

Evolution of Gender Integration in the DON: Summary of Five Analytical Efforts for the Assistant Secretary of the Navy (Financial Management and Comptroller)

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Abstract

The Assistant Secretary of the Navy (Financial Management and Comptroller) (ASN(FM&C)) sponsored a multi-pronged effort to explore the effects of actual and potential personnel policy changes on Department of the Navy (DON) personnel inventories and budgets. A primary focus of the study was the impact of changes in the gender mix of personnel on retention and manning, and on the costs associated with maintaining the desired levels of each. This document synthesizes the results of the various efforts undertaken for the study in a cohesive way that creates a whole that is greater than the simple sum of its parts. In addition to the recommendations associated with each analytical effort, we make two final recommendations: DON policy-makers and analysts should make conscious efforts to avoid cognitive bias when framing policy options and research questions, and they should continue to think outside the box to identify innovative approaches to personnel management.

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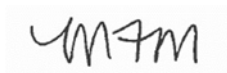
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Executive Summary

The Assistant Secretary of the Navy (Financial Management and Comptroller) (ASN(FM&C)) sponsored a multi-pronged effort to explore the effects of actual and potential personnel policy changes on Department of the Navy (DON) personnel inventories and budgets. A primary focus of the study was the impact of changes in the gender mix of personnel on retention and manning, and on the costs associated with maintaining the desired levels of each. The study addressed five specific questions related to gender, career outcomes, and costs:

1. How does the cost-minimizing combination of accession and selective reenlistment bonus (SRB) policies vary as the gender mix of Navy enlisted accessions changes?
2. What are the drivers of gender differences in Navy post-bootcamp, pre-fleet enlisted attrition rates?
3. What are the cost implications of gender differences in misbehavior among enlisted personnel in the Navy and the Marine Corps?
4. How does the gender mix of enlisted and officer endstrength affect the demand for collocation in the Navy and the Marine Corps, and what is the effect on retention?
5. How has the 2015 change in the maternity leave policy for uniformed personnel affected female reenlistment and manning in the Navy?

This document synthesizes the results of the various efforts undertaken for the study in a cohesive way that creates a whole that is greater than the simple sum of its parts. We used our own characterization of the DON's gender integration evolution as an organizing structure.

The DON's evolving approach to women in the force

We divided the years since the beginning of the All-Volunteer Force (AVF) into three phases, each defined in terms of the level of female representation in the DON forces, as well as the laws and policies governing the nature of women's participation in them, especially in combat roles. Movement through the three phases was determined by specific external events and prevailing social attitudes, as well as two overarching forces that tended to constrain evolutionary progress.

Evolutionary phases of gender integration

We call the first evolutionary phase the “early phase.” It runs from 1973 to 1993 and is primarily characterized by the complete formal prohibition on women serving in combat roles. During this phase, the question of whether and how women should serve in the military was seen more as a social and political issue than as an issue to be resolved analytically.

The second evolutionary phase is called the “transitional phase.” It runs from 1994 to 2007 and is primarily characterized by the relaxation of some combat restrictions for women. Policy questions during this phase focused on how to accommodate women without harming readiness. Policy research focused on managing female representation and its costs, and emphasized monetary incentives as a key force management tool.

Finally, we labeled the third evolutionary phase the “modern phase.” Starting in 2008, it continues through the present. The modern phase is primarily characterized by the total relaxation of combat restrictions for women. Policy questions and research in this phase have, and are currently, focused on how to achieve complete gender integration, including how to create an inclusive environment.

Evolutionary constraints

The first evolutionary constraint is cognitive bias in decision-making, which has tended to limit both the questions asked and the data used to assess the costs and benefits of increasing women’s presence in the DON’s active duty forces. The second is the emphasis on monetary incentives, which may fall short as a force management tool in the context of DON gender integration, especially when it comes to addressing gender gaps in retention. The strength of these constraints has gradually declined as the DON’s gender integration evolution has progressed.

Combined narrative

To summarize the study’s five analytical efforts, we characterized each according to how it aligns with the approaches associated with the transitional and modern phases of the DON’s gender integration evolution. We then grouped the efforts as follows: updating a transitional approach (Question #1), modern approaches that change the cognitive frame (Questions #2 and #3), and modern approaches that move beyond monetary incentives (Questions #4 and #5).

Updating a transitional approach: Question #1

Although the Navy has long used inventory project models (IPMs) for accession planning, none has been designed to aid in determining cost-minimizing combinations of accession and selective reenlistment bonus (SRB) strategies. To fill this gap and answer question #1, we created a prototype IPM and successfully demonstrated that personnel cost minimization can be made central to the IPM approach, and that jointly determining the optimal accession and SRB policies has the potential to achieve savings for the Navy. Viewed through the lens of the gender integration evolution, the effort also showed that, although we have associated IPMs with the transitional phase of the evolution, they remain an important personnel management tool, and that monetary incentives remain an important policy lever.

Changing the cognitive frame: Questions #2 and #3

Analytical approaches associated with the modern phase of gender integration can be characterized by their acknowledgment of—and in some cases, explicit challenge to—the evolutionary constraints. Questions #2 and #3 do both by adopting new underlying cognitive frames. Specifically, rather than taking lower female retention as given, question #2 assumes that the gender retention gap can be reduced with readiness-neutral policies. With this as a starting point, the analytical effort examined the determinants of post-bootcamp, pre-fleet losses for male and female Sailors, and found that the issue of higher female loss rates is not a general one, but is concentrated in a few highly technical ratings. The data also indicated that men and women attrite from these ratings for different reasons, which suggested next steps for research and subsequent policy formation. Question #3, in turn, switches the focus from the costs imposed by women to the costs imposed by men—specifically, the costs of higher rates of misbehavior. The analysis confirmed that male enlisted Sailors and Marines misbehave at higher rates than their female counterparts, and that this extra misbehavior imposes substantial costs. More generally, this analysis served as an example of how cognitive bias can lead to incomplete cost-benefit analyses of gender integration and may hinder effective and efficient use of personnel budgets.

Going beyond monetary incentives: Questions #4 and #5

To complete the gender integration evolution, the DON must also acknowledge the limitations of monetary incentives as a force management tool, and the DON has done this by offering non-monetary benefits to eligible servicemembers. The analytical efforts that addressed questions #4 and #5 assessed the retention effects of two such policies: colocation for servicemembers who are married to other servicemembers and expanded maternity leave, respectively. The assessment of the colocation policy indicated that collocating same-service DON enlisted personnel is positively associated with reenlistment for both men and women, but the effect is

greater for women. The assessment of the new maternity leave policy indicated that it has been positively associated with reenlistment rates for female Sailors and that the extra work weeks associated with the higher reenlistment rates more than offset the work weeks lost due to the longer leave. Both analyses indicate that non-monetary incentives can be effective and efficient policy tools for closing the retention gender gap.

Final thoughts

In addition to the recommendations associated with each analytical effort, we make two final recommendations for overcoming the evolutionary constraints to achieve true gender integration: DON policy-makers and analysts should make conscious efforts to avoid cognitive bias when framing policy options and research questions, and they should continue to think outside the box to identify innovative, non-monetary approaches to personnel management.

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Introduction

The Assistant Secretary of the Navy (Financial Management and Comptroller) (ASN(FM&C)) sponsored a multi-pronged effort to explore the effects of actual and potential personnel policy changes on Department of the Navy (DON) personnel inventories and budgets. A primary focus of the study was the impact of changes in the gender mix of personnel on retention and manning and the costs associated with maintaining the desired levels of each.¹

This document synthesizes the results of the various efforts undertaken for the study in a cohesive way that creates a whole that is greater than the simple sum of its parts.

Background and motivation

Having the right types of personnel in the right quantities is key to military readiness. This means that the quantity and quality of retention, and their impact on manning, are of paramount importance and must be constantly monitored and managed to ensure that the DON is best positioned to meet any given threat.

Personnel costs are, however, a large part of the DON budget and, whatever the budgetary environment, controlling such costs is a Department imperative. When budgets are tightening, the DON needs to know how to cut costs with minimal impact on readiness. When budgets are growing, the DON must take care to use extra dollars as efficiently as possible.

At the same time, the DON is seeking to maintain, and even increase, female representation among uniformed personnel across all paygrades and military occupations. Since women have, historically, had lower retention than men, this has implications for retention, manning, and budgets.

Questions addressed

The broad scope of this study required us to develop a detailed analytic plan to evaluate specific personnel policies. With the sponsor's concurrence, we made the changing female shares of personnel in the active components of the United States Navy (USN) and United States

¹ As part of the study, the team also estimated the potential savings associated with delaying E-2, E-3, and E-4 advancement. This analysis did not have a gender component. The results are reported in a memo to the sponsor.

Marine Corps (USMC) central to our plan. The result was a multi-pronged effort that addressed five specific questions related to gender, career outcomes, and costs:

1. How does the cost-minimizing combination of accession and selective reenlistment bonus (SRB) policies vary as the gender mix of Navy enlisted accessions changes?
2. What are the drivers of gender differences in Navy post-bootcamp, pre-fleet enlisted attrition rates?
3. What are the cost implications of gender differences in misbehavior among enlisted personnel in the Navy and the Marine Corps?
4. How does the gender mix of enlisted and officer endstrength affect the demand for collocation in the Navy and the Marine Corps, and what is the effect on retention?
5. How has the 2015 change in the maternity leave policy for uniformed personnel affected female reenlistment and manning in the Navy?

These questions emerged from discussions with the study sponsor with whom we worked to identify which gaps in the DON's understanding of the effects of personnel policies on retention, manning, and personnel costs could be addressed with analysis. For each question, the decision to include the Navy or the Marine Corps, and enlisted or officer personnel, was driven by the potential size of the policy effects on the outcomes of interest, the availability of data with sufficient sample sizes, and the resource limits of the study. Using these criteria, we analyzed the Navy enlisted force most frequently.

This document

To aid in disseminating the results of the study's multiple efforts, we were asked to present a combined summary of all the findings. This document fulfills that task.

To provide both context and a structure for the summary, we begin with a timeline of gender integration in the DON, which we characterize as an evolution that occurred in three phases and was subject to two constraining evolutionary forces. We define the three phases of integration not only by changes in the level of female representation in the DON forces, but also by changes in prevailing social attitudes about women in the military, especially women in combat, and by changes in governing laws and policies, including approaches to supporting policy research. The phases of gender integration that we present are our notions alone. There are other equally valid ways to view the DON's gender integration timeline. Moreover, although we cite previous research where applicable to illustrate our points, we do not provide a comprehensive literature review of gender integration in the Navy and Marine Corps; such an effort is beyond the scope of this study.

The second section of this document is the study summary itself. Specifically, we provide a synthesis of the five analytical efforts that is informed by our understanding the DON's gender integration evolution. We use the features of each evolutionary phase not only to explain the approach used to answer each question but also to interpret the findings.

The document ends with takeaways generated by this summary that add to the conclusions and recommendations presented in the reports produced for each separate effort, as well as some final thoughts on the implications of this study's research for the continued evolution of gender integration in the DON.

