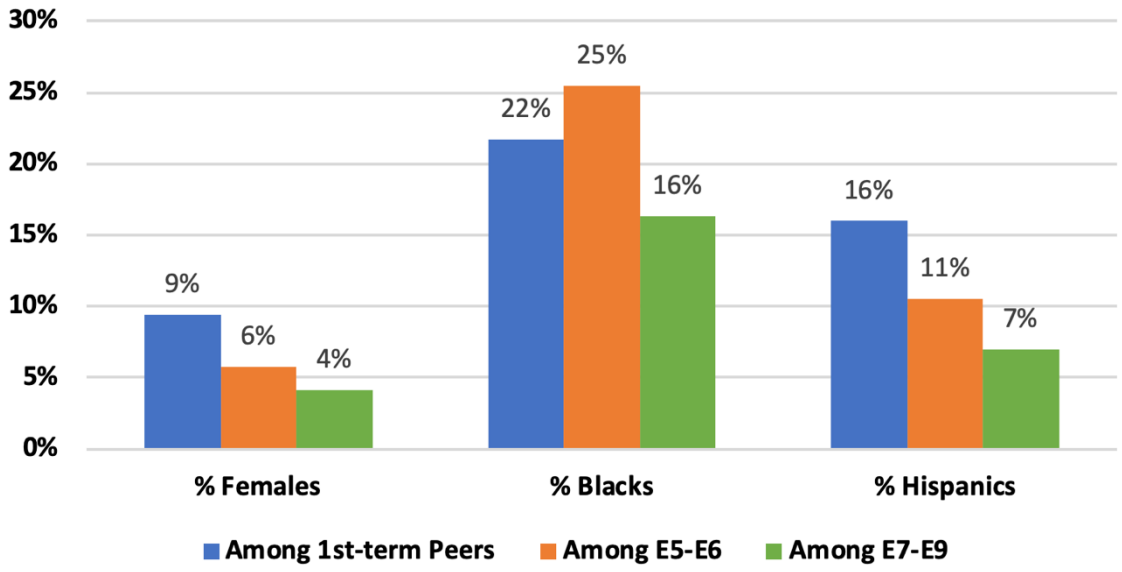

Figure 8. Explanatory Variables Summary

Table 1 shows the summary statistics for enlisted in our medium-size and large-size ship samples, and Table 2 shows the summary statistics for officers in our medium-size ship sample. The data shows that the percentage of females and female peers in the officer community is higher when compared to the enlisted ranks. In contrast, the percentage of blacks, black peers, Hispanics, and Hispanic peers is higher in the enlisted community when compared to the officer ranks.

Table 1. Enlisted Summary Statistics

	Medium-size Total Sample (n = 133,298)		Large-size Total Sample (n = 117,713)	
Variable	Mean	Std. Dev	Mean	Std. Dev
% of Enlisted that reenlist after first-term	44.8	49.7	35.2	47.8
% of Peers who are female	9.4	11.2	16.8	16.7
% of Peers who are black	21.7	8.3	24.4	18.2
% of Peers who are Hispanic	16.0	5.4	17.6	13.1
% of E5-E6 who are female	5.8	7.2	10.5	13.6
% of E5-E6 who are black	25.4	11.6	31.6	19.9
% of E5-E6 who are Hispanic	10.8	6.0	12.1	11.3
% of E7 and above who are female	4.3	5.3	6.5	13.8
% of E7 and above who are black	16.5	10.0	23.8	23.0
% of E7 and above who are Hispanic	7.5	6.1	8.8	13.5
% of Enlisted who are female	8.6	28.0	16.9	37.5
% of Enlisted who are black	21.4	41.0	25.2	43.4
% of Enlisted who are Hispanic	16.9	37.5	18.9	40.1

Table 2. Officer Summary Statistics

	Medium-size Total Sample (n = 8,062)	
Variable	Mean	Std. Dev
% of Officers that stay pass 84 mths	80.0	40.0
% of Peers who are female	18.3	16.3
% of Peers who are black	7.3	8.3
% of Peers who are Hispanic	8.2	9.1
% of O3-O4 who are female	6.5	8.6
% of O3-O4 who are black	10.5	10.5
% of O3-O4 who are Hispanic	7.5	8.6
% of O5-O6 who are female	3.0	10.7
% of O5-O6 who are black	5.1	15.1
% of O5-O6 who are Hispanic	4.7	14.7
% of Officers who are female	17.7	38.2
% of Officers who are black	7.8	26.8
% of Officers who are Hispanic	8.9	28.5

D. ECONOMETRIC MODEL

We use linear probability models to determine the effects of diversity among peers and role models on the retention of first-term Navy Sailors through the following equations. Our baseline model for estimating the effects of diversity on retention is shown below.

$$Y_{iso} = \beta_0 + \beta_1 * D + \mu_s + \mu_y + \mu_o + \varepsilon_{iso} \text{ (for the given minority group)}$$

where

Y_{iso} = the reenlistment decision for Sailor i assigned to UIC (ship) s observed with EAOS in FY y in occupation o.

D = Diversity measures

- Percentage of minorities among peers (LOS less than 48 months for enlisted/LOS less than 84 months for officers)

- Percentage of minority among E5–E6/O3–O4
- Percentage of minority among E7–E9/O5–O6

μ_s = UIC fixed effects

μ_y = FY fixed effects

μ_o = Rating/designator fixed effects

Our study includes three minority dimensions, which are female, black, and Hispanic. The interpretation of β_1 is how changes in diversity within ships are related to changes in retention within ships, holding fiscal year and occupation constant. As such, the source of variation identifying the diversity effect is from within ship changes in diversity over time.

Arkes (2019) recommends using one of three econometric models when dealing with a dichotomous outcome: a linear probability model (LPM), probit, or logit. Estimates from the linear probability model are easier to interpret. It is easier to use fixed effects with LPM than probit or logit and the model choice should not make a difference for an outcome that is so far from 0 or 1 as an average, as no predicted values should be outside the [0, 1] range.

E. MODEL ASSESSMENT

To assess the strength of our model, we rely on the 11 Big Questions introduced by professor Jeremy Arkes (2019) in his book *Regression Analysis: A Practical Introduction*. Reverse causality is not likely, because reenlistments do not affect the diversity measures described in our model. Next, we attempt to correct all possible omitted variable biases by controlling for UIC, FY, and rating/designator. Other than those controls, we could not think of anything else that would have an effect on both the diversity measures and the outcome (reenlistment). Finally, because first-term Sailors have no prior knowledge of the diversity make-up of their first ship assignment and their rating/designator, the chance for self-selection bias (choosing the diversity they would experience on the ship) is minimal.

In addition, many first-term Sailors do not have the option to choose their first assignment, and detailers do not assign Sailors to commands with diversity in mind.

Much like the report from Greene (2019), our data lacked the ability to identify the positions of command master chief and commanding officer. The Navy recently established the command senior chief, command master chief, and fleet master chief service ratings for the Reserve component. Future studies will benefit from this change once the active-duty component aligns with the new service ratings initiative.

