



Estimating the Effect of a Single-Salary System on Marriage Rates and Retention

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Abstract

This report considers one of the potential effects of a DOD move to a single-salary system (SSS): changes in servicemember retention driven by changes in marriage behavior. It analyzes the effects that a move to an SSS is likely to have on the percentage of servicemembers who are married and studies the changes in retention rates and force size that may be induced by any changes in marriage behavior. Our approach includes a review of the literature on the relationships between compensation, marital status, and retention; computation of pay changes under different SSS implementation scenarios; estimation of the effect of marital status on retention using personnel data; and development of a model that can forecast marriage rates and force size over time. Overall, we find that these effects are likely to be small, so there is little need for policy-makers to be concerned about these effects when considering a change to an SSS.

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Cover image credit: 191107-N-ND356-1205 Pearl Harbor (Nov. 7, 2019). Boatswain's Mate 2nd Class Kyle Woody, assigned to the Arleigh-Burke-class guided-missile destroyer, USS *William P. Lawrence* (DDG 110), is welcomed by his family during a homecoming celebration. *William P. Lawrence* returned to its homeport of Pearl Harbor following a successful deployment to the 3rd and 7th Fleet areas of operations. (US Navy photo by Mass Communication Specialist 2nd Class Jessica O. Blackwell/Released)

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Executive Summary

The Department of Defense (DOD) is considering moving to a single salary system (SSS) that would eliminate the basic allowances for housing (BAH) and subsistence (BAS) and increase basic pay to compensate servicemembers. The 13th Quadrennial Review of Military Compensation (QRMC) is studying this issue, and the QRMC's director asked CNA in 2018 to identify and prioritize potential second- and third-order effects of moving to an SSS. This report considers one of the potential effects identified in that work: changes in servicemembers' retention driven by changes in their marriage behavior. It analyzes the effects that a move to an SSS is likely to have on the percentage of servicemembers who are married, and it examines the changes in retention rates and force size that may be induced by any changes in marriage behavior. Overall, we find that these effects are likely to be small.

Our approach includes a review of the literature on the relationships between compensation, marital status, and retention; computation of pay changes under different SSS implementation scenarios; estimation of the effect of marital status on retention using personnel data; and development of a model that can forecast marriage rates and force size over time.

We consider three SSS implementation scenarios: (1) a "full compensation" scenario in which basic pay is increased to fully offset the loss of BAH, BAS, and the associated tax advantage (to members without dependents); (2) a "partial compensation" scenario in which the increase in basic pay is reduced so as to maintain cost neutrality to the federal government; and (3) a "partial compensation with housing rents" scenario, in which servicemembers living in military-provided housing are assessed rents to counteract the large pay increases going to servicemembers not currently receiving BAH under the first two SSS implementation scenarios. Under the full and partial compensation scenarios, non-BAH recipients receive regular military compensation (RMC) increases, while married BAH recipients see their pay reduced, with the largest pay reductions for married junior enlisted. Scenario 3, partial compensation with housing rents, eliminates much of this differential treatment between servicemembers who do and do not receive BAH. In general, among BAH recipients, married servicemembers receive somewhat larger pay reductions than single members, although the difference tends to be small.

Our literature review shows that servicemembers in the current environment, both enlisted and officers, are more likely to marry, and tend to marry earlier, than comparable civilians. With respect to the relationship between compensation and marriage, the literature supports a "marriage bar" hypothesis, in which higher levels of income are linked to higher marriage

rates, but only for incomes up to a certain level (usually defined as a local community median level of income). The literature also provides evidence that marriage positively affects military retention, with the strongest such effects for men who are early in their military careers.

Our statistical analysis of Defense Manpower Data Center data confirms the literature's findings on marriage and military retention, with the largest positive effects for male enlisted, somewhat smaller effects for male officers, and no effect for most female enlisted (with the exception of those in the Army). For female officers, our analysis finds that being married has a negative effect on retention, which is consistent with findings in previous CNA studies.