The DON's Evolving Approach to Women in the Force

In the 45 years since the beginning of the all-volunteer force (AVF), social attitudes about and laws governing the participation of women in the US armed forces have evolved substantially. Reflecting these external changes, the DON's approach to women in its forces has also evolved over time. In this section, we describe that evolution. First, we identify three key evolutionary phases and describe the gender-based policies and research underlying each phase. Then we identify two key evolutionary constraints and describe how they have moderated the DON's gender-integration evolution.

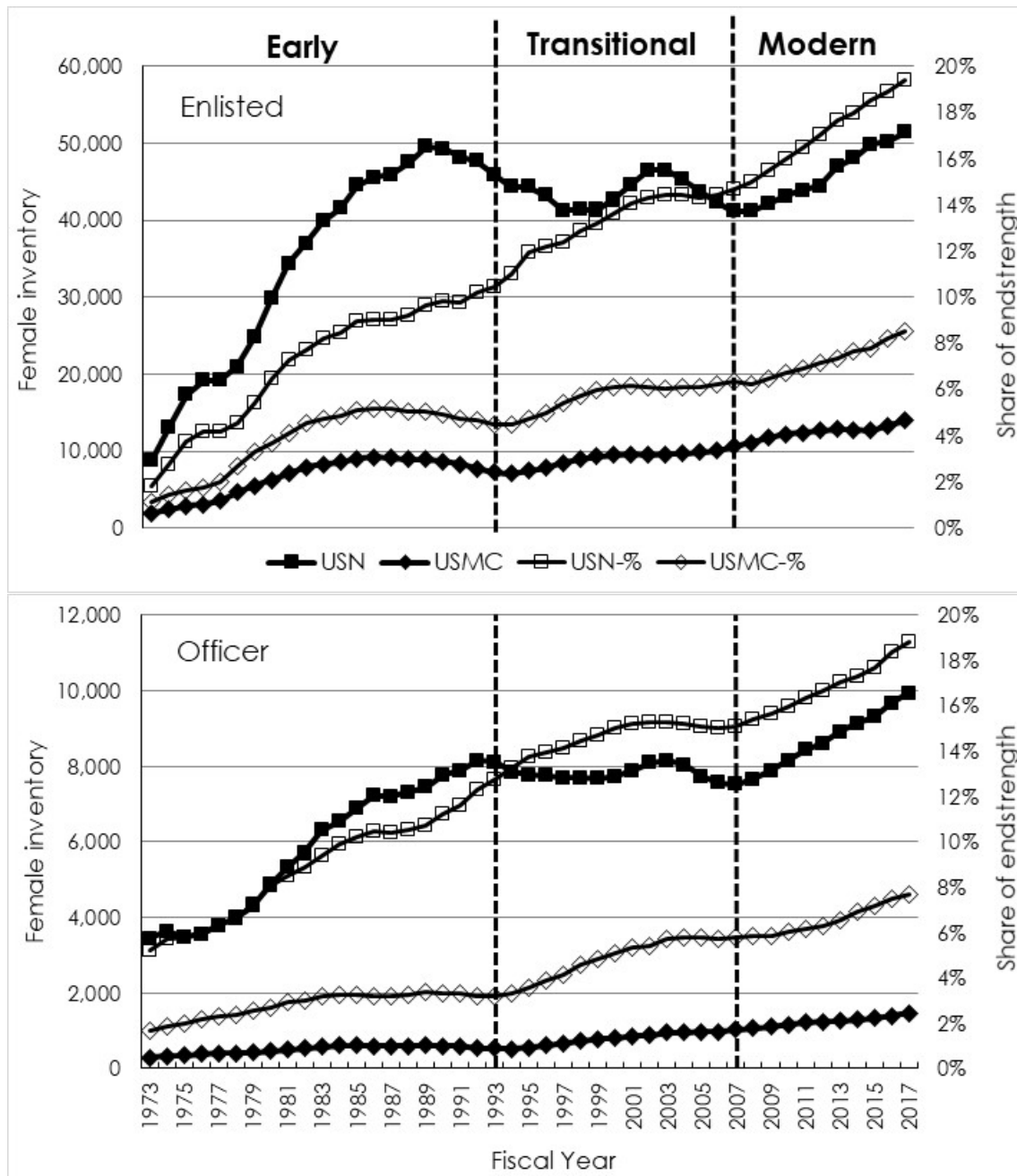
Evolutionary phases of gender integration

The two panels in Figure 1 show how female representation among DON enlisted and officer personnel increased from fiscal year (FY) 1973, the beginning of the AVF, through FY 2017, the most recent year of available data. For each group, the data include the number of female personnel and their share of total endstrength. The figure also shows how we use these data to define and describe the three phases of the DON's gender integration evolution, which we label "early," "transitional," and "modern."

Early phase: FY 1973 to FY 1993

As shown in Figure 1, what we call the "early phase" of the DON's gender integration evolution encompasses the first two decades of the AVF. In addition to the introduction of the AVF, relevant social and political forces during and immediately preceding this period include the Reagan military buildup and some key advances for women's rights following President Johnson's 1968 executive order prohibiting sex discrimination by government contractors and requiring affirmative action plans for hiring women. These advances include the passage by Congress in 1972 of both Title IX of the Education Amendment, which prohibits sex discrimination in all aspects of education programs that receive federal support, and the Equal Rights Amendment, which was intended to guarantee legal gender equality. The defining characteristic of this phase is the complete formal prohibition on women serving in combat roles.

Figure 1. Female representation among enlisted and officer personnel by DON service and evolutionary phase



Sources: Inventory data come from reference [1]; the evolutionary phases are defined by the authors.

Female representation during the early phase

During the early evolutionary phase, female representation in the Navy increased substantially: the number of female enlisted personnel increased more than five-fold, from 8,835 to 45,919, and the number of female officers more than doubled, increasing from 3,445 to 8,113. As a result of these increases in female inventory, female shares of total Navy enlisted (officer) endstrength rose from 1.8 (5.2) percent to 10.5 (12.8) percent. Average Navy enlisted and officer female endstrength shares were 7.2 and 9.0 percent, respectively.

Female representation also increased among Marine Corps personnel, but not as quickly. Increasing from 1,973 to 7,228, the number of female enlisted Marines more than tripled; the number of female Marine Corps officers increased by 75 percent, from 303 to 532. Throughout this early phase, female shares of both enlisted and officer Marine Corps endstrength remained below 5 percent, and the average Marine Corps enlisted and officer female shares were 3.8 and 2.8 percent, respectively.

Laws and policies on female participation during the early phase²

Underlying these increases in female representation were new laws and policies that expanded service opportunities for women but also kept many constraints in place. For example, a handful of changes around the beginning of the AVF opened the way for increased female participation in all the services. First, in 1967, Congress eliminated the 2 percent cap on women's share of each enlisted force. Then, in 1974, the legal age requirement for women enlisting without parental consent was made the same as the requirement for men. For officers, key accession programs were opened to women—the Reserve Officers' Training Corps in 1972 and the service academies in 1976. Changes in DON-specific policies also allowed women's participation to expand. In 1975, the Marine Corps allowed women to be assigned to all occupations except those in infantry, artillery, armor, and flight crews. The Navy, in its turn, opened pilot training and naval flight officer positions to women in 1973 and 1979, respectively, and the surface community was opened to women in 1978 when a law change permitted the Navy to assign women to permanent duty on noncombatant ships.

But, even with these changes, women were still strictly restricted to non-combat roles by a combination of law and policy. Specifically, the 1978 modification to Title 10 that allowed DON women to serve on noncombatant ships explicitly prohibited them from serving on Navy vessels or aircraft engaged in combat missions, and DON women were restricted from combat roles on the ground by the Department of Defense (DOD) policy known as the "risk rule." Implemented in 1988, the risk rule barred women from units and positions in which the "risk of exposure to direct combat, hostile fire, or capture is equal to or greater than that experienced

² Many studies have documented this history of women's participation in the US armed forces; see references [2-6].

by associated combat units in the same theater of operations” [7]. These combat restrictions limited not only the career fields available to women but also the positions within career fields to which they could be assigned. For both DON services, the risk rule meant that women could not be assigned to support units that were, or were likely to be, colocated with combat units. For the Navy, the combat exclusion laws limited the number of women who could be assigned to some otherwise open Navy occupational fields because of the need to maintain an acceptable sea/shore rotation rate for the men who were assigned to combat positions at sea [2-3, 6].

As a result of these policies, at the end of the early phase of gender integration, 39 percent of Navy positions and 77 percent of Marine Corps positions remained closed to women [5].

Research and analysis during the early phase

Throughout the early phase of gender integration, the Navy and the Marine Corps tracked male and female recruitment, retention, and career satisfaction as part of manpower planning. In particular, accession goals for men and women were based on program needs that were, in turn, determined by the assignment rotation limits set by the combat restrictions for women. (See references [3, 8-9].)

Research on the broader, more controversial policy questions of whether and how women should serve was limited, primarily because there were so few women to study. For example, from a readiness perspective, two key questions were whether women had the physical strength required to do many military jobs, and whether the introduction of women into the force would have a negative impact either on unit cohesion or on the “morale and efficiency of men who have taken pride in the masculinity of their profession” [2-3]. To answer questions about women’s potential physical limitations, officials (and others involved in the public debate) drew on data from the population at large indicating that, on average, women are smaller and have less upper-body strength than men, but neither the Navy nor the Marine Corps adopted occupation-specific physical standards and assessments [10-11]. Similarly, because there were no gender-integrated combat units to study, research could not be done in this area. Some reports did, however, cite the experiences of other countries as indicating that full gender integration had a negative effect because it was only done in crisis situations and restrictions on women in combat were re-imposed once the crises had past [2-3, 12].

Otherwise, the question of whether and how women should serve in the military was seen as a social and political issue, rather than one to be resolved analytically. In 1980, and again in 1991, a researcher for the Congressional Research Service described the debate about women in combat as a struggle between the push for women’s right to equal opportunity, on one hand, and prevailing ideas about women’s roles in society, on the other:

Those who emphasize equal rights and responsibilities say women in the armed forces cannot advance to the top without experience in combat units. Some go even beyond this, and say that women cannot be equal in society as

long as they are barred from full participation in all levels of the national security system.

Those opposed to women in combat contend that the protection of women is a mark of civilization and a method of safeguarding the human race.... They see permitting women in combat as an extreme deviation from tradition which would detract from the dignity and femininity of women and disturb family cohesion to such an extent that it might have a broad adverse impact on society. [2-3]

Transitional phase: FY 1994 to FY 2007

We have labeled the second evolutionary phase the “transitional phase.” It begins in FY 1994 and ends in FY 2007 when the data show, for all four groups of DON personnel, an up-tick in female representation after several years of relatively little change. Relevant events affecting this phase are the first Gulf War, which occurred at the end of the early phase, and the wars in Afghanistan and Iraq, which continued through the modern phase. The nature of women’s participation in the first Gulf War began to shift perceptions about women’s roles in combat, and women’s participation in the engagements in Iraq and Afghanistan accelerated that shift. More generally, the military drawdown of the 1990s tightened military budgets and strong labor market conditions focused attention on the use of special and incentive (S&I) pays as force management tools. The defining feature of this phase is the partial relaxation of combat restrictions for women.