Furthermore, we encountered challenges in accurately defining race as a result of a change around 2002 that modified the way the Navy records race in service members' official records. We believe the inconsistencies in race codes created a discrepancy in the race code in approximately 4% of the observations, potentially adding to measurement error. Lastly, the data does not perfectly capture officers who were prior enlisted. The issue we encountered is that these officers, although very junior in the officer community, are not first-term Sailors and they do not separate when they commission, making it hard to correctly place them in the appropriate sample group. In either case, the misclassification of race and prior enlisted officer would create downward bias on the estimated effect, making the true effect further away from zero.

IV. RESULTS

In this section, we present the results and limitations from our six separate-effects models that estimate the effects of diversity on retention among three groups: peers, intermediate supervisors, and senior-level supervisors for enlisted and officers on both medium and large-size ships.

In Tables 3–7, Models 1 and 2 show the effects of females and males, Models 3 and 4 show the effects of blacks and non-blacks, and Models 5 and 6 show the effects of Hispanics and non-Hispanics separately. All models include fixed effects for UIC, FY, and rate/designator to account for the variance in retention within each ship, FY, and occupation.

In Figures 9 through 17 we show the estimated effect of a 10-percentage point increase in females in the three groups (peers, intermediate supervisors, and senior-level supervisors) on enlisted and officers' retention on medium, and large-size ships. We choose to display and interpret our results this way because the standard deviation of our three key explanatory variables is roughly 10%.

A. MEDIUM-SIZE SHIPS

We divide the results by effects on enlisted sailors' retention, and effects on officers' retention, for clarity.

1. Enlisted Sailors

For these results, we present the findings by diversity dimension within the enlisted ranks.

a. Effect for Females

Table 3 illustrates the effects for enlisted females and enlisted males. The outcome—reenlistment decision—is observed for both enlisted females and enlisted males who are in their first term of service. The estimates are interpreted as the change in probability that a female Sailor reenlists if exposed to a change in the percentage of peers,

immediate supervisors (E-5 and E-6), and senior enlisted leadership (E-7 through E-9) who are female.

The estimates show that a 10–percentage point increase in females among first-term peers results in an estimated 1.8 percentage point increase in the probability of reenlistment for first-term males. This is an interesting finding that male Sailors' re-enlistment is positively affected by an increase of percentage of females among their peers. The result is statistically significant at the 1% significance level. Moreover, our data shows that a 10–percentage point increase in females among immediate supervisors (E-5 and E-6) results in an estimated 1.2 percentage point increase in the probability of reenlistment for first-term males, while a 10–percentage point increase in females among senior-level supervisors (E-7 through E-9) results in an estimated 3.3 percentage point decrease in the probability of reenlistment for first-term females. Both results are statistically significant only at the 10% significance level.

We also see that first-term black females reenlist at a higher rate than non-black females, first-term black males reenlist at a higher rate than non-black males, and first-term Hispanic males reenlist at a higher rate than non-Hispanic males. These results are also statistically significant at the 1% significance level.

Table 3. Retention of First-Term Enlisted Sailors on Medium Platforms and Submarines (by Gender).

	Dependent Variable = Reenlist (First-termer)	
	(1) Effect for Females	(2) Effect for Males
Peers (% Female)	0.040	0.181***
	(0.144)	(0.054)
Supvr E5-E6 (% Female)	0.118	0.116*
	(0.159)	(0.067)
Supvr E7-E9 (% Female)	-0.327*	-0.059
	(0.171)	(0.074)
Black Sailor	0.139***	0.113***
	(0.011)	(0.004)
Hispanic Sailor	0.013	0.023***
	(0.013)	(0.004)
Observations	9,551	102,115
R-squared	0.062	0.055
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects from Table 3 are visually displayed in Figure 9. The range of the color bars represents the 5% significance level. The asterisks on the bars mark the direction of the estimated effect. We see that an increase in females among first-term peers and immediate supervisors (E-5 and E-6) has a positive effect on the probability of

reenlistment for males that are in their first term. Other than the female peer-effect on males, none of the other results are statistically significant at the 5% significance level.

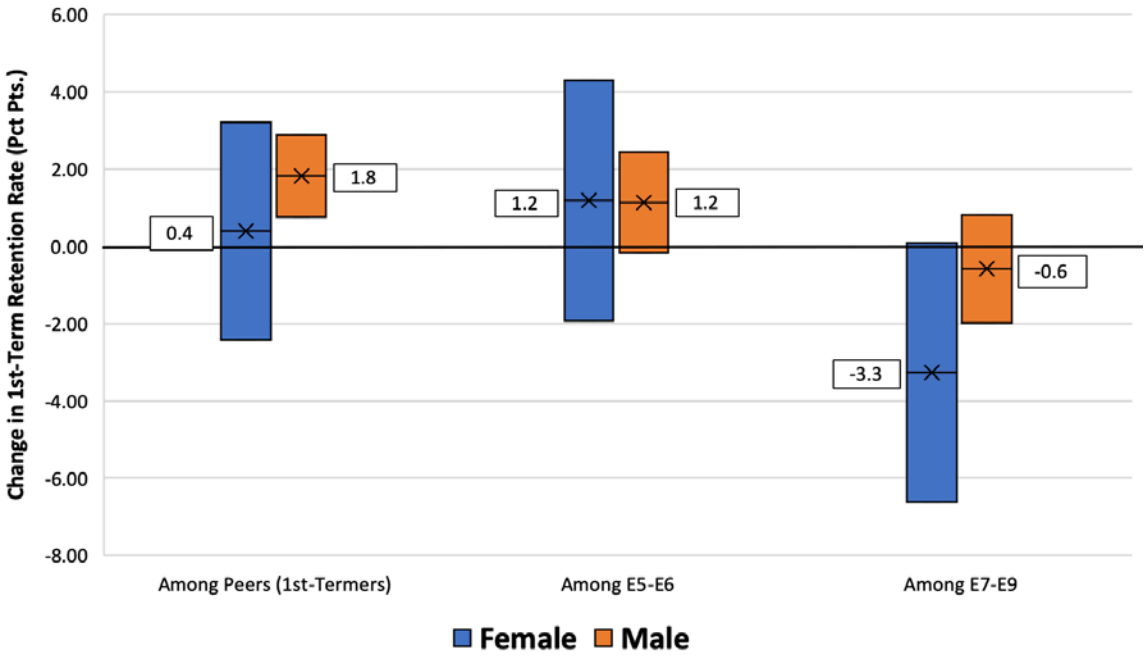

Figure 9. Estimated Effect of 10–Percentage Point Increase in Enlisted Females on First Term Reenlistment on Medium-Size Ships

b. Effect for Blacks

Table 4 illustrates the effects for enlisted blacks and enlisted non-blacks. The outcome—reenlistment decision—is observed for both enlisted blacks and enlisted non-blacks who are in their first term of service. The estimates are interpreted as the change in probability that a black Sailor reenlists given their exposure to black peers, black immediate supervisors (E-5 and E-6), and black senior enlisted leadership (E-7 through E-9), compared to the change in reenlistment probability for enlisted non-blacks.