Our force inventory modeling analysis, however, suggests that SSS implementation is likely to have only small effects on the percentage of the force that is married and on retention and force size. Reasons include the following:

- The nature of pay changes under an SSS means that some servicemembers may receive pay increases that offset the effect of pay reductions received by others.
- The effects of compensation on marriage behavior, and of marriage behavior on retention, do not affect all servicemembers equally strongly (male, junior enlisted are the most affected).
- The effects of compensation on marriage behavior and of marriage behavior on retention, when combined, result in a smaller overall effect on retention than might be anticipated by considering the magnitude of either of the individual effects in isolation.

We note, however, that our work is not a comprehensive analysis of the potential effects of an SSS on military retention. We focus here on retention effects induced by changes in marriage behavior. There may be additional important retention effects that are beyond the scope of this analysis. Overall, however, our study suggests that the effects of an SSS on military marriage rates, and the effect of changes in marriage behavior on military retention, are likely to be small. Therefore, there is little need for policy-makers to be concerned about these effects when considering a change to an SSS.

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Introduction

The 13th Quadrennial Review of Military Compensation (QRMC) is considering whether the US military should move from its current regular military compensation (RMC) structure to a single-salary system (SSS). The RMC that most servicemembers currently receive consists of four components:¹

- **Basic pay**—A salary that depends on a servicemember’s rank and years of service (YOS)
- **Basic allowance for housing (BAH)**—A nontaxable allowance that offsets housing costs for servicemembers who do not receive government-provided housing and that varies depending on a servicemember’s rank, location, and dependent status (those with dependents receive a larger allowance)
- **Basic allowance for subsistence (BAS)**—A nontaxable allowance that offsets a servicemember’s meal costs and depends on officer/enlisted status (enlisted receive a larger allowance)
- **Tax advantage**—The tax savings resulting from the nontaxability (at both the federal and state levels) of BAH and BAS

Although this RMC structure has been in place since the late 1940s, policy-makers are concerned that it may be (1) overly complex, making it difficult for servicemembers to understand the full value of their compensation, and (2) inequitable in some ways, such as the preferential treatment of servicemembers with dependents and the failure to embody the principle of “equal pay for equal work” [1-4].

As a result, the FY 2017 National Defense Authorization Act (NDAA) mandated that the Department of Defense (DOD) study whether the current RMC system should be converted to an SSS. According to the NDAA, an SSS would involve the following:

- Elimination of BAH and BAS
- Pay table changes specifying the pay levels, by paygrade and YOS, required to
 - Achieve pay comparability with the civilian sector
 - Effectively recruit and retain a high-quality all-volunteer force

¹ In addition to basic pay and housing and subsistence allowances, the US military provides a variety of special and incentive pays for service in particular environments and circumstances. These include hazardous duty pay, family separation pay, and special pays for hard-to-staff positions and occupations.

- Cost-of-living (CoL) adjustment, using the same adjustment system that DOD currently uses worldwide for civilian employees
- Necessary adjustments to the military retirement system, including the retired pay multiplier, to ensure that servicemembers' financial situations are similar to what they would be under the new Blended Retirement System (BRS)

The NDAA also specifies a cost containment objective so that a new SSS would result in “minimal” additional costs (at most) to the government compared with the current RMC system [5].

As part of the effort to understand the implications of such a change, the director of the 13th QRMC asked CNA in 2018 to identify and prioritize potential nondirect (second- and third-order) effects of moving from the current RMC system to an SSS and to develop study designs for analyzing the potentially highest priority effects.² One of the effects identified by that study was potential changes in servicemember retention induced by changes in marriage behavior [6].³ This study explores this potential effect of SSS adoption.

Compensation, marriage, and military retention

A significant body of social science research literature shows that marriage decisions are sensitive to a couple's financial situation and compensation level [7-10]. This research suggests that moving to an SSS could change servicemembers' decisions to marry and/or have children or take on other dependent relatives. Because servicemembers with dependents reenlist at higher rates, if adopting an SSS were to change the percentage of servicemembers who are married or have dependents, it could have important effects on retention as well [11]. When recruits come into the military, most are single (in 2018, about 93 percent of E-1s had no dependents, as did 74 percent of O-1s, as reported by the Office of the Undersecretary of Defense for Personnel and Readiness) [12]. Yet, compared with civilians, servicemembers—both enlisted and officers—tend to marry at younger ages and at higher rates [13].