Female representation during the transitional phase

The numbers of enlisted and officer women in the Navy fluctuated during the transitional phase, decreasing initially, then rising, then falling again. At the end of the period, the number of female enlisted (officer) Navy personnel had decreased by 3,195 (322), or 7.2 (4.1) percent. Because of the drawdown, however, the female shares of both enlisted and officer endstrength increased over the period, both reaching 15 percent, with average shares being 13.3 and 14.7 percent, respectively.

In contrast, the numbers of enlisted and officer women in the Marine Corps increased slowly but steadily over the period. The number of female enlisted (officer) Marines increased by 50.3 (94.5) percent, from 7,029 (529) in FY 1994 to 10,568 (1,029) in FY 2007. Despite these increases in numbers of women, female representation among enlisted and officer Marine Corps personnel remained relatively low, with average endstrength shares for both groups—5.8 percent for enlisted and 4.9 percent for officers—hovering around 5 percent.

Laws and policies on female participation during the transitional phase

The policies that defined female participation during the transitional phase constitute the first steps on the road to relaxing combat restrictions for women. In early 1994, Secretary of

Defense (SECDEF) Les Aspin notified Congress that combat aviation would be opened to women and that women would be permanently assigned to surface combatant vessels [5].³ He also issued a memo to replace the 1988 risk rule with the new Direct Ground Combat Definition and Assignment Rule. Announced in January 1994 (but not effective until October), the rule stated that all servicemembers “are eligible to be assigned to all positions for which they are qualified, except that women shall be excluded from assignment to units below the brigade level whose primary mission is to engage in direct combat on the ground” [14].⁴

Although the purpose of the new policy on ground combat was to open more positions to women, it still allowed the services to set assignment restrictions under four conditions:

- The service secretary attests that the cost of appropriate berthing and privacy arrangements is prohibitive;
- Units and positions are doctrinally required to physically collocate and remain with direct combat units that are closed to women;
- Units are engaged in long-range reconnaissance operations and Special Operations Forces missions; or
- Job-related physical requirements would necessarily exclude the vast majority of female servicemembers. [14]

The Navy implemented these DOD policy changes by removing all but the following restrictions on female participation: submarines⁵ and small ships were kept closed, as were any Special Forces assignments and assignments to units that would deploy and collocate with Special

³ These policy changes were enabled by preceding changes in law. Specifically, the law excluding women from serving in combat aircraft was repealed by the National Defense Authorization Act (NDAA) for 1992 and 1993 (passed in December 1991) [13], and the law excluding women from service on combatant vessels was repealed in November 1993.

⁴ The SECDEF memo also provided the following definition of direct ground combat: “Direct ground combat is engaging an enemy on the ground with individual or crew served weapons, while being exposed to hostile fire and to a high probability of direct physical contact with the hostile force’s personnel. Direct ground combat takes place well forward on the battlefield while locating and closing with the enemy to defeat them by fire, maneuver, or shock effect.” [14]

⁵ The issue of opening submarine service to women was revisited in 2000 when the Defense Advisory Committee on Women in the Services (DACOWITS) recommended that Navy leadership commit to integrating women into the submarine community. According to reference [6], however, the recommendation was opposed by both the Navy and Congress based on concerns about the costs of modifications and the possibility of sexual misconduct affecting unit cohesion and effectiveness.

Forces personnel.⁶ The Marine Corps, in turn, opened as many positions as possible within the direct ground combat constraints.⁷ According to reference [5], this left about 9 percent of Navy positions, and 38 percent of Marine Corps positions, still closed to women. More specifically, Table 2 shows the underlying reasons for keeping positions closed based on the four exclusion conditions provided by the Direct Ground Combat Definition and Assignment Rule. The data show that the key issue for the Navy was making adjustments to living conditions (primarily on submarines), while the key issue for the Marine Corps was direct ground combat.

Table 1. DON closed or restricted positions by service and DOD exclusion condition

| DON service | Direct ground combat | Collocation with ground combat units | Living arrangements are cost prohibitive | Special operations and long-range reconnaissance | Total |
|--------------|----------------------|--------------------------------------|--|--|--------------------|
| Navy | 0 (--) | 4,187 (12.5%) | 25,663 (76.9%) | 3,516 (10.5%) | 33,366 (100.0%) |
| Marine Corps | 28,469 (65.5%) | 14,991 (34.5%) | 0 (--) | 0 (--) | 43,460 (100.0%) |

Source: Reference [15], Table I.1

Research and analysis during the transitional phase

Research and analysis played a greater role in the DON's approach to female participation during the transitional phase than in the early phase largely because there were now more women participating across all paygrades and in a broader range of occupations. At one level, this meant female participation could be studied in a way that hadn't been possible during the early evolutionary phase because there were now larger female samples on which to base

⁶ According to reference [15], the following Navy career fields and ratings remained closed: Special Warfare Officer; Warrant Officer, Special Warfare; Submarine Duty Officer; Special Warfare Combatant Swimmers; SEAL Candidate; Special Warfare Combatant Craft Crewmember; Special Operations Independent Duty Corpsman; Special Operations Technician; Submarine Force Independent Duty; Aviation Boatswain's Mate Launch and Recovery Equipment; Fire Control Technician; Fire Control Technician, Ballistic Missile; Fire Control Technician, Gun Fire Control; Gunner's Mate, Guns; Gunner's Mate, Missile; Missile Technician; Sonar Technician, Surface; Sonar Technician, Submarine. The following ship types also remained closed: Fleet Ballistic Missile Submarine; Attack Submarine; Mine Counter Measure; Mine Hunter, Coastal; Patrol Coastal.

⁷ According to reference [15], the following Marine Corps career fields remained closed: Infantry; Artillery; Tank and Assault Amphibian Vehicle. The following military occupational specialties also remained closed: Ground Intelligence Officer; Counterintelligence Officer; Counterintelligence Specialist; Interrogation Specialist; Ordnance Vehicle Maintenance Officer; Towed Artillery Systems Technician; Assault Amphibian Repairer/Technician; Main Battle Tank Repairer/Technician; Ordnance Vehicle Maintenance Chief; Low Altitude Air Defense Gunner; Forward Air Controller/Air Officer; Low Altitude Anti-Air Warfare Officer; Marine Corp Security Force Guard; Marine Corp Security Force Close Quarter Battle Team Member.

rigorous quantitative and qualitative analyses. At another level, it meant that accounting for gender differences that affected manpower planning was more important and more complicated, so more rigorous research was required. Thus, research during this phase focused on both assessing the impact of the new policies and supporting efficient management of a more gender integrated force within the constraints of the existing manpower and personnel system.

Two key assessment studies were a 1997 study by the RAND Corporation [5] and a 1999 study by the Government Accounting Office (GAO) [16], both of which addressed the impact of gender integration on unit readiness, cohesion, and morale in the Navy, the Marine Corps, and the Army.⁸ Because readiness, cohesion, and morale are difficult to measure, both assessments were based on servicemembers' perceptions about these phenomena in their units. In general, both studies found that opening previously closed units to women did not harm readiness. The GAO authors noted that their results were similar to the results from the earlier RAND study, and summarized their conclusions as follows: "[M]ost men and women agreed that women either affected readiness no differently from men or affected readiness positively or very positively" [16]. Both studies did, however, raise some issues related to gender integration that needed continued attention. These included gender stereotypes and differential treatment of men and women.

Turning to implementation support, CNA studies for the Navy during this period focused on several key planning factors: the size of the female inventory [17] and the number of at-sea bunks for women [18-19] as constraints on women's assignment and participation; the impact on manning of unplanned losses and assignment limitations due to pregnancy [20-22]; and gender differences in retention, specifically lower retention for women [23-24]. It is notable that all but one of these studies was initiated in the first few years of the transitional evolutionary phase in response to the policy changes that marked its beginning. The exception is reference [24], which was done in 2006 to study gender differences in retention for officers in the surface warfare community in response to the emergence of a troubling gender retention gap.⁹ It is also the only study to look at officers rather than enlisted personnel. For the Marine Corps, only a few early CNA studies focused specifically on women. These include reference [26], which looked at career progression for female and other minority officers, and reference [27], which looked at the impact of pregnancy and other factors on the deployability of enlisted

⁸ Neither effort studied units in the Air Force, because most had already been open to women before the 1994 policy changes.

⁹ Reference [25], also released in 2006, used qualitative techniques to look at the reasons for the gender differences in retention among surface warfare officers.

Marine Corps personnel. Otherwise, CNA work for the Marine Corps focused on planning models that simply included gender as a factor [28-29].

A final key implementation study for the Navy was reference [30], which supported the decision to keep submarine service closed to women based on the conclusion that several *assumed* negative effects on readiness would outweigh the benefits of providing equal opportunities to women. This analysis did not acknowledge or count any potential readiness benefits associated with women in the submarine force.¹⁰

Later in the transitional phase there was an increased emphasis on using targeted compensation in the form of S&I pays and bonuses as force management tools. This new research focus was not related to gender issues, but rather a response to strong competition from the civilian labor market and tight budget constraints. For example, in 1999, the presidential charter for the Ninth Quadrennial Review of Military Compensation (QRMC) proposed a “targeted pay increase for noncommissioned officers and mid-grade officers who gained the skills, education, and experience so valued by our thriving private sector” [32]. As a result, much of the research for this QRMC focused on specific types of S&I pays, and the final report recommended that the DOD consider adopting special pays for overseas duty, critical skills retention bonuses, and skill and capability pays. See references [33-39] for the supporting research.¹¹

Then, in 2002, the presidential charter for the 10th QRMC called for particular attention to be paid to the potential for consolidating S&I pays and bonuses into fewer, broader authorities [45]. The goal was not, however, to decrease the scope for targeting specific force management needs, but to increase the flexibility for doing so in response to changing conditions. Thus, the 10th QRMC recommended consolidating the many existing S&I pays into eight broad categories:

- Enlisted Force Management Pay
- Officer Force Management Pay
- Nuclear Officer Force Management Pay
- Aviation Officer Force Management Pay
- Health Professions Officer Force Management Pay
- Hazardous Duty Pay
- Assignment or Special Duty Pay
- Skill Incentive/Proficiency Pay [45]

¹⁰ For a more detailed discussion of this decision, see [31].

¹¹ Additional work for the Navy on sea pay includes references [40-41], and work on assignment incentive pay includes references [42-44].

Modern phase: FY 2008 to current

Finally, the third evolutionary phase begins in FY 2008 and notionally runs through current time, though the data end in FY 2017. We call this the “modern phase” of the DON gender integration. As previously noted, the choice to end the transitional phase in FY 2007 and begin the modern phase in FY 2008 was driven by the data as FY 2008 shows the beginning of a new period of increasing female representation among DON personnel. The beginning of the modern phase is also marked, though less precisely, by changes in thinking about women’s participation in combat due to their performance in Iraq and Afghanistan. In particular, despite the combat exclusion policy, women from all the military services successfully performed ground combat roles in both operations.¹² At the same time, there was an increased emphasis on diversity in the workplace, including a new emphasis on inclusion rather than assimilation. Combined, these changes in attitudes renewed congressional interest in equal opportunities, especially promotion opportunities, for women in the military. The defining feature of this phase is the complete relaxation of all formal, gender-based restrictions on women in combat.