The estimates show that a 10–percentage point increase in blacks among peers results in an estimated 2.1-percentage point increase in the probability of reenlistment for first-term blacks, and 1.0-percentage point increase for non-blacks. Similarly, a 10-percentage point increase in blacks among immediate supervisors results in an estimated 1.4–percentage point increase in the probability of reenlistment for first-term blacks, and 0.7-percentage point decrease for non-blacks. These results are statistically significant only at the 10% significance level.

Additionally, a 10–percentage point increase in blacks among senior enlisted leadership (E-7 through E-9) results in an estimated 1.3–percentage point increase in the probability of reenlistment for first-term blacks, and 0.3-percentage point increase for non-blacks. Both results are statistically significant at the 5% significance level. Our results are in line with the findings from Greene (2019).

We also see that first-term non-black females reenlist at a lower rate than first-term non-black males and first-term non-black Hispanics reenlist at a higher rate than non-black non-Hispanics. These results are statistically significant at the 1% significance level.

Table 4. Retention of First-Term Enlisted Sailors on Medium Platforms and Submarines (by Diversity: Blacks).

	Dependent Variable = Reenlist (First-termer)	
	(1) Effect for Blacks	(2) Effect for Non-Blacks
Peers (% Black)	0.211*	0.104*
	(0.108)	(0.055)
Supvr E5-E6 (% Black)	0.138*	-0.065*
	(0.073)	(0.037)
Supvr E7-E9 (% Black)	0.125**	0.059**
	(0.057)	(0.028)
Female Sailor	0.002	-0.038***
	(0.010)	(0.007)
Hispanic Sailor	-0.009	0.026***
	(0.011)	(0.004)
Observations	23,494	88,189
R-squared	0.060	0.049
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 10. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. Every result is statistically significant at least at the 10% level.

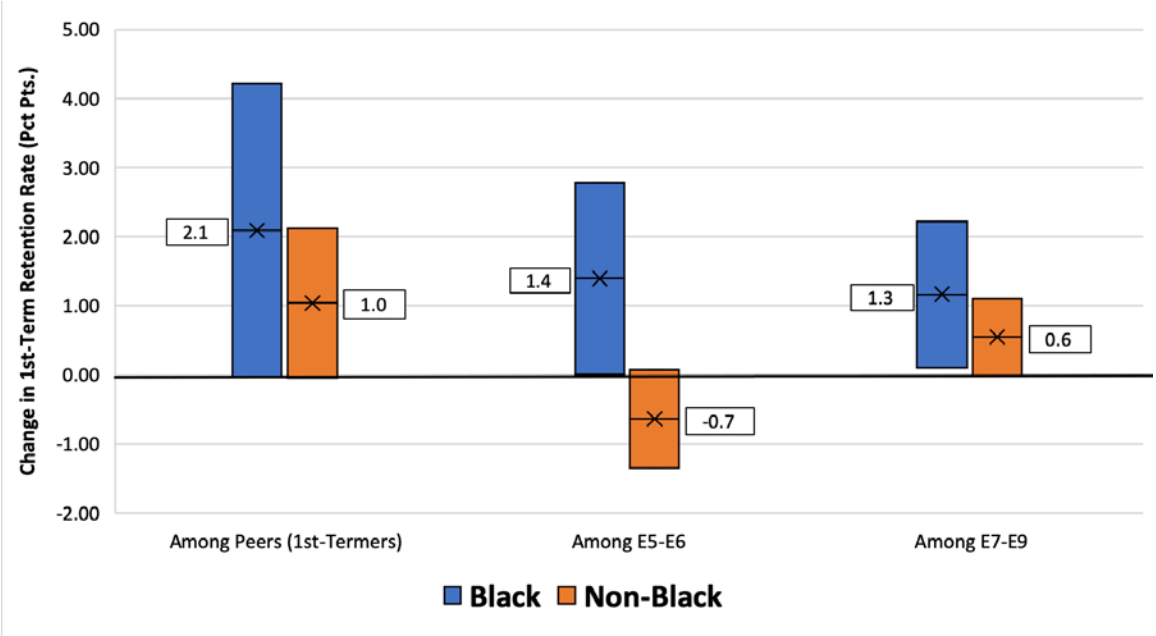

Figure 10. Estimated Effect of 10–Percentage Point Increase in Enlisted Blacks on First Term Reenlistment on Medium-Size Ships

c. Effect for Hispanics

After estimating the models for Hispanics and non-Hispanics, we find that none of the coefficients for the key explanatory variables are statistically significant. Figure 11 displays the estimated effect of a 10–percentage point increase in Hispanics among peers, immediate supervisors (E-5 and E-6), and senior-level supervisors (E-7 through E-9) on the retention of first-term Hispanics versus first-term non-Hispanics. The range of the color bars represents the 5% significance level. The asterisks on the bars mark the direction of the estimated effect. We conclude that the results are statistically not significantly different from zero at the 5% significance level.

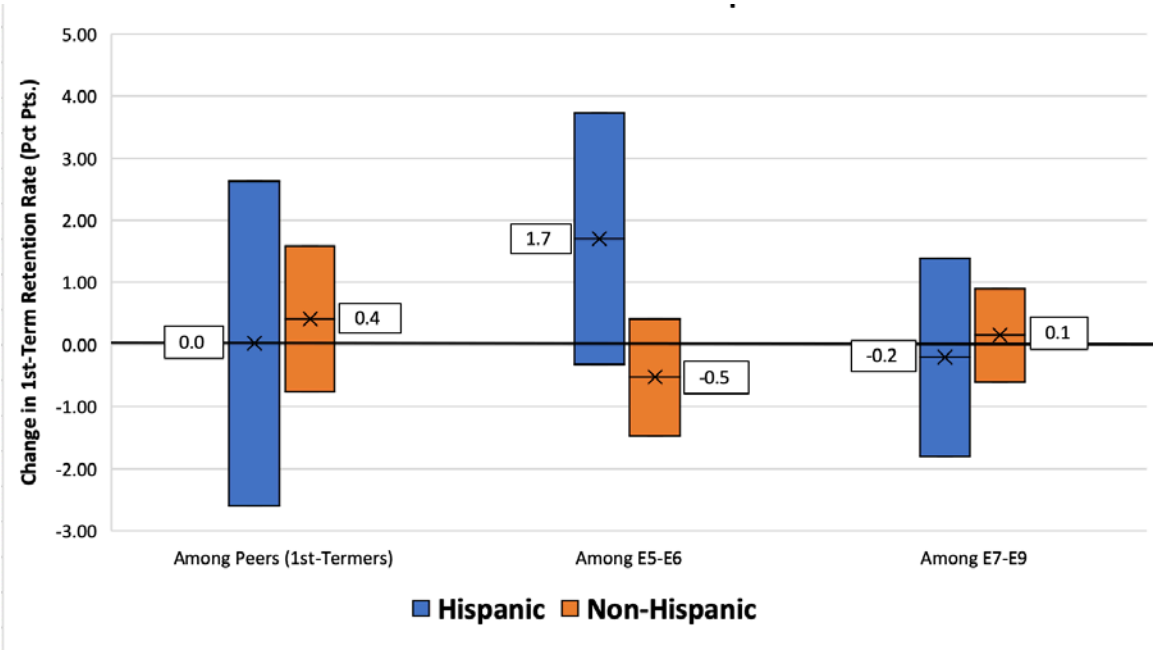

Figure 11. Estimated Effect of 10–Percentage Point Increase in Enlisted Hispanics on First Term Reenlistment on Medium-Size Ships