² Second- and third-order effects are nondirect potential effects of adopting an SSS, such as budgetary cost increases, impacts to servicemembers and their families, or risks to readiness caused by adverse effects on recruiting, retention, or servicemember morale. They differ from the direct (i.e., first-order) effects of implementing an SSS, which include changes to the pay table, implementation of a locational CoL adjustment, and modifications to the military retirement system.

³ We emphasize that SSS-related pay changes could have larger retention effects than just those induced by changes in marriage behavior. Our study, though, focuses only on marriage-induced retention changes.

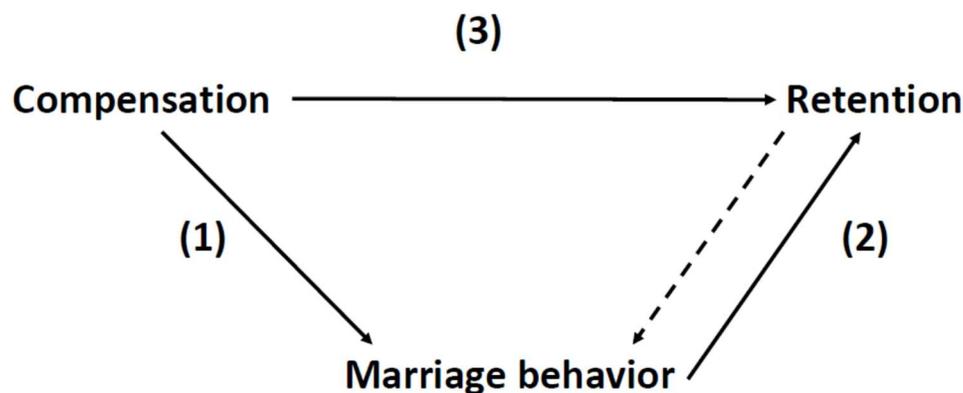
The current RMC structure provides two incentives for junior servicemembers to marry at younger ages than civilians. First, BAH payments are higher for members with dependents. Currently, the BAH payment differential between single and married members ranges from 10 to 31 percent, depending on rank (see Table 11 in Appendix A). The largest differentials go to junior enlisted in paygrades E-1, E-3, and E-4 and to warrant officers in paygrade W-1 [12]. Overall, these BAH differentials result in RMC differentials of about 5 percent for married enlisted members and 1 percent for married officers (see Table 12 in Appendix A). The largest marriage differential is received by married junior enlisted in paygrades E-1 to E-4 [12].^{4,5}

The second, related incentive for early marriage is that marriage allows junior servicemembers to move out of bachelor housing and begin receiving BAH. Survey evidence shows that few servicemembers prefer to live in bachelor housing, and a higher percentage of homeowners tend to be satisfied with their housing than those living in military housing [14].

The marriage behavior of servicemembers may matter for military readiness, in part because married servicemembers tend to reenlist at higher rates than their single counterparts. This raises the possibility that an SSS that eliminates BAH and the with-dependents pay advantage could adversely affect retention rates by lowering the marriage rate and reducing the proportion of servicemembers with dependents.

To illustrate some of the empirical challenges of studying relationships between compensation, marriage behavior, and military retention, Figure 1 displays a set of hypothesized relationships among these three factors.

Figure 1. Theory of the relationships between compensation, marriage behavior, and retention



⁴ These differentials represent cross-location averages and do not incorporate BAH's location-specific component.

⁵ Appendix A provides additional information about BAH and RMC.