Female representation during the modern phase

After declining during the transitional phase, the numbers of women in the Navy resumed their steady increase during the first 10 years of the modern phase. The total increases were 10,216 (24.8 percent) for enlisted Navy personnel and 2,288 (29.9 percent) for Navy officers. As a result, female shares of Navy endstrength approached 20 percent, with female shares of enlisted and officer endstrength reaching 19.4 and 18.8 percent, respectively. The average for both groups was 17 percent.

The numbers of female Marines continued to steadily increase: the size of the female enlisted (officer) inventory increased by 25.4 (37.0) percent, from 11,113 (1,072) in FY 2008 to 13,938 (1,469) in FY 2017. In terms of endstrength shares, female representation among Marines still remained below 10 percent, with the female share of enlisted endstrength reaching only 8.5 percent and the female share of officer endstrength reaching only 7.7 percent. The averages for the two groups of Marine Corps personnel were 7.3 and 6.6 percent, respectively.

Laws and policies on female participation during the modern phase

During this phase, all gender-based restrictions on female participation in the US armed services were eliminated, so all career fields, and positions within them, are now technically open to women. The relaxation of these final constraints occurred over several years through a combination of incremental changes in law and policy. These changes are summarized in chronological order in Table 1.

¹² See references [46-48].

Table 2. Timeline for elimination of combat exclusions

| Year | Key Legislative and Policy Actions | Law |
|------|--|---|
| 2008 | The Military Leadership Diversity Commission (MLDC) is established to review promotion and command opportunities in the armed services by ethnicity and gender. | P.L. 110-417; 122 Stat. 4476; October 14, 2008 |
| 2010 | DOD notifies Congress of intent to allow women to serve on submarines. | NA |
| 2011 | Congress mandates review of the Direct Ground Combat and Assignment Rule. | P.L. 111-383; 214 Stat. 4217; January 7, 2011 |
| 2011 | The MLDC issues its final report in March and recommends that the DOD eliminate gender-based combat exclusion policies using a phased approach. | NA |
| 2012 | DOD eliminates the colocation restriction from the Direct Ground Combat and Assignment Rule. | NA |
| 2013 | DOD repeals the Direct Ground Combat and Assignment Rule, removing barriers to the assignment of women to combat units and occupations, and directs implementation by January 1, 2016. | NA |
| 2014 | Congress issues validation criteria for the development of gender-neutral occupational standards. | P.L. 113-291; 128 Stat. 1919; September 19, 2014 |
| 2015 | Congress issues an additional validation criterion for the development of gender-neutral occupational standards and reduces the notify-and-wait period for congressional review to 30 calendar days. | P.L. 114-92, November 25, 2015. |
| 2015 | The SECDEF announces all combat roles and units open to women. | NA |

Source: Adapted from reference [6].

The decision to open submarine service to Navy women occurred earliest, and was announced when the DOD formally notified Congress of this intention in January 2010. According to [31], a driving factor behind the decision was “the recognition that excluding women from submarine service limits the Navy’s ability to select the best and the brightest for these highly technical and demanding jobs.” Following the phased integration plan, the first female officers

entered training in July 2010 and took positions on submarines in December 2012. The first enlisted women entered the training pipeline in August 2015 and were assigned to boats in August 2016. By April 2017, there were 80 female officers and 50 female Sailors in the submarine community [49].

The final relaxation of the restrictions on ground combat didn't occur until five years later, in 2015. For the Navy, this meant opening positions in the enlisted and officer naval Special Warfare communities (e.g., SEALs). As of April 2019, however, no women have been selected for these positions. For the Marine Corps, this meant opening the combat arms career field and the primary military occupational specialties (PMOSs) within it, as well as assignments in otherwise unrestricted PMOSs below the division level in the ground combat element. According to [6], as of September 2016, the Marine Corps had integrated 174 women into combat units, and the first three enlisted women to transfer into operational infantry positions were slated to report to their units in January 2017. As with the Navy, no female Marines have yet been assigned to special operations units. In both DON services, both women and men must complete demanding training pipelines to qualify for classification and eventual assignment to special operations career fields.¹³

Research and analysis during the modern phase

Research in the modern evolutionary phase has begun to focus on how to achieve the final integration of women into the DON services. Some of the efforts have been directly aimed at supporting the new policies that allowed women to serve in combat roles; others have been geared toward developing an inclusive approach to gender integration. Efforts in both categories have used innovative analytical methods that became more feasible than in earlier phases, due to improvements in computing capabilities and data quantity and quality.

For the Navy, two CNA studies were conducted to facilitate gender integration in the submarine community. The initial study, released in 2001, addressed the mechanics of developing and sustaining populations of female officers and enlisted personnel within the existing manpower and personnel system, as well as the potential management challenges that submarine community leaders and commanding officers might face [31]. Then, a 2014 study directly supported the enlisted integration by developing a discrete-event model to simulate the flow of enlisted women from accession through their submarine careers [50].

¹³ Specifically, as of April 2019, the CNA field representative to the Naval Special Warfare Development Group confirmed that no women have completed the Basic Underwater Demolition/SEAL (AKA, "BUDS") training, so there are not yet any female SEALs. Similarly, the CNA field representative to the Naval Information Warfighting Development Center in Norfolk confirmed that, while one woman did complete phases I and II of the Marine Corps Forces Special Operations Command (MARSOC) Assessment and Selection (A&S) Program, she did not advance to the next phase. Thus, there are not yet any female Critical Skills Operators or Special Operations Officers.

To support the gender integration of combat units, the Marine Corps created a Women in Service Restriction Review Operational Planning Team that sponsored and coordinated a series of studies addressing two primary lines of research. The first line of research addressed gender differences in physical abilities and injury rates and the creation of gender-neutral occupational standards. (See references [51-52].) The second line of research addressed a broader set of management issues, including the potential impact of gender integration on unit cohesion, combat effectiveness, and recruiting and retention. (See references [51-56].)

Research to support a more inclusive approach to gender integration has attempted to get past the gender stereotypes that dominated the earlier evolutionary phases and to understand whether and why men and women have different experiences as servicemembers. The focus has been on gender differences in career progression, especially retention and reenlistment. For example, for Navy officers, two 2018 studies (references [57] and [58]) used data from fitness reports (fitreps) to explore whether gender is a statistically significant determinant of retention even after controlling for performance. Then, to understand the potential impact of the work environment, reference [58] also used fitrep data to control for the quality of commanding and executive officers, while reference [59] examined whether the gender composition of an officer's early-career ship crews made a difference. For Navy enlisted personnel, reference [31] addressed the crew composition issue by controlling for the presence of women in a model of first-term reenlistment rates in the surface fleet.

Still other studies looked more directly at potential policy solutions. For example, reference [31] used quantitative data to confirm the qualitative result from the 1997 RAND study [5] indicating that including senior enlisted women in gender-integrated crews can have a positive impact on the retention of both male and female Sailors. Finally, reference [60], an evaluation of the Navy's Career Intermission Program, and references [61] and [62], analyses of the assignment and retention patterns of Navy and Marine Corps military mothers, supported the DON's effort to develop policies to improve work-life balance for both male and female servicemembers.

Evolutionary constraints

For each evolutionary phase, our descriptions above identified a few defining cultural, political, and/or economic factors. Here, we identify two overarching forces that operated in the background of every phase to shape the DON's approach to both policy and research over the course of its gender integration evolution. Specifically, we identify two constraining forces whose strength gradually declined as the evolution progressed. The first evolutionary constraint is cognitive bias in decision-making, which has tended to limit both the questions asked and the data used to assess the costs and benefits of increasing women's presence in the DON's active duty forces. The second is the emphasis on monetary incentives, which may fall

short as a force management tool in the context of DON gender integration, especially when it comes to addressing gender gaps in retention.

Cognitive bias in decision-making¹⁴

Research has shown that cognitive bias can distort both decision-making processes and their outcomes. In particular, there are five forms of interrelated bias that have worked to shape decision-making in the context of gender integration in the DON. These are discussed below.

Biases that distort decision processes

The first type of bias is *status-quo bias*, which is essentially a preference for the status quo. It develops when a change is perceived as risky, so decision-makers overweight the potential costs of that change relative to its potential benefits. Related to status quo bias is the second type of bias—*omission bias*, which is a tendency to favor an act of omission over one of commission. In situations where sins of commission are expected to be punished more severely than sins of omission, the status quo is likely to be particularly appealing.

The third type of bias is *anchoring bias*. This occurs when, in the process of considering a decision, the mind gives disproportionate weight to the first information it receives. Thus, initial impressions or data anchor subsequent choices and judgments. A near-relation to anchoring bias is *confirmation bias*, which causes people to look for evidence that confirms opinions they already hold. Such opinions can be based on initial evidence (much as an anchoring bias is), or on stereotypes or unconscious bias.

The final type of bias is *framing bias*. Framing bias occurs when a decision-maker's preferences over a range of options depend on how those options are presented. Framing bias is especially important because it can trigger all the others. For example, choices in which one option is framed as the status quo and other options are framed as changes from the status quo are likely to trigger status quo bias. Similarly, framing can introduce new, or trigger existing, anchors, as well as lead toward confirming evidence.

Cognitive bias in the context of DON gender integration

The extent to which cognitive bias has shaped DON decision-making processes and underlying research has progressively declined over the three phases of the DON's gender integration evolution.

In the early and transitional phases, when motivated by civil rights concerns, the question of women's participation in the military was framed in terms of accommodating women's right

¹⁴ This subsection largely draws from a 2006 *Harvard Business Review* article, "The Hidden Traps in Decision Making" [63]. Additional studies on cognitive bias and decision-making include references [64-69].

to equal opportunity without increasing costs or harming readiness. This was a false dichotomy that reflected status quo bias. It resulted in a great deal of attention being placed on the costs of women in terms of lower retention, assignment limitations that result from pregnancy, and the need to reconfigure berthing on ships and submarines; very little attention was given to the potential benefits of including women in the force or to the ways that men might impose costs that women do not. Seen in this light, the exclusion conditions in the Direct Ground Combat Definition and Assignment Rule and the accompanying decisions to keep submarines and combat positions closed to women may have been affected by status quo bias.

In the transitional phase, interacting anchors and opinions also affected the analysis of DON gender integration. In particular, the stereotypical notions that women are either less inclined or less qualified to serve in the military interacted with the anchoring fact that the new cohorts of women retained at lower rates, to create the impression that gender differences in retention were immutable phenomena that had to be taken as facts and managed around. More generally, these cognitive biases combined to create a myopic approach to cost-benefit analyses of gender-related policies. In particular, research paid very little attention to understanding how accommodations that are notionally made for women might also benefit men and the organization overall. This approach to managing women in the DON forces was more akin to accommodation and assimilation than to true integration and inclusion.

In the modern phase, as attitudes about women in the military have changed and as female representation in the services has increased, the constraining impact of cognitive bias has lessened, and research to support more inclusive policies has begun to use new cognitive frames. Examples are exploring the possibility that women's relatively low retention is not due to an inherent distaste for military life but due to potentially changeable aspects of DON policy or culture; and acknowledging the potential benefits of gender integration, not only in terms of what the women themselves bring to the table, but also in terms of the positive effects of improvements in work-life balance and command climates for all servicemembers.