2. Officers

We present our results by diversity dimension within the officer ranks.

a. Effect for Females

Table 5 illustrates the effects for female officers, and for male officers. The outcome—retention decision—is observed for both female officers and male officers who are staying in the Navy at the end of their first term of service. The estimates are interpreted as the change in probability that a female officer stays in the Navy, given her exposure to an increase in female peers who are in their first term, female immediate supervisors (O-3 and O-4), and female senior leadership (O-5 and O-6), when compared to the change in retention probability for first-term male officers. After running the model for females and males, we find that none of the results for the key explanatory variables are statistically significant at any of the levels measured (1%, 5%, and 10%).

Table 5. Retention of First-Term Officers on Medium Platforms and Submarines (by Gender).

	Dependent Variable = Retention (First-termer)	
	(1) Effect for Females	(2) Effect for Males
Peers (% Female)	0.142	0.005
	(0.109)	(0.046)
Supvr O3–O4 (% Female)	-0.004	-0.033
	(0.157)	(0.077)
Supvr O5–O6 (% Female)	0.012	0.037
	(0.115)	(0.060)
Black Officer	0.041	0.023
	(0.036)	(0.018)
Hispanic Officer	-0.002	0.010
	(0.039)	(0.016)
Observations	1,196	6,100
R-squared	0.356	0.360
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 12. The range of the color bars represents the 5% significance level. The asterisks on the bars mark the direction of the estimated effect. We conclude that the results are statistically not significantly different from zero at the 5% significance level.

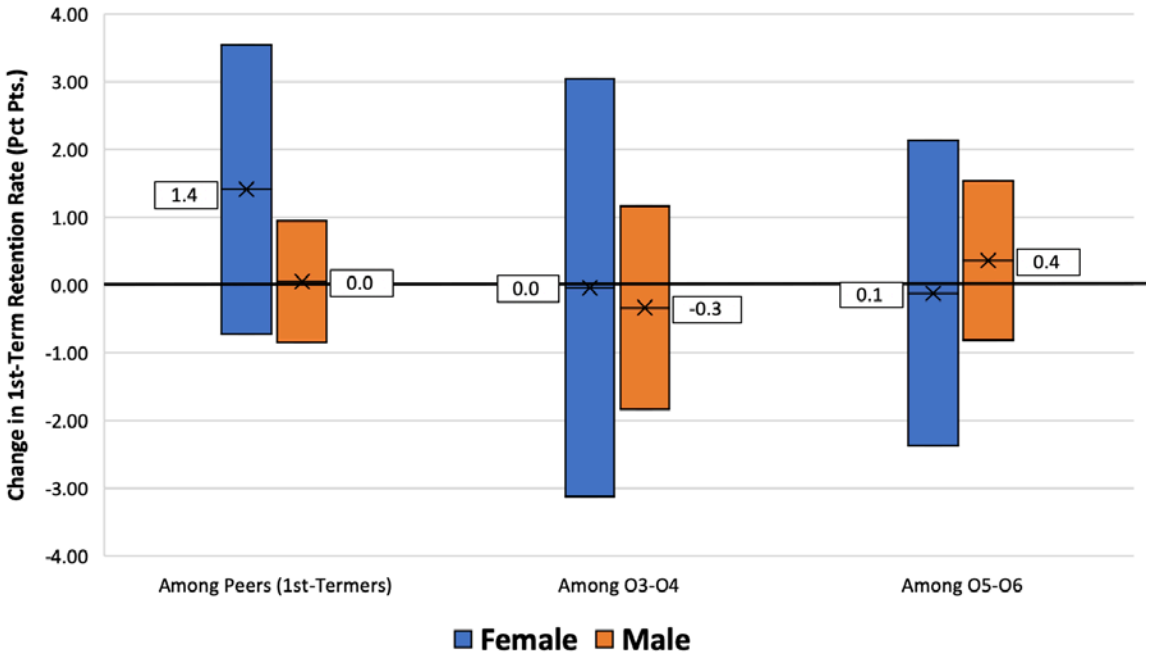

Figure 12. Estimated Effect of 10 Percentage Point Increase in Female Officers on Retention on Medium-Size Ships

b. Effect for Blacks

Table 6 illustrates the effects for black officers and non-black officers. The outcome—retention decision—is observed for both black officers and non-black officers who are in their first term of service. The estimates are interpreted as the change in probability that a black officer stays in the Navy given their exposure to black peers who are in their first term, black immediate supervisors (O-3 and O-4), and black senior leadership (O-5 and O-6), compared to the change in retention probability for first-term non-black officers. After running the model for blacks and non-blacks, we find that none of the results for the key explanatory variables are statistically significant at any of the levels measured (1%, 5%, and 10%).

Table 6. Retention of First-term Officers on Medium Platforms and Submarines (by Diversity: Blacks).

	Dependent Variable = Retention (First-termer)	
	(1) Effect for Blacks	(2) Effect for Non-Blacks
Peers (% Black)	0.355	-0.032
	(0.330)	(0.059)
Supvr O3-O4 (% Black)	0.053	0.037
	(0.195)	(0.051)
Supvr O5-O6 (% Black)	-0.280*	0.001
	(0.168)	(0.032)
Female Officer	0.025	-0.031**
	(0.053)	(0.015)
Hispanic Officer	-0.024	0.001
	(0.097)	(0.015)
Observations	470	6,784
R-squared	0.518	0.338
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 13. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. We conclude that the results are statistically not significantly different from zero at the 5% significance level, as the estimate of blacks among senior leadership (O-5 and O-6) is statistically significant at the 10% level.