Compensation changes affect marriage behavior (shown by line (1) in Figure 1), as higher incomes are associated with higher marriage rates (perhaps because higher incomes are associated with lower levels of family stress). Marriage rates, in turn, have a positive effect on military retention (line (2) in Figure 1). Changes in compensation, however, also affect retention directly, by changing the attractiveness of staying in the military rather than leaving and accepting alternative civilian-sector employment (line (3) in Figure 1). In this study, we focus on effects (1) between compensation and marriage behavior and (2) between marriage behavior and military retention. In other words, we consider the effects on retention brought about by potential changes in marriage behavior that could result from an SSS.

The connections between compensation, marriage behavior, and retention can be two-way relationships. For example, while marriage behavior has been found to affect retention, retention also could influence (or be correlated with) marriage behavior if, for example, those who marry have a preference for stability with respect to both family life and career. This potential relationship is indicated by the dashed arrow linking retention to marriage behavior in Figure 1. These potential reverse causality and omitted variable problems complicate our ability to empirically disentangle the effects of marriage behavior on retention, and we take steps to deal with them in our empirical analysis.

Report overview

This study's purpose is to assess the extent to which, under an SSS, changes in servicemember pay could affect retention and force size by reducing military marriage rates (the combination of effects 1 and 2 in Figure 1). We consider the following questions:

- How would the pay of married and single members change under various SSS implementation scenarios?
- What effects would these pay changes have on servicemember marriage rates, and how would these affect the proportions of married and single members in the force?
- What effect would a change in the married and single proportions in the force have on retention rates?

The report is organized as follows. The first section reviews the literature on compensation, marriage, and retention in the military. We examine long-term trends in military marriage rates, the relationships between compensation and marriage rates, marriage rates and military retention, and compensation and military retention. Important findings include the following:

- The effect of income on marriage rates is positive, but it tends to diminish at higher income levels.

- Married servicemembers retain at higher levels than single members; the effect is larger for men than for women, and larger early in a servicemember's career.
- There is a positive association between pay and retention, and, again, the effect appears to be strongest early in a servicemember's career.

The next section considers pay changes under an SSS. The distribution of pay changes by paygrade will, of course, depend on the details of SSS implementation, so we illustrate the implications of three alternative implementation scenarios. With the possible exception of junior enlisted personnel, there do not appear to be major differences in the pay changes (relative to current RMC) received by married and single servicemembers under the SSS scenarios we consider.

The third section covers our empirical analysis of the relationship between marriage and retention. We find that, for male enlisted and officers, there is a positive effect of marriage on military retention. For female servicemembers, however, the effect tends to be small to nonexistent for enlisted and negative for officers (that is, being married is associated with lower retention rates).

The fourth section looks at the implications of our compensation, marriage, and retention findings for force inventory, under different SSS implementation scenarios. Specifically, we consider what may happen to the percentages of married and single servicemembers in the force, and the implications for force size that may affect readiness. Overall, we find that the SSS implementation scenarios considered probably will have relatively small effects on servicemembers' marriage behavior and that changes in force inventory resulting from these changes in marriage patterns also will be relatively small.

Literature Review

In this section, we review how the existing literature might inform the expected effects of SSS implementation on servicemember marriage behavior and, ultimately, retention. With the objective of relying on previous work to establish a baseline of currently understood relationships and to inform our analytical approach, we review and summarize two distinct literatures. First, we review existing literature on the relationship between compensation and marriage decisions, since an SSS will alter servicemembers' overall compensation. Second, we summarize previous findings on how marital status affects retention.⁶