Emphasis on monetary incentives for force management

In FY 2017, the total military personnel budgets for the Navy and Marine Corps were approximately \$30 billion and \$14 billion, respectively. Of these totals, various types of monetary compensation constituted the vast majority [70-71]. Thus, to a large extent, efficient management of military personnel costs is about efficient management of military compensation. In the discussion of policy research in the transitional evolutionary phase, we noted that, since FY 2000, the DOD and the DON have increasingly emphasized targeted S&I pays and bonuses as a means to achieve efficient force management. Here, we provide a little more detail on the differences between basic compensation and targeted monetary incentives and summarize some general ideas about the roles and efficiency of each type. Then, we discuss how these ideas about efficiency might not apply in the context of gender integration.

The roles and efficiency of different types of monetary compensation

From an employer's perspective, a compensation system should achieve several basic goals in ways that are consistent with organizational values. Reference [72] summarizes the goals of the DON's compensation system as follows:

- Attract and retain the right overall number of personnel.
- Attract and retain the right types of personnel.
- Motivate effective work.
- Allocate personnel across jobs.
- Provide subsistence.
- Promote equity.

Different kinds of compensation can be targeted to achieve each of these goals at different levels of cost-effectiveness. Thus, the compensation that servicemembers receive as annual income comes in two broad categories—regular military compensation (RMC) and special pays and bonuses.¹⁵

RMC includes basic pay, basic allowances for food and housing, and the tax advantage that accrues because the allowances are not subject to federal income tax. RMC is the largest component of military compensation; in FY 2017, basic pay and basic allowances accounted for over 70 percent of total DON pays and allowances [70-71]. All components of RMC increase with paygrade and/or length of service (LOS), and the basic allowances also vary by location and dependents status. Based on this design, RMC works to achieve most of the goals listed above. First, it provides a base level of compensation that not only provides subsistence, but is also sufficiently competitive relative to civilian compensation to attract and retain enough enlisted and officer recruits to man the AVF. The fact that RMC increases with paygrade also helps motivate effective work when combined with the merit-based promotion system, while the geographic variation in allowance amounts helps allocate personnel to jobs across high- and low-cost-of-living locations. Finally, the fact that RMC is the same for everyone in the same paygrade-LOS cell, regardless of occupational specialty or service, helps promote equity across the DON force.¹⁶

Although this last feature of RMC is intentional because of the desire to promote equity, it means that RMC is not an effective tool for attracting and retaining specific types of personnel or allocating personnel across different types of jobs. Thus, the DON achieves these goals with

¹⁵ Retirement pay is another large component of military compensation, but it is deferred compensation from the servicemember's perspective, so we don't discuss it here. In FY 2017, the retirement pay accrual constituted 14 percent of the total DON budget for pay and allowances [70-71].

¹⁶ See [72] for more discussion of how RMC works to achieve these goals of the military compensation system.

S&I pays and bonuses, which are targeted to specific needs. For example, skill-specific enlistment bonuses (EBs) and SRBs for enlisted personnel, and community-specific retention bonuses for officer personnel, create occupational pay differentials that are absent from RMC. In particular, these pays are used to target critical skills for which the supply of personnel is small relative to the demand, either because the skills are inherently scarce or because there are relatively more or better civilian opportunities. Similarly, assignment incentive pay, sea-duty pay, and hazardous duty pay are compensating differentials for difficult, dangerous, or unpleasant jobs. Several studies have demonstrated that the targeted nature of these pays makes them more cost-effective than RMC for achieving the sorting and allocating goals of the Navy's compensation system.¹⁷ Compared to RMC, S&I pays are a much smaller part of total DON compensation, accounting for only 5 percent of total pays and allowances in FY 2017 [70-71].

The inapplicability of monetary incentives in the gender-integration context

In 2002, the 9th QRMC recommended that RMC for officers and enlisted personnel should be set at around the 70th percentile of civilian pay for individuals with similar demographic characteristics [32], and since that time RMC has achieved or exceeded that benchmark.¹⁸ In general, this level of compensation has been considered successful at achieving the overall desired levels of recruitment and retention across the services, even during the years when the engagements in Iraq and Afghanistan put pressure on both [77-78].

As we have seen, however, women remain a disproportionately small part of annual DON accessions and women's retention and reenlistment lag behind men's at several career points. In other contexts, when RMC leaves a recruitment or retention gap, S&I pays and bonuses are used to target the group whose market choices aren't sufficiently responsive to RMC. This is not, however, either possible or desirable when the targeted group is defined by gender or any other legally protected characteristic. Specifically, not only is it illegal to offer a gender-based pay differential but doing so would undermine the goal of using the compensation system to promote equity.

Thus, the DON needs to consider other ways to increase women's share of the force and address the gender differences in retention, which is exactly what the shift in policy and research focus in the modern phase has done. By adopting a more inclusive, more complete

¹⁷ See, for example, references [72-76], which also provide more detail on the theories for why these pays are more efficient.

¹⁸ The 11th QRMC reported that, in 2009, RMC for all active-component military personnel was at about the 90th percentile for enlisted members and 83rd percentile for officers [77]; in 2016, RAND estimated that it was at the 84th percentile for enlisted personnel and the 77th percentile for officers [78].

approach to gender integration, the DON has begun to consider the efficacy of policy tools other than compensation. Of course, compensation—both RMC and S&I pays—still matters, but it is only one tool in the force management tool kit.

Summary

In this section, we described the evolution of gender integration in the DON by dividing the period of roughly 45 years between the introduction of the AVF and the current day into three phases, each defined by the nature of female participation and the extent of female representation in the DON's forces. For each phase, we also characterized the DON's approach to managing the women in its ranks as it moved from minimizing representation and its associated costs, to managing representation and its costs, to working towards full gender integration.

Understanding the DON's gender integration evolution serves two purposes. The immediate purpose is to inform the next section's summary of the study's five efforts in one combined narrative. More generally, however, it can help the DON continue to move through the evolutionary phases to complete gender integration. By explicitly acknowledging that policies and policy research in the early and transitional evolutionary phases were limited by the evolutionary constraints, the evolutionary construct can encourage decision-makers to think objectively and creatively about personnel policy options going forward.

Combined Narrative

The research undertaken as part of this study is characteristic of research in the first 10 years of the modern phase of the DON's gender integration evolution: it is less affected by the evolutionary constraints than research from the early and traditional phases, but is not yet entirely free of them. To summarize the study's five analytical efforts, we characterized each effort according to how it aligns with the approaches associated with the transitional and modern phases and organized the narrative as follows:

- An updated transitional approach: The analytical effort associated with Question #1 aligns with the policy and research approaches of the transitional phase of gender integration in which the gender gap in retention is fixed and monetary incentives are the key to changing retention behavior.
- Modern approaches that change the cognitive frame: The analyses associated with Questions #2 and #3 align with the modern-phase policy approach in which the framing of questions is less affected by cognitive bias. Specifically, Question #2 explores reasons for the gender gap in retention, rather than taking it as a given, while Question #3 considers costs imposed by men.
- Modern approaches that move beyond monetary incentives: The analytical efforts associated with Questions #4 and #5 align with the modern phase of gender integration. They evaluate DON policies that implicitly acknowledge the limitations of monetary incentives to address the gender gap in retention.

Updating a transitional approach

Military personnel management entails making plans for recruiting, training, and maintaining sufficient numbers of personnel with the skills and experience levels needed to meet service requirements. An important personnel management tool is inventory projection models (IPMs) which are designed to predict the degree to which current personnel inventories can meet future requirements. During the transitional phase of the DON's gender integration evolution, IPMs that allowed male and female career progression to evolve differently became especially important as female shares of accessions and inventories increased, but gender differences in retention also emerged.

Following this tradition, two recent examples of Navy enlisted IPMs are the IPM developed by the Total Force Manpower, Training, and Education Requirements Division (OPNAV N12) and the Navy Enlisted Management Model (NeMMo) developed under the guidance of the Navy's

Research, Assessment and Modeling Branch (OPNAV N1T). Both models were developed in part to help with accession planning as the female share of the force increased. Specifically, using recent historical female and male accession shares for each enlisted management community (EMC), both models simulate EMC-specific career progression by gender, and project changes in manning rates (i.e., inventory-to-requirements ratios) at sea and on shore as the total number of accessions, the share of accessions by EMC, or the female share of accessions in each EMC is changed.¹⁹

Although we are now well into the modern phase of the DON's gender integration, this transitional-phase approach to personnel management is still appropriate given the military's closed personnel system. Specifically, it is often necessary to model the flow of personnel through the 20- to 30-year military career, and doing this requires making some assumptions about career progression patterns, including retention rates, for key groups of personnel. Thus, when using tools such as IPMs, analysts may take prevailing gender differences in career progression patterns as given, not because they are subject cognitive bias, but because they consider these patterns to represent the most reasonable assumptions at the time. New modeling approaches can, however, be used to make tools such as IPMs even more useful.

Modifying the IPM: Question #1

A key tenet of efficient manpower and personnel policy is to achieve desired manning levels at the lowest possible cost. When female servicemembers have lower average retention rates than their male counterparts, increasing female shares of accessions means that, all else equal, the services have two basic options for filling requirements at senior grades: bring in more accessions and carry higher junior grade inventories or buy more retention. Both options will entail higher personnel costs. If the services choose to bring in more accessions, they will incur higher total recruiting, training, and compensation costs; if they choose to buy more retention, average compensation will be higher. It is also possible, however, that adopting a combination of accession and retention policy changes could be used to minimize the costs of achieving the desired manning level.

A potential limitation of the existing IPMs is that they are not explicitly designed to find such personnel cost-minimizing solutions. Indeed, the analytical approach underlying these models may favor a policy of increasing the number of accessions in response to an increase in the female share of accessions, possibly overlooking a more efficient retention policy or combination of accession and retention policies.

¹⁹ We refer the readers to [79] or to [80] for more details about each model, including how they differ.

It is this limitation of the current IPM approach that motivated the first of the five questions addressed in this study: How does the cost-minimizing combination of accession and SRB policies vary as the gender mix of Navy enlisted accessions changes?²⁰ To address this question, we created a model to jointly determine the cost-minimizing combination of accession and reenlistment policies to achieve a desired manning level as the female share of accessions changes.

This analytical effort is consistent with approaches used during the transitional phase of gender integration because we take as a given the assumption that gender differences in Navy enlisted retention are fixed, and we do not explore alternatives to traditional monetary incentives to change reenlistment behavior. In other words, we modify the analytical approach used with previous IPMs, but, while we are cognizant of the evolutionary constraints on gender integration, we do not challenge them. The effort is documented in [80].

Approach

We built a prototype model to find cost-minimizing accession-SRB solutions to fill requirements when the female share of accessions is changed. Specifically, we built a stochastic inventory projection model (SIPM) that simulates the movement of every male and female Sailor from accession through his or her Navy career. To establish a proof of concept, we included only five EMCs in our prototype model, which we chose to cover a range of sea duty intensity and female representation.²¹ The model is stochastic because each Sailor's career progression is dependent on probabilities for annual continuation (versus loss) and advancement. To set the baseline inventory simulation, we used recent billets authorized (BA) by paygrade for each EMC as the benchmark for requirements, and we used recent accessions and inventory to initialize the simulation. We based our stochastic treatment of Sailor career progression on recent historical rates for continuation and advancement.