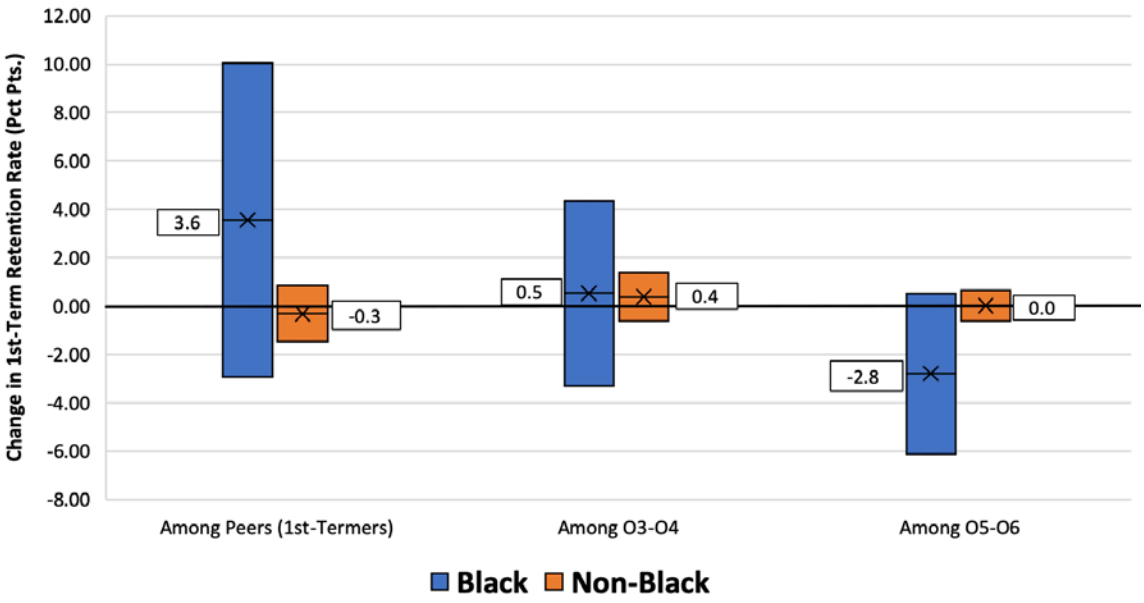

Figure 13. Estimated Effect of 10–Percentage Point Increase in Black Officers on Retention on Medium-Size Ships

c. Effect for Hispanics

Table 7 illustrates the effects for Hispanic officers and non-Hispanic officers. The outcome—retention decision—is observed for both Hispanic officers and non-Hispanic officers who are in their first term of service. The estimates are interpreted as the change in probability that a Hispanic officer stays in the Navy given their exposure to Hispanic peers, Hispanic immediate supervisors (O-3 and O-4), and Hispanic senior leadership (O-5 and O-6), compared to the change in retention probability for non-Hispanic officers.

The estimates show that a 10–percentage point increase in Hispanics among first-term peers results in an estimated 4.0-percentage point increase in the probability of retention for first-term Hispanics. This estimate is statistically significant at the 10% significance level. The data also shows that a 10-percentage point increase in Hispanics among senior leadership (O-5 and O-6) results in an estimated 0.8–percentage point increase in the probability of retention for first-term non-Hispanics. The result is statistically significant at the 5% significance level. We also see that first-term non-Hispanic blacks stay in the Navy at a higher rate than non-Hispanic non-blacks. These results are also statistically significant at the 5% significance level.

Table 7. Retention of First-Term Officers on Medium Platforms and Submarines (by Diversity: Hispanics).

	Dependent Variable = Retention (First-termer)	
	(1) Effect for Hispanics	(2) Effect for Non-Hispanics
Peers (% Hispanic)	0.395*	0.065
	(0.234)	(0.046)
Supvr O3-O4 (%Hispanic)	0.422	-0.002
	(0.331)	(0.056)
Supvr O5-O6 (%Hispanic)	0.056	0.082**
	(0.137)	(0.032)
Black Officer	0.000	0.036**
	(0.096)	(0.016)
Female Officer	-0.067	-0.018
	(0.061)	(0.013)
Observations	506	6,748
R-squared	0.535	0.369
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 14. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. We see that an increase in Hispanics among senior leadership (O-5 and O-6) has an estimated positive effect on the retention of non-Hispanic officers who

are in their first-term of service, and the result is statistically significant at the 5% significance level. We conclude that with the exception of the estimate of Hispanics among senior leadership (O-5 and O-6), the other results are statistically not significantly different from zero at the 5% significance level.

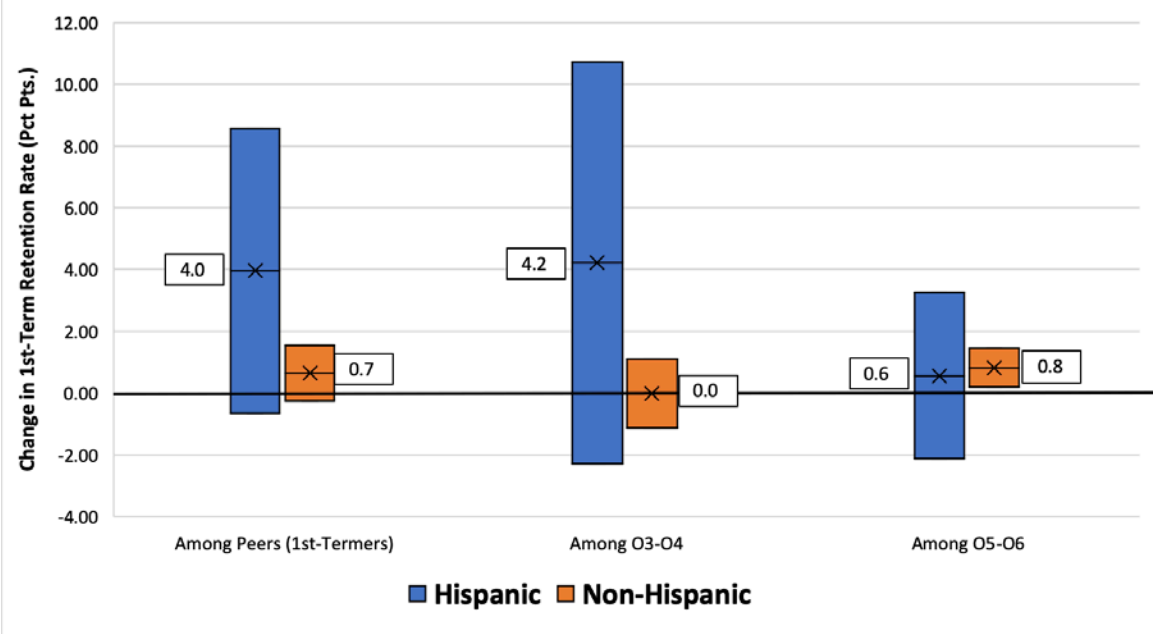

Figure 14. Estimated Effect of 10–Percentage Point Increase in Hispanic Officers on Retention on Medium-Size Ships

B. LARGE-SIZE SHIPS

We present our results for large-size ships by diversity dimension within the enlisted ranks for readability.

1. Effect for Females

The estimates on Table 8 show that a 10–percentage point increase in females among immediate supervisors (E-5 and E-6) results in a 0.3–percentage point increase in the probability of reenlistment for first-term males. This result is statistically significant at the 10% significance level. We also see that first-term black females reenlist at a higher rate than first-term non-black females, first-term black males reenlist at a higher rate than

first-term non-black males, first-term Hispanic females reenlist at a higher rate than first-term non-Hispanic females, and first-term Hispanic males reenlist at a higher rate than first-term non-Hispanic males. These results are statistically significant at the 1% significance level.

Table 8. Retention of First-term Enlisted Sailors on Large Platforms (by Gender).