Military and civilian marriage behavior

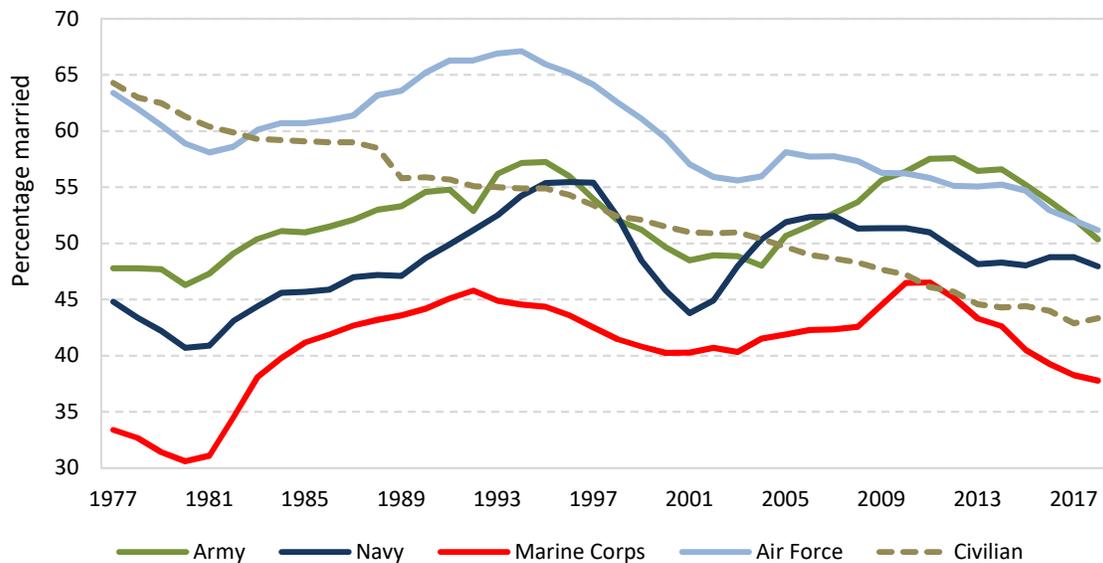
There have been profound changes in marriage behavior in the United States over the last several decades, and we must be aware of these changes when considering the findings of existing analyses of the relationships between compensation, marriage, and retention. It also should be recognized that most existing studies of the relationship between income and marriage behavior are based on civilians' marriage decisions; it is therefore important to understand how servicemembers' marriage decisions might differ.

The United States has witnessed substantial changes in family formation over the last half century. The median age at first marriage, which declined markedly through the first half of the 20th century, has risen sharply since the 1970s, and the percentage of people 15 and older who have never married has increased significantly. As marriage has become less common and has occurred later in life, sharp increases have taken place in both nonmarital childbearing and cohabitation [15].

Marriage behavior in the military has seen much less change in recent decades compared with the civilian sector. When the military was transitioning to an all-volunteer force in the 1970s, marriage rates among civilians were substantially higher than those in the Army, Navy, and the Marine Corps, and were marginally higher than those in the Air Force. While marriage rates among civilians have declined sharply since that time, they have been much more stable in the services; at present, marriage rates in the Air Force, Army, and Navy are higher than among civilians (see Figure 2).

⁶ Additional information about military marriage behavior is provided in Appendix B, and Appendix C has more information about specific studies on the relationships between compensation, marriage behavior, and retention.

Figure 2. Percentage married by service with a comparison group of civilians (ages 18 to 44)



Source: Population Representation in the Military Services - Fiscal Year 2017 [13].

Several factors affect these military marriage trends. One important influence is the service's requirement profile. The Marine Corps, for example, has a younger population than the other armed forces and this may account, at least in part, for the service's lower marriage rate. Service-level accession policies also affect the frequency of marriage in the military—the Marine Corps has more stringent limits than the other services on the number of dependents that recruits can have when they access.⁷ Marriage rates also may be driven by self-selection among military branches. The Air Force, for example, has relatively low rates of overseas deployment, which may be especially attractive to personnel who enter service with dependents or who wish to start families. A final point to note is that all the services have seen declines in marriage rates since the Great Recession.

Two other significant differences in military and civilian marriage behavior follow [13, 16]:

- Racial differences—a much smaller marital racial gap in the armed forces
- Earlier marriages, on average, for servicemembers compared with civilians

⁷ At present, the Marine Corps requires a waiver if an applicant has any dependents under the age of 18, while the Army requires a waiver only if the applicant has two or more such dependents. As a consequence, the Army is now accessing significantly more married personnel than the Marine Corps.