The model includes three categories of personnel costs. The first category is recruiting costs, which vary by EMC based on differences in required recruiting effort, advertising costs, and EBs. The second category is Sailor compensation by paygrade, which we derived by subtracting

²⁰ We did not develop a parallel model for the Marine Corps because, given the lower level of female representation their requirement for such a model was not as urgent as the Navy's, and we had to prioritize the allocation of study resources.

²¹The five EMCs are Machinist's Mate (Surface Warfare) (MMSW), Operations Specialist (OS), Aviation Ordnanceman (AO), Yeoman (YN), and Hospital Corpsman (HM).

EB and SRB amounts from annual DOD composite rates for the Navy. The third category is SRB costs, for which we computed starting values based on recent SRB levels for each EMC.²²

Our modeling and optimization approach has two stages. In the first stage, the model finds separate, optimal accession and SRB plans for each of five EMCs. The optimal plans minimize total personnel costs while satisfying desired manning levels and a desired female share of accessions. For the second stage, we assumed that Navy policy-makers also face constraints on the total number of accessions and the total SRB budget for all five EMCs combined, along with a desired female share of total accessions and desired manning levels. A second optimization routine then finds the cost-minimizing distribution of female accessions across all five EMCs.²³

Results

Our results show that modeling changes to accession and SRB levels simultaneously—rather than considering changes to accession and SRB levels in isolation—can yield savings for the Navy. In addition, we show that the cost-minimizing combinations of accessions and SRBs can vary by EMC. For example, when we increased the female share of accessions in the HM EMC from its recent historical share of 31 percent to 36 percent, we found that the cost-minimizing solution increased both accession and SRB levels.²⁴ By contrast, when we increased the female share of accessions for the Aviation Ordnanceman (AO) EMC from its recent historical share of 35 percent to 40 percent, we found that the cost-minimizing solution was to increase accessions and reduce SRBs to zero.

Using the second optimization routine to address constraints on the total number of accessions and the total SRB budget, we demonstrate that our prototype model can find the optimal allocation of female accessions across the five EMCs given a desired female share of total accessions.

Conclusions and recommendations

This effort demonstrates three points. First, personnel cost minimization can be made central to an inventory projection modeling approach. Second, jointly determining the optimal accession and SRB policies in response to a change in the female share of accessions has the

²² We assumed that the reenlistment rate response to a one-level increase in SRB can vary by EMC and follows results based on previous CNA research [81].

²³ In the first stage of the optimization, we used a grid randomized iterative descent (GRID) search technique. In the second stage of the optimization, we searched over the range of results from the first stage optimization—derived by varying the desired female accession percentage for each EMC—to find the optimal distribution of female accessions across the EMCs. See [80] for details.

²⁴ For the HMs, the optimal solution was 8.5 percentage points less costly than increasing SRBs only, and 3.5 percentage points less costly than increasing accessions only.

potential to achieve savings for the Navy. Third, if decision-makers face constraints on the total number of accessions and the SRB budget, this modeling approach can determine the cost-minimizing spread of the desired female share of total accessions across all EMCs.

The results also provide evidence that developing a true all-Navy SIPM/cost minimization model could be beneficial for accession and retention policy planning. Our prototype, however, is not yet a mature model. We recommend the following for future model development:

- Continue to develop the prototype model to include more categories of personnel costs and Navy career event details. These include:
 - expanding and refining the definition of meeting requirements
 - refining the modeling of career progression
 - incorporating a more complete set of costs in the model.
- Expand the prototype to include all of the Navy's EMCs.

Implications

Although we have associated them with the transitional phase of the DON's gender integration evolution, IPMs remain an important personnel management tool in the closed military personnel system. Likewise, monetary incentives remain an important policy lever, especially in the short run. This is why we recommend further developing the prototype model. However, thinking in the broader terms of the DON gender integration evolution, we also see that it is important to be aware of how the evolutionary constraints may still be operating. In this case, it is worth noting that cost minimization may not be the most inclusive criterion for distributing female accessions across occupations.

Changing the cognitive frame

Analytical approaches associated with moving from the transitional phase toward the modern phase of gender integration can be characterized by their acknowledgment of—and in some cases, explicit challenge to—the evolutionary constraints.

For example, the cognitive biases evolutionary constraint can lead to assuming that the retention gender gap is fixed when undertaking personnel policy analysis. While this assumption may be appropriate for any given planning exercise, as done in the prototype IPM developed to answer Question #1, moving toward complete gender integration also requires that it be tested. Specifically, to determine whether this assumption is valid, we must identify the reasons for lower female retention. If the gap is the result of immutable gender differences that cannot be addressed with Service policies and practices, then the assumption is valid. Otherwise, the assumption is not valid and may hinder both gender integration and effective and efficient use of personnel budgets.

To identify the drivers of retention differences, however, we must first identify the places in military careers where female retention lags behind male retention. Once we have identified the leaks in career progression for women, we can explore the reasons that it occurs, with the understanding that the reasons may differ over the course of a career.

Previous research has already identified some specific career points where differences in male and female retention rates occur. We know from previous CNA research that female DEP and bootcamp completion rates lag behind men's [82-83]. We also know that in more recent years, female reenlistment rates can lag behind men's [83]. Relatedly, in some cases, women also have lower advancement rates than men [84].

Calculations prepared for [31] and [50] suggested that there were gender differences in the loss rates from the Navy during the time when accessions undergo early rating-specific training (i.e., post-bootcamp) but before full duty assignment to the fleet for a small group of EMCs. To our knowledge, however, gender differences in post-bootcamp, pre-fleet attrition rates have not been systematically examined across the enlisted Navy.

Exploring the reasons for lower female retention: Question #2

Our second analytical effort is a continuation of the approach to identify where female retention lags behind male retention in military careers and why. Specifically, it addresses Question #2: What are the drivers of gender differences in Navy post-bootcamp, pre-fleet enlisted attrition rates? Here we expand the examination to all Navy skill specialties. The analysis is documented in [85].

Approach

We used data from CNA's enlisted street-to-fleet (STF) database for this analysis.²⁵ We calculated loss rates from the Navy during the time when accessions are undergoing early rating-specific training (i.e., post-bootcamp) but before full-duty assignment to the fleet (i.e., pre-fleet) by gender.²⁶ We paid particular attention to differences in loss rates from highly technical ratings requiring high Armed Services Vocational Aptitude Battery (ASVAB) scores for entry. These Sailors are among the most expensive to recruit and have long (i.e., expensive)

²⁵ The STF is composed of Navy enlisted personnel records organized to follow Sailors from as early as entry into the Delayed Entry Program (DEP) through their active duty careers.

²⁶ As we describe in [85], a Navy rating is a general enlisted occupation which can include multiple related skill specialties known as *enlisted management communities* (EMCs). For example, recruits who enter the Navy with a promise of training for a Nuclear Field (NF) rating may specialize in any one of eight associated surface ship or submarine nuclear EMCs. In this report, we consider a recruit to have reached the fleet in a promised rating if he or she reached the fleet in any of the EMCs associated with that rating.

training pipelines; therefore, early exit from the Navy is especially costly compared with losses from other post-bootcamp, pre-fleet training pipelines. If gender differences in loss rates exist, we examined whether factors other than gender might explain the differences in loss rates. Finally, we used data on loss codes in personnel records to determine whether reported reasons for the losses differ by gender.²⁷

Results

We found gender differences in post-bootcamp, pre-fleet loss rates in only a few ratings, all in highly technical specialties. Specifically, we found that female rates were higher than male rates in the Advanced Electronics and Computer Field (AECF), the Nuclear Field (NF), and some Cryptologic Technician (CT) fields. In these ratings, female post-bootcamp, pre-fleet loss rates have exceeded male rates by 50 to 100 percent or more since the 1990s. We found that the gender difference in loss rates persists even after accounting for differences in test scores and other factors that could be associated with both gender and loss rates. Furthermore, we found that differences in the length of post-bootcamp, pre-fleet training pipelines across Navy ratings do not explain the gender differences in post-bootcamp, pre-fleet loss rates that we observe.

We also found that women who leave the Navy in the post-bootcamp, pre-fleet period from these rating pipelines are more likely than men to be assigned loss codes indicating health (physical and mental) or family issues, such as “Medical,” “Pregnancy,” or “Parenthood.” Male losses are more likely to be assigned loss codes indicating behavioral issues, including “Drugs,” “Alcohol,” “In lieu of court martial (CM),” and “Other misconduct.” In addition, we found that, compared with male losses, female losses are more likely to be assigned reenlistment quality codes (RQCs) titled “Parent,” “Physical disability,” or “Condition” (indicating a personality or other condition, such as fear of flying, that does not rise to the level of a disability but does impair a person’s ability to perform military tasks).

Conclusions and recommendations

It is somewhat puzzling to find that higher female post-bootcamp, pre-fleet losses occur almost exclusively in a few, highly technical ratings. Although these ratings account for a relatively small portion of all Navy personnel, these personnel are among the most expensive to recruit and train. According to the loss information, these women apparently leave the Navy for health- or family-related reasons at higher rates than men, even though they have successfully completed bootcamp. The loss data also suggest that female Sailor misbehavior does not appear to explain higher female loss rates; in fact, the data suggest that men who attrited in the post-bootcamp, pre-fleet period misbehaved at higher rates than women.

²⁷ The loss code data include information on reenlistment quality codes (RQCs), or the signal that the services give regarding the suitability of the separating servicemember for reenlistment at a future date.

We recommend that the Navy gain a deeper understanding of exactly why female post-bootcamp, pre-fleet loss rates in certain ratings exceed male rates by undertaking the following.

- Review the loss code assignment process.
- Take steps to better understand differences in women's and men's experiences in the training pipeline, including analyzing existing or newly developed exit interviews or surveys that ask servicemembers about their reasons for leaving and about their experiences during training.
- Review decision-making processes that determine how Sailors who are experiencing problems in the training pipeline are identified and whether such Sailors are reassigned to new ratings.

Implications

The analysis has two main implications. First, it reinforces the importance of identifying where and why gender differences in service career progression exist. This analytical approach, which is predicated on the assumption that the retention gender gap can be changed, can yield results to inform development of cost-effective, readiness-neutral policies to help close the retention gender gap.

Second, the results imply that men may misbehave at higher rates than women. Although men have higher retention rates overall, their higher rates of misbehavior are likely to impose other costs.

Calculating costs imposed by men: Question #3

Analyses of the costs and benefits of gender integration can help the DON use personnel budgets effectively and efficiently. The cognitive biases evolutionary constraint, however, can affect these cost-benefit calculations. For example, status quo bias may lead to (correctly) including costs imposed by women in excess of those imposed by men (i.e., pregnancy and childbirth) while (incorrectly) ignoring costs imposed by men in excess of those imposed by women. An example of the latter is suggested by one finding from our analysis of gender differences in post-bootcamp, pre-fleet loss rates: men appear to misbehave at higher rates than women, which likely imposes higher costs.

This leads to study question #3: What are the cost implications of gender differences in misbehavior among enlisted personnel in the Navy and the Marine Corps? Our analysis is intended to support efforts to comprehensively assess the costs and benefits of gender integration and to provide the DON with more visibility and clarity of the costs of misbehavior. The results are documented in [86].