	Dependent Variable = Reenlist (First-termer)	
	(1) Effect for Females	(2) Effect for Males
Peers (% Female)	-0.005	-0.012
	(0.018)	(0.016)
Supvr E5–E6 (% Female)	-0.012	0.029*
	(0.030)	(0.017)
Supvr E7–E9 (% Female)	0.023	-0.003
	(0.027)	(0.014)
Black Sailor	0.141***	0.113***
	(0.008)	(0.004)
Hispanic Sailor	0.027***	0.022***
	(0.009)	(0.004)
Observations	16,985	83,845
R-squared	0.050	0.033
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 15. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. We conclude that the results are statistically not significantly different from zero at the 5% significance level.

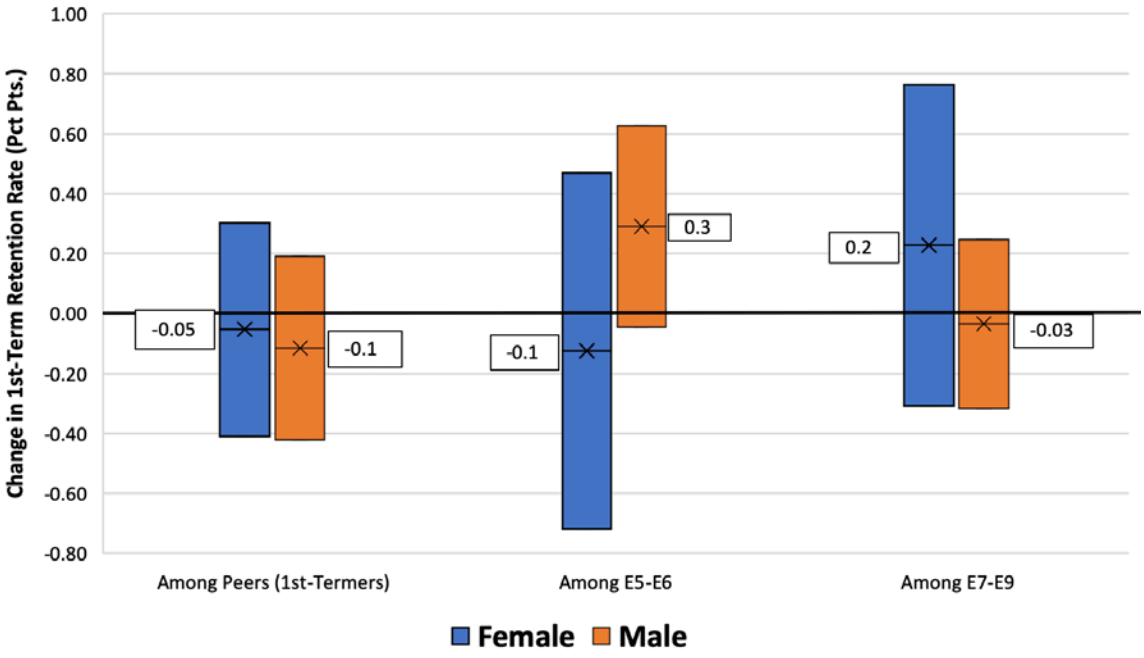

Figure 15. Estimated Effect of 10–Percentage Point Increase in Enlisted Females on Retention on Large-Size Ships

2. Effect for Blacks

The estimates on Table 9 show that a 10–percentage point increase in blacks among senior-level supervisors (E-7 through E-9) results in a 0.3–percentage point increase in the probability of reenlistment for first-term blacks. This result is statistically significant at the 5% significance level. We also see that first-term black females reenlist at a higher rate than first-term non-black females, which is consistent with the results we find on medium-size ships. First-term non-black females reenlist at a lower rate than first-term non-black males. These results are statistically significant at the 5% and 1% significance level, respectively.

Table 9. Retention of First-term Enlisted Sailors on Large Platforms (by Diversity: Blacks).

	Dependent Variable = Reenlist (First-termer)	
	(1) Effect for Blacks	(2) Effect for Non-Blacks
Peers (% Black)	0.007	-0.006
	(0.016)	(0.016)
Supvr E5–E6 (% Black)	0.011	-0.007
	(0.022)	(0.012)
Supvr E7–E9 (% Black)	0.030**	0.003
	(0.015)	(0.009)
Female Sailor	0.018**	-0.020***
	(0.008)	(0.005)
Hispanic Sailor	-0.001	0.028***
	(0.011)	(0.004)
Observations	24,343	76,520
R-squared	0.029	0.023
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 16. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. We conclude that with the exception of the estimated effect that blacks among senior leadership (O-5 and O-6) have on first-term blacks, the other results are statistically not significantly different from zero at the 5% significance level.

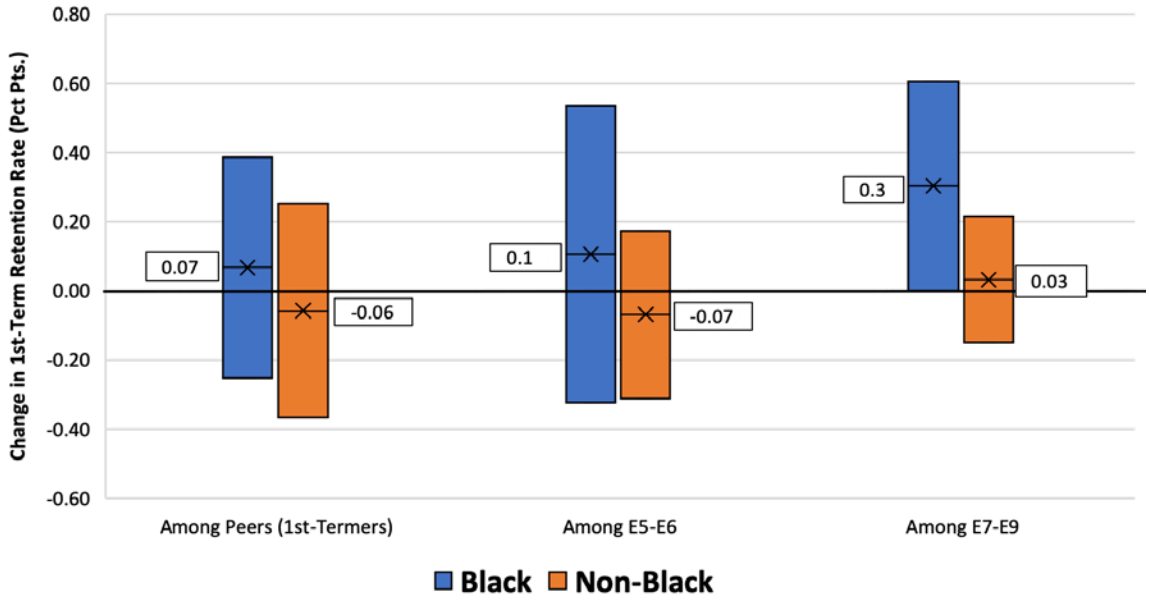

Figure 16. Estimated Effect of 10–Percentage Point Increase in Enlisted Blacks on Retention on Large-Size Ships

3. Effect for Hispanics

The estimates on Table 10 show that a 10–percentage point increase in Hispanics among senior-level supervisors (E-7 through E-9) results in a 0.5–percentage point decrease in the probability of reenlistment for first-term Hispanics. This result is statistically significant at the 10% significance level. We find that none of the other results for the key explanatory variables are statistically significant at any of the levels measured (1%, 5%, and 10%).