Approach

We defined *misbehavior* as offenses covered by the punitive articles of the Uniform Code of Military Justice (UCMJ), which can range from minor disciplinary infractions to serious criminal offenses. In response to misbehavior, the services can take a range of actions that are either administrative or punitive.

We measured misbehavior by certain events recorded in enlisted personnel records indicating that a Sailor or Marine committed an offense that was notable enough to appear in the personnel records. Specifically, for Sailors, we use placement in a disciplinary status, demotions, and misconduct-related separations as indicators of misbehavior. For Marines, we use nonjudicial punishments (NJPs), courts-martial, demotions, and misconduct-related separations. Our counts of misbehavior events are likely to underestimate the true incidence of misbehavior because personnel records do not contain information such as conduct resulting in an unofficial reprimand.

Both the misbehavior itself and the response to it can generate costs to the services. We grouped the costs associated with misbehavior by the nature of the offense and the type and scope of the response. Specifically, we created three cost categories:

- costs that are directly generated by the misbehavior itself (e.g., missed workdays, loss or damage to property, and costs generated by addressing victims' needs)
- response-related costs (e.g., leadership time and the investigation and adjudication of alleged offenses)
- costs that result from other outcomes that can follow from the misbehavior (e.g., gapped billets and administrative and punitive separations).

For each cost category, we used per-incident cost estimates from the research literature, or we calculated them using service budget data. Notably, we were unable to find existing estimates, or to compute our own, for many of the identified cost types because the information is not collected or is not reported in databases made available to CNA. Thus, like our counts of misbehavior incidents, our estimates of the total costs of extra male misbehavior are also conservative and probably constitute a lower bound.

Results

We found that DON active duty enlisted men had higher rates of misbehavior than women in every year between FY 1999 and FY 2015. Male misbehavior rates were, on average, about 1.5 to 2.5 times higher than female rates depending on the specific indicator of misbehavior and the service. Using data from FY 2015 and applying the female misbehavior rates to the male population, we estimated that the higher rates of male misbehavior generated about 1,400 extra misbehavior incidents in the Marine Corps and about 2,000 extra incidents of

misbehavior in the Navy. We then applied the per-incident costs to the estimates of extra misbehavior incidents. We calculated that, in FY 2015, male misbehavior generated extra annual costs of about \$57 million for the Marine Corps and \$197 million for the Navy.

Conclusions and recommendations

We confirmed that men have higher rates of reported misbehavior than women in the active component enlisted forces of the Navy and Marine Corps. The costs of misbehavior, including its impact on readiness, however, are not well quantified. There are many missing cost estimates for the effects of misbehavior, and the limited information that is recorded requires a concerted effort to obtain and organize. We concluded that the services are not yet in a position to determine just how costly misbehavior is, although our attempt to quantify the costs suggests that it is nontrivial.

We recommend the following to the DON:

- Be aware of how cost-benefit analyses of gender integration can be incomplete and continue to strive for a comprehensive comparison.
- Keep improving cost estimates of misbehavior, both to assess the true impact of misbehavior on readiness and to allocate resources for prevention and response effectively and efficiently.

Implications

The cognitive biases evolutionary constraint can hinder personnel policy analysis in tangible ways. This specific example suggests that bias can lead to incomplete cost-benefit analyses of gender integration and may hinder effective and efficient use of personnel budgets. More generally, changing the cognitive frame can produce more comprehensive analysis.

Going beyond monetary incentives

To move along the gender integration continuum, the services must implement policies and practices that directly mitigate the evolutionary constraints. The DON has been especially active in pursuing policies that address the limitations of monetary incentives by offering non-monetary benefits to eligible servicemembers. One example is found in the Navy and Marine Corps policies regarding geographically collocating servicemembers who are married to other servicemembers. Both services make significant efforts to collocate their servicemembers with their military spouses. We might expect that Sailors and Marines who are colocated with their military spouses would be more likely to retain than those who are not colocated. Moreover, female servicemembers could be disproportionately affected by the policy because, compared

to men, female servicemembers are more likely to be married to a servicemember.²⁸ To our knowledge, however, no one has estimated the relationship between colocation and servicemember retention.

Another example is the DON's efforts to increase the amount of maternity leave available to active duty servicemembers. As with colocation, we might expect that an increase in maternity leave would be viewed positively by servicemembers—in particular, women—and may translate into increases in retention. Moreover, to our knowledge, the matter of quantifying the relationship between maternity leave and retention in the Navy and Marine Corps has only recently begun to be explored.²⁹

Analyzing the retention impact of colocation: Question #4

Per the Navy policy described in [87], a Sailor and his or her servicemember spouse are considered colocated if they are assigned to units that are within 90 driving miles of each other. These servicemembers are considered not colocated if their assigned units are greater than 90 miles apart. The Marine Corps colocation policy is described in [88]. The Marine Corps considers Marines in dual-military marriages to be colocated if the spouses' assigned units are no more than 50 miles apart; otherwise, these Marines are not considered colocated. For both services, the colocation measure is the distance between unit assignments for the spouses, not the distance from their residence to assignments.

In practice, the Navy has been making significant efforts to colocate Sailors who are married to other military service personnel for several years. The 2016 MilPERSMAN updated and formalized such efforts while clearly establishing the 90-mile colocation definition. The Marine Corps has also made efforts to colocate Marines in dual military marriages; its policy was updated in 2014.

Colocation may become an increasingly important non-monetary benefit as the female shares of Navy and Marine Corps grow. In this effort, we address Question #4: How does the gender mix of enlisted and officer endstrength affect the demand for colocation in the Navy and the

²⁸ See the results subsection below for information on the share of male and female enlisted Sailors and Marines who are married to another servicemember and are colocated.

²⁹ The Career Intermission Program (CIP) is another innovative non-monetary incentive that the DON pursued before being adopted DOD-wide. CIP servicemembers to take up to 36 months away from active duty to pursue activities such as education or care of family members. Servicemembers are obliged to return to active duty and serve two months for every month of CIP leave taken. CNA examined the program several years ago; our results can be found in [60].

Marine Corps, and what is the effect on retention? The Navy and Marine Corps servicemember colocation analyses are documented in [89-90] and [91-92], respectively.

Approach

For our enlisted analyses, we use the likelihood of reenlisting as our measure of retention. We began our Navy enlisted analysis by examining EMF personnel records of enlisted Sailors who made a reenlistment decision from FY 2005 to FY 2015. We identified Sailors who were married to other service personnel, including other Sailors. For Sailors who were married to another Sailor, we also determined their colocation status at the time of their reenlistment decisions.³⁰ We then estimated the statistical relationship between colocation and the probability of reenlistment. We modeled the likelihood of reenlistment as a function of factors such as Sailor personal demographics, Navy career characteristics, and the key variable of interest—whether Sailors are colocated at the time of reenlistment. We allowed the estimated association of colocation and reenlistment to vary by gender, and we estimated three separate reenlistment models, one each for reenlistment Zones A, B, and, C.³¹

For enlisted Marines, we used personnel information contained in the Total Force Data Warehouse (TDFW) to quantify the relationship between colocation and reenlistment. We follow the same analytical approach for enlisted Marines as we did for enlisted Sailors.³²

We had hoped to perform similar in-depth empirical analyses of colocation and retention for Navy and Marine Corps officers. Officer sample sizes, however, are much smaller than enlisted sample sizes, especially when subdivided by the key variables of interest: marital and colocation status, gender, skill specialty (i.e., Navy officer community or Marine officer MOS), and years of commissioned service (YCS). In addition, typically, officers are able to make a decision to stay or leave active service at any time once they meet their minimum service requirement (MSR).³³ The long stay/leave decision window requires a more complicated modeling approach that we were unable to pursue within the resources of this study. Instead, we calculated some basic cross tabulations of colocation and year-to-year continuation for certain Navy officer groups. We describe our methodology in more detail in the officer results

³⁰ We were unable to determine the colocation status of Sailors who were married to a non-Navy servicemember. Our enlisted Navy colocation results apply to Sailors in dual-Navy marriages only.

³¹ Zones A, B, and C correspond to less than one and up to 6 years of service (YOS), 6-10 YOS, and 10-14 YOS, respectively.

³²As with our enlisted Navy analysis, our enlisted Marine colocation results apply to Marines in dual-Marine marriages only.

³³ Officers may incur additional service obligations beyond their MSR. These include situations where the service requires a return on investment, such as when officers incur a payback tour after participating in a service-paid educational programs or undertaking training for a new specialty.

section below. We were unable to do the same for Marine Corps officers because of small sample sizes.

Results

Enlisted Sailors

In our sample of enlisted Sailors, the share of women who were married to a military spouse at the Zone A reenlistment point was substantially greater than that for men (21 and 4 percent, respectively). Likewise, at the Zone A decision point, the share of women who were married to a Navy spouse was 17.4 percent compared to 3.2 percent for men. At the Zones B and C decision points, the share of Sailors married to military spouses—including those married to Navy spouses—increased modestly for both women and men, but the relative gender difference in the shares remained about the same across the zones. Across all zones, about 80 percent of Sailors in dual-Navy marriages were colocated at the time of their reenlistment decisions.

We found that colocation is associated with a higher probability of reenlisting, and that the association is especially large for women. A summary of the key results follows:

- At the Zone A reenlistment decision, we estimated that colocated female Sailors were 8.6 percentage points more likely to reenlist than noncolocated female Sailors (51.3 versus 42.6 percent). We estimated that colocated male Sailors were 5.5 percentage points more likely to reenlist than noncolocated male Sailors (69.7 versus 64.2 percent).
- At the Zone B reenlistment decision, we estimated that colocated female Sailors were 11.6 percentage points more likely to reenlist than noncolocated female Sailors (62.9 versus 51.3 percent). We found no statistically significant difference in the estimated probability of reenlisting for colocated versus noncolocated men (i.e., we find an estimated difference of 74.4 versus 70.4 percent, but the difference is not statistically different from zero).
- At the Zone C reenlistment decision, we estimated that colocated female Sailors were 10.1 percentage points more likely to reenlist than noncolocated female Sailors (81.8 versus 71.7 percent). We estimated that colocated male Sailors were 8.5 percentage points more likely to reenlist than noncolocated male Sailors (86.6 versus 78.1 percent).
- Notably, we also found that at the Zone A decision point, single female Sailors had a higher estimated probability of reenlisting than single male Sailors (57.7 versus 52.1 percent).

Enlisted Marines

Among enlisted Marines making reenlistment decisions over the same period, we observed significant gender differences in the likelihood of being in a dual military marriage and colocated. At the Zone A reenlistment decision point, about 35 percent of female Marines were married to a military spouse, compared with 3 percent for male Marines. In addition, a higher percentage of women than men were married to a Marine spouse at the Zone A reenlistment decision point (28 and 2 percent, respectively). We observed similar gender differences at the Zone B and C decision points. About 88 percent of Marines in dual-Marine marriages were colocated at the time of their reenlistment decisions.