Table 10. Retention of First-term Enlisted Sailors on Large Platforms (by Diversity: Hispanics).

	Dependent Variable = Retention (First-termer)	
	(1) Effect for Hispanics	(2) Effect for Non-Hispanics
Peers (% Hispanic)	0.003	0.021
	(0.009)	(0.019)
Supvr E5-E6 (%Hispanic)	-0.024	-0.022
	(0.037)	(0.018)
Supvr E7-E9 (%Hispanic)	-0.045*	-0.016
	(0.027)	(0.014)
Black Sailor	0.098***	0.124***
	(0.011)	(0.004)
Female Sailor	-0.013	-0.007
	(0.009)	(0.005)
Observations	18,251	82,611
R-squared	0.030	0.036
UIC FE	YES	YES
FY FE	YES	YES
Rating/Designator FE	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

The estimated effects are visually displayed in Figure 17. The range of the color bars represents the 5% significance level and the asterisks on the bars mark the direction of the estimated effect. We conclude that the results are statistically not significantly different from zero at the 5% significance level.

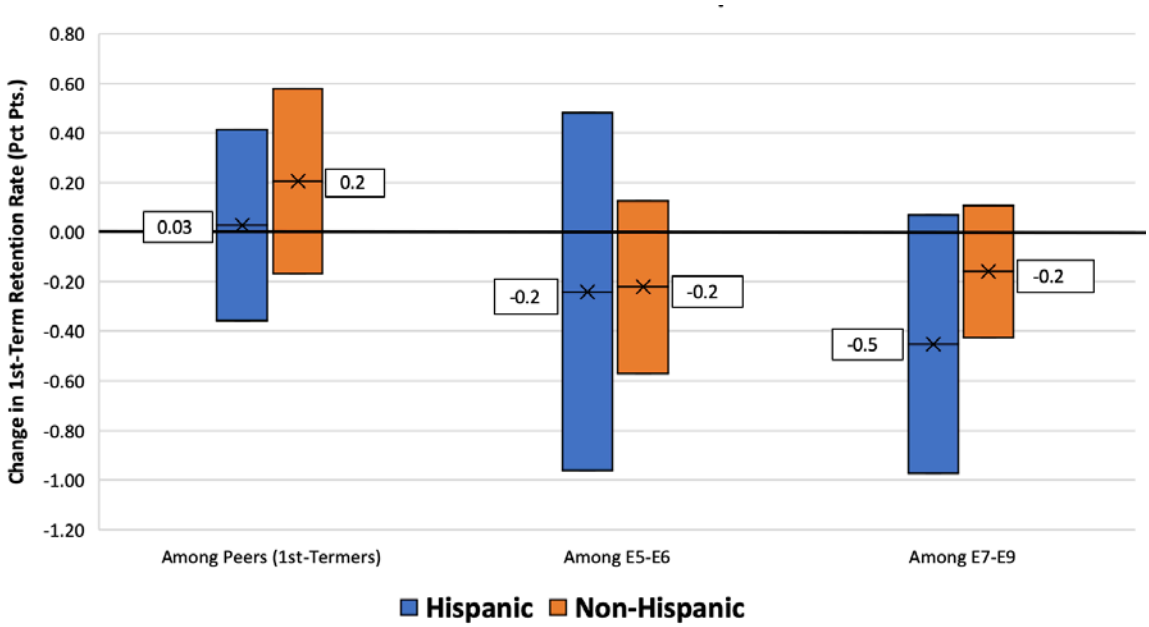

Figure 17. Estimated Effect of 10–Percentage Point Increase in Enlisted Hispanics on Retention on Large-Size Ships

C. LIMITATIONS

The results from our study are impacted by low variability, which can in part be attributed to the low number of observations—especially for the officer estimates. In addition, we encountered challenges in accurately defining race because of a change around 2002 that modified the way the Navy records race in service members' official records. We believe the inconsistencies in race codes created a discrepancy in the race code in approximately 4% of the observations, potentially adding to measurement error.

Although some results do not reflect a statistically significant effect of diversity on retention, Arkes (2016) offered some possible explanations for the meaning of insignificant estimates. First, there is the possibility that an effect exists, but we are not able to detect it due to the low number of observations. Second, biases, such as measurement error, may counteract any true effect. Lastly, there is the possibility that some Sailors are positively affected by diversity while some are negatively affected. As such, their effects cancel each other out, making the observed effect close to zero and not statistically significant.

V. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

This study analyzes the effects of an increase in minority peers and minority command leadership on first-term Navy junior enlisted and officer personnel retention outcomes. It found statistically significant evidence confirming some results from recent studies that suggested that an increase in same-dimension minority peers and role models could increase the likelihood of reenlistment and retention for certain demographic minorities during their first-term of naval service.

1. Enlisted Retention in Medium Ships and Submarines

The results suggest that an increase in same-minority peers, immediate supervisors, and senior leadership onboard medium ships and submarines has statistically significant positive effects mainly on Black first-term sailors. Enlisted blacks results suggest that a 10–percentage point increase in diversity among peers, immediate supervisors, and senior leadership increases the likelihood of first-term Black sailor reenlistment by 2.1, 1.4, and 1.3–percentage points, respectively.

In contrast, the results from enlisted females showed there was no impact on female retention from a 10–percentage point increase in females among first-term peers but first-term male retention increased by 1.8–percentage points. The estimated effects for females from an increase in senior leadership diversity were negative, compared to Black sailors, as females were 3.3-percentage points less likely to remain in service while under the same leadership.

The same 10-percentage point increase in diversity among peers, immediate supervisors, or senior leadership for Hispanics, had no statistically significant effect on the reenlistment decisions of naval enlisted personnel aboard medium-size ships and submarines. Results seem to indicate that first-term black and Hispanic males reenlist at a higher rate than non-black and non-Hispanic males. In other words, all enlisted minorities included in this study were more likely to reenlist than their non-minority counterparts

under the same diverse peer and leadership group. These results were statistically significant at the 1% and 10% significance level.

2. Enlisted Retention on Large Ships

Our analysis estimated statistically significant effects from an increased diversity in female immediate supervisors and from same-minority Black and Hispanic Senior Leadership. The results indicate that a 10–percentage point increase in females among immediate supervisors did not influence first-term female enlisted Sailors' reenlistment decisions but caused first-term males to be 0.3 percentage points more likely to reenlist. For black sailors, a 10-percentage point increase in same-minority senior leadership increases retention by 0.3 percentage points. Conversely, the same change in same-minority senior leadership for Hispanics decreases retention by 0.5 percentage points. Results are statistically significant at the 1% and 10% significance level, respectively.

Lastly, Black and Hispanic first-term enlisted male minorities were 1.4 and 0.3 percentage points, respectively, more likely to reenlist than Black and Hispanic females and 1.1 and 0.22 percentage points more likely to remain in service, compared to non-minority males. Results were statistically significant at the 1% significance level. Results seem to indicate that irrespective of the platform analyzed in our study, first-term enlisted minorities are more likely to reenlist than non-minorities under the same leadership. There were no statistically significant effects from same minority peers on the reenlistment decision-making process for first-term enlisted personnel onboard large ships. This could be attributed to the grand scale of the platforms in this category and the consequent diminished interactions during the time they are not directly working together.

3. Officer Retention in Medium Ships and Submarines

Our analysis suggests that there are no significant effects for female junior officers from an increase in same dimension minorities among peers, immediate supervisors, or senior leadership. Moreover, our results suggest that a 10-percentage point increases in Black senior leadership had a negative impact on junior black officer retention, reducing it by 2.8 percentage points, compared to junior non-black officer retention. While the same increase in Hispanic senior leadership did not have a statistically significant impact on

junior Hispanic officer retention, it increased junior non-Hispanic officer retention under the same leadership by 0.8 percentage points. Moreover, an increase in same-minority peers increased Hispanic officer retention by 4.0 percentage points, compared to junior non-Hispanic officers in the same group. Results were statistically significant at the 10% significance level.

4. Retention Decisions

Successful completion of at least one tour under a minority leader has a positive effect on both minorities and non-minorities service members' retention rate. Our results suggest that for the enlisted personnel in general, black and Hispanic minorities have a higher likelihood to reenlist, compared to their non-minority counterparts, and are also more likely to be influenced by their respective minority peers and superiors. Conversely, enlisted females were less likely to be affected by their same dimension minority peers or superiors, compared to enlisted males. Moreover, our results also indicate that females are generally less likely to remain in service when compared to first-term enlisted males, which aligns with prior studies (Ash et al., 2012; CNA, 2013). In fact, our results may suggest that female minority role models and peers exert little to no influence on female retention decisions, and they might be just be more inclined to leave the Navy after their first-term of service for better civilian employment opportunities or other personal convictions. Although this study used richer data than prior similar ones, the data remained insufficient to produce more accurate results and correct all previous biases found in both Greene (2019) and Terranova (2019) studies.

This analysis confirms the results from Greene's (2019) study, which evaluated the relationship between minority role-model influence and retention among first-term enlisted Sailors, and it found that same-minority black leadership increases blacks' retention. Moreover, it also confirmed that an increase in diversity among leadership increases retention for both minority and non-minority personnel in the Navy. This may indicate that given adequate command diversity and more opportunities, an increase of diversity among peers and leadership could increase retention for minorities in both the enlisted and officer communities. In other words, increasing minority opportunities could have a positive

impact in overall retention in the Navy surface and submarine fleet. The availability of more recent data, a wider variety of platforms, communities, and variables, as well as the exclusion of Sailors and officers who attrite prior to their reenlistment or retention opportunity, allowed this analysis to improve upon recent similar studies. In this analysis, like Terranova's (2019), the effect of minority peers and role models on officer retention decisions remained unchanged, but it did increase non-minority junior officer's retention. Conversely, this analysis aligned with Greene's (2019) enlisted results and suggested that an increase in enlisted minority leadership increased retention for different demographic groups.

Although D&I are increasing minority recruitment in some demographic groups, our results may help explain gender and racial disparities under certain circumstances for first-term junior Navy personnel. It might also support an argument for leadership and commissioning opportunities for certain demographic groups that are still overrepresented in the enlisted ranks but underrepresented in the officer ranks, compared to the civilian national demographics, which limits their influence on retention decisions. Similarly, it may support the notion that while female recruitment has been increasing for the past few decades, women are still grossly underrepresented in both the enlisted and officer ranks, not necessarily because they are dissatisfied or discriminated against, but because they are naturally more likely to leave the service irrespective of their naval experience.

While the Navy has improved upon its previous Diversity Inclusion numbers, there are still many areas that could benefit from a greater understanding and subsequent policy implementation that will greatly impact Navy personnel demographics to be more aligned with national demographics. Our estimates could suggest that further D&I training and empirically driven policies (under reasonable assumptions) could reduce recruitment and attrition costs and help with long-term talent management. However, these estimates may differ under different assumptions. Additionally, when additional effects and potential outcomes of D&I policies are considered in the analysis, including those that were not able to be quantified or monetized, the study's results may seem rather inconclusive. For example, D&I policies could be likely to improve recruiting, which reduces recruitment and subsequent attrition costs and increases long-term retention under certain assumptions

but provide inconclusive and inconsistent results under other. Lastly, the results indicate that diversity recruitment goals could be empirically driven so minorities are resourcefully targeted to meet and exceed accession goals while increasing long-term retention and overall national security.

B. RECOMMENDATIONS

To solve current D&I problems, the Navy has to thoroughly understand the causes of minority underrepresentation and poor retention. However, this is a multifaceted and complex task, in which each additional retention determinant identified, analyzed, and explained will undoubtedly help improve minority recruitment and retention issues through a better understanding of the individual decision-making process.

Based on previous and current results, we believe the Navy should consider D&I during their detailing process in order to ensure adequate minority representation and increase personnel retention. Like Greene (2019), we recommend studies with more racial minorities and individual identifiers, such as NECs, which are required in order to increase the effectiveness of the study and accurately recommend the best courses of action to mitigate the current minority underrepresentation in the officer ranks and other D&I issues currently affecting Naval service. With more accurate data, analysts and researchers will be able to pinpoint diversity issues at the unit level, which will mitigate measurement error, increase the accuracy and validity of the study, and strengthen the policy creation process and other corrective action efforts. Moreover, with a considerable increase of platforms and communities, to include aviation and staff corps (law, medical, and others), studies would not only produce more accurate results but also benefit from a much greater variation that can help explain whether and to what extent minority peers, role models, and other determinants influence personnel retention decisions.

We expect that comprehensive study findings will support the notion of increasing leadership opportunities for qualified minorities to help close racial/ethnic and gender gaps in the Navy. If this notion were empirically supported, we would recommend the creation of a Navy program similar to the U.S. Coast Guard's College Student Pre-commissioning Initiative (CSPI) as an effective minority recruitment tactic, among other inclusion

programs derived from current findings. The idea is that if we collectively conclude that minority role-model and peer effects influence minority retention decisions, and successfully identify the most influential factors, we can strategically incentivize minorities through the provision of career enhancing opportunities and other programs that will level the playing field for racial/ethnic and gender minorities and enhance D&I in the Navy.

Lastly, we second recommendations from prior studies, such as the proactive enforcement of command diversity committee objectives, command climate surveys that include in-depth questions regarding the unit's diversity to identify shortfalls in inclusion, and the development of an accountability system—which includes rewards and consequences—to ensure that senior leaders and their commands are meeting the committee's diversity requirements.

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