We found that colocation is associated with a higher estimated probability of reenlisting for certain groups only—namely, Zone A women, Zone B men, and Zone C women. The following summarizes the key results:

- At the Zone A reenlistment decision, we estimated that colocated female Marines were 3.7 percentage points more likely to reenlist than their noncolocated counterparts (40 versus 36.3 percent). We estimate that colocated and noncolocated male Marines reenlisted at different but statistically indistinguishable rates (50.9 versus 47.8 percent).
- At the Zone B reenlistment decision, we estimated that colocated men were 5.2 percentage points more likely to reenlist than their noncolocated counterparts (81.5 versus 76.3 percent), while we found no statistically significant difference in the estimated probability of reenlisting for colocated versus noncolocated women (70.6 versus 69.2 percent).
- At the Zone C reenlistment decision, we estimated that colocated women were 5.0 percentage points more likely to reenlist than noncolocated women (87.8 versus 82.7 percent). For men, the difference is 0.9 percentage points (91 versus 90 percent), but it is not statistically significant.
- Like their Navy counterparts, at the Zone A decision point, single female Marines have a higher estimated probability of reenlisting than single male Marines (40 versus 25 percent).

Navy officers

We used Navy officer personnel records from 2005 to 2017 to identify officer characteristics such as gender, community, YCS, and marital and colocation status. Our tabulations included Surface Warfare Officers (SWOs) and aviators (i.e., pilots and NFOs combined) only.³⁴

³⁴Small sample sizes made examination of other officer communities impractical.

Specifically, we examined snapshots of the SWO and aviator inventories from year to year and computed one-year community continuation rates by YCS throughout the relevant stay/leave decision window (i.e., in the period following completion of their MSR). The window was 3 YCS through 8 YCS (3/8 YCS) for SWOs and 7 YCS through 12 YCS (7/12 YCS) for aviators. We did not control for any other demographic or military career characteristics. We performed separate continuation calculations for women and men and colocated and non-colocated officers. The goal was to determine if continuation rates differed by colocation group and gender and whether those differences warranted more in-depth analysis.

At YCS 3, about 17 percent of the female SWO sample was married to another servicemember versus about 6 percent for male SWOs. Of the female SWOs married to another servicemember, about 60 percent were married to a Navy officer (the share for men was 64 percent). At YCS 7, about 20 percent of the female SWO sample were married to another servicemember versus 7 percent for men. Among those married to another servicemember, the shares married to a Navy officer were about 73 and 79 percent for female and male SWOs, respectively.

For aviators at YCS 7, about 40 percent of the women and 6 percent of the men were married to another servicemember. Of the aviators married to another servicemember, about 84 percent of the women and 75 percent of the men were married to a Navy officer. The shares of aviators married to another servicemember (and to a Navy officer) at YCS 12 were about the same as the shares at YCS 7.

Our colocation-continuation tabulations are summarized by the following.

- Among female SWOs in dual-Navy marriages, there was only a negligible difference in continuation for those who were colocated versus noncolocated with their Navy spouses.
- Among female aviators in dual-Navy marriages, those who were colocated with their Navy spouses had higher continuation rates than those who were not colocated.
- Neither male SWO nor male aviator continuation rates appeared to be positively correlated with colocation.

We remind readers that our enlisted and officer colocation analyses do not show that colocation *caused* the increase in reenlistment rates or officer continuation rates. Other policy changes, economic conditions, or other unobservable factors that affect colocated and noncolocated servicemembers differently may have contributed to our findings.

Conclusions and recommendations

Our results showed that, in general, colocating same-service DON enlisted personnel is positively associated with reenlistment. Moreover, we found that the estimated association was especially strong for women. We recommend that the Navy and Marine Corps continue

their colocation efforts, and when possible, expand them. To aid potential expansion efforts, we recommend that the DON undertake a similar examination of the relationship between colocation and retention for DON enlisted personnel married to non-DON enlisted personnel.³⁵

The results for Navy officers were less consistent. Our limited examination suggests that female aviator continuation—but not female SWO continuation—may be positively associated with colocation. The early evidence also suggests that male aviator and SWO continuation are not associated with colocation. We recommend that the Navy explore undertaking more in-depth analysis to improve the estimate of the relationship between colocation policy and officer retention, with a particular focus on aviators.

Implications

Coupled with the fact that colocation is a narrowly targeted benefit, these results provide evidence that non-monetary incentives can be effective and efficient policy tools for improving retention overall and helping to close the retention gender gap. The results also provide evidence that improving gender integration by mitigating evolutionary constraints can help both female and male servicemembers achieve career and family aspirations.

Analyzing the retention impact of maternity leave: Question #5

The DON's willingness to adopt forward-looking non-monetary incentives was especially evident when it changed its maternity leave policy. Prior to 2015, the DON provided 6 weeks of paid maternity (convalescent) leave to active component female Sailors and Marines to be taken consecutively immediately after the birth of a child. This aligned with the DOD policy at the time. Over an 8-month period in 2015 and 2016, however, the DON made two changes to its active component maternity leave policy. The first increased the amount of leave available to birth mothers to 18 weeks (to be used over the child's first year), and the second cut back the leave to 12 weeks (to be taken consecutively immediately after the birth of the child) in accordance with a new DOD policy.

Additional maternity leave taken by servicemembers decreases the amount of work that they perform at their commands, but retention may improve if servicemembers view the increase in leave positively. The additional weeks of work created by higher retention rates could offset the weeks of work lost by those who use additional maternity leave. Better retention could also reduce recruiting and training costs. There is, however, little evidence available to indicate which of these effects is likely to dominate. In particular, research on civilian sector maternity leave policies and retention not only is sparse but also may not be directly applicable to DON

³⁵ As part of this study, we identified enlisted Sailors who were married to enlisted Marines, but the subsamples by gender and colocation status were problematically small for performing colocation-reenlistment analysis for those dual-military couples.

servicemembers because of the unique contractual nature of military service. This leads to our research question #5: How has the 2015 change in the maternity leave policy for uniformed personnel affected female reenlistment and manning in the Navy? Resources allowed us to study the only one DON population; we chose the enlisted Navy because it has both the largest number and the greatest share of women. Our results are documented in [93].

Approach

Our evaluation of the change in maternity leave policy aimed to answer the following three questions:

1. Did female Sailors take additional maternity leave when it was offered?
2. Is the change in maternity leave policy statistically associated with changes in reenlistment rates of female Sailors?
3. What is the estimated net effect of the policy change on weeks of work?

We addressed the first question by merging Defense Health Agency (DHA) medical claim data containing information on births to Sailors between May 2011 and September 2016 with data from the Navy's electronic leave (e-leave) system from April 2011 through September 2017. The merged data allowed us to observe leave taken 30 days before and up to 365 days after Sailors gave birth and to examine leave taken before, during, and after the policy changes.

We addressed the second question by using EMF personnel records to compare female and male reenlistment rates before and after the longer maternity leave policy went into effect.³⁶ We analyzed the gender differences in reenlistment rates separately for female Sailors with and without children because the two groups have different reenlistment patterns and may react differently to the increase in maternity leave. Our particular focus is on the reenlistment behavior of Sailors with four-year obligations (4YOs) because we can observe which maternity leave policy was in effect when they chose to reenlist.

We addressed the third question by comparing the additional weeks worked for the military through higher female reenlistment rates with the lower number of weeks worked from taking maternity leave.

Results

Our results are summarized as follows:

- The amount of maternity leave taken in the first year after birth increased substantially for Sailors who gave birth on or after January 1, 2015, the retroactive implementation

³⁶ Specifically, we used the difference-in-differences (also referred to as diff-in-diffs) methodology to analyze how female reenlistment and male reenlistment changed relative to one another in the wake of each policy change.

date of the 18-week maternity leave expansion. Specifically, the median leave-taker took the full 6 weeks of leave under the old policy and the full 18 weeks of leave under the new policy.

- Expanded maternity leave is associated with a 3.7 percentage point increase in the female 4YO Zone A reenlistment rate relative to men. The estimated association is largely attributable to women who have not previously had children, which is the majority of women making a first-term reenlistment decision. This translates to about 165 additional 4YO female Sailors reenlisting for a second term each year.
- At average reenlistment lengths, many more weeks of work are gained because of increased reenlistment rates than are lost because of the increase in maternity leave. Rough estimates also suggest that the additional reenlistment appears to offset a small amount of the sea duty lost or delayed annually due to pregnancy and operational deferment.
- We found that a small percentage of women (less than 5 percent) had leave records that indicated that they took no leave after childbirth. We ruled out explanations for reportedly taking no days of maternity leave after birth, such as separation from the Navy immediately after birth or miscoding maternity leave as some other type of leave.

We caution that this reenlistment analysis does not prove that the expansion of maternity leave caused the increase in reenlistment rates. As with our colocation analyses, it is possible that our findings are affected by factors that we were unable to include in our model that affect men and women differently.

Conclusions and recommendations

The results provide evidence that expanded maternity leave appears to be a successful, cost-effective policy change. Moreover, our results appear to be driven primarily by women without children. Thus, our estimated associations between expanded maternity leave and reenlistment rates may reflect forward-looking decisions by female Sailors without children rather than backward-looking decisions by female Sailors with children. The additional leave may provide more assurance to female Sailors who do not yet have children that a multiyear service obligation is compatible with having a family. Based on our findings, we make the following recommendations:

- The Navy should continue to explore nontraditional, non-monetary personnel policies both to reduce the retention gender gap and to minimize personnel costs.
- If the Navy wants better visibility on the use of all types of leave—including maternity leave—it needs to continue to improve its e-leave system.

Implications

Our maternity leave analysis provides additional evidence that the offering certain non-monetary benefits can be effective and efficient policy tools for closing the retention gender gap. They lend support for examining other in-kind policies—in addition to more traditional monetary policies—to improve retention rates.

Takeaways from the Combined Narrative

This document synthesized the results of the five efforts undertaken for the study into a cohesive combined narrative. Since the theme that connected the five efforts was “changes in the gender mix of the Navy and Marine Corps active component forces,” the basis for the narrative was our understanding of the evolution of gender integration in the DON. In particular, we structured the narrative according to two phases of the DON’s integration evolution—what we labeled the “transitional phase” and the “modern phase”—and the role of two factors that moderated, and at times constrained, that evolution—the presence of cognitive bias in decision-making and an emphasis on monetary incentives for force management.

Based on this structure, the narrative generated the following key takeaways that add to the conclusions and recommendations presented in the reports documenting the results of each separate effort:

- Even in the modern phase of the DON’s gender integration evolution, IPMs remain an important personnel management tool, and monetary incentives remain an important policy lever. In particular, the approach used to answer Question #1 demonstrated that personnel cost minimization can be made central to the IPM approach and that jointly determining the optimal accession and SRB policies has the potential to achieve savings for the Navy.
- Changing the cognitive frame to explore when and why women leave the services at higher rates than men (Question #2) and to explicitly calculate extra costs generated by men (Question #3) revealed opportunities to both address the gender gap in retention and improve personnel management overall.
- Expanding the policy scope beyond monetary incentives—colocation (Question #4) and maternity leave (Question #5)—showed that there are likely to be cost-effective ways to close the retention gap while improving or holding constant male retention.

We conclude with two final recommendations for overcoming the evolutionary constraints to achieve true gender integration: DON policy-makers and analysts should make conscious efforts to avoid cognitive bias when framing policy options and research questions, and they should continue to think outside the box to identify innovative, non-monetary approaches to personnel management.

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