The higher prevalence of young marriage in the military is probably due in part to stressors unique to the military (e.g., deployments and resulting financial burdens) [17-18]. Also, the military offers married members financial stability in terms of “the ability to live off-base, meals subsidized by the Basic Allowance for Subsistence (BAS), a higher housing allowance through the Basic Allowance for Quarters (BAQ), and health care for the spouse” [18].

These military-civilian differences in marriage behaviors provide a framework for the remaining literature review. They suggest that any relationship between compensation and marriage behavior may differ for civilians and servicemembers. That said, though much of the existing literature—especially as it relates to the marriage-compensation link—focuses on civilians, these studies can be informative of possible compensation effects for servicemembers as well. Of course, when the available studies exclusively analyze the civilian context, we will be unable to distinguish which findings also are likely to hold in the military context. These limitations highlight the significant value-added from our empirical research, summarized in subsequent sections.

Compensation and marriage

A significant body of social science research literature shows that marriage decisions are sensitive to a couple’s financial situation and compensation level. These studies date back to Becker (1973) and McCubbin and Patterson (1983), but a number of more recent studies have estimated this relationship as well [7-8, 10, 19-21]. These studies employ a wide variety of data on family formation and use disparate empirical approaches. There is a subset of empirical approaches most relevant to our analysis; these include those implementing total income models, marriage-bar models, and specialization models.

Total income models posit that total household income increases raise the likelihood of marriage. Specifically, Smock et al. (2015) found that cohabitating couples with fewer monetary resources were more likely to experience stress and marital conflict, while Schneider (2011) found that certain wealth types (car ownership and financial assets) are positively related to the likelihood of marriage [21-22]. Marriage-bar models suggest that, for couples with average incomes below a perceived marriage “bar,” or threshold (often defined as the median income in their community), any income increase (decrease) can produce a substantial rise (decline) in the likelihood of marriage. This finding is relevant to our analysis because it seems likely that a substantial portion of the services’ enlisted forces have incomes close to or below the marriage bar. Ishizuka (2018) found that, for couples whose combined earnings were less than the median, there was a positive and significant effect of income on the marriage decision [7]. Finally, specialization models posit that the decision to marry can be characterized as people with complementary skills forming a household in which each person focuses on the activities in which they have a comparative advantage. This is supported by Brines and Joyner’s

(1999) finding that “married couples who adopt a more specialized division of labor are less likely to divorce, but the effect is modest” [23]. These models may be relevant to SSS considerations since there is evidence of greater wage-employment specialization among military families than among civilians. The Council of Economic Advisers (2018) reports that “military spouses are far less likely to participate in the labor market than the general working age population” [24].⁸

Overall, the literature supports the marriage-bar hypothesis that income matters for marriage behavior only up to a certain level. Also, income effects on marriage may be stronger for couples who already are cohabitating. If the marriage-bar model is a good representation of how military members make marriage decisions, it is possible that the introduction of an SSS could result in substantial reductions in the propensity to marry among service personnel. As mentioned earlier, current BAH policy increases servicemembers’ effective income when they marry. If the increase is sufficient to push a member from under the marriage bar to over it, eliminating it might substantially reduce military marriage rates. Since servicemembers with dependents reenlist at higher rates, if adopting an SSS changed the percentage of members who are married or have dependents, it could have important effects on retention as well (via the relationship between marital status and retention, discussed next) [11].

Marriage and retention/continuation

In this subsection, we review existing literature on how attrition and retention behaviors differ for single and married personnel. An important caveat is that marital status has not been the focus of a major military attrition or retention study. Although there are consistent results across a variety of studies using different methodologies that single and married personnel are retained at higher rates, we emphasize that these are not causal estimates of marriage behavior effects on attrition and retention; we therefore cannot be certain that they represent what would happen if marriage rates were to change. Overall, the literature suggests the following:

- Married servicemembers are more likely to attrite early during their first contracts, although the literature is mixed on whether the attrition differences persist after the first six months [27-28].

⁸ It’s not clear the extent to which the specialization effect depends on spousal labor force participation being a voluntary choice, as opposed to one forced on couples by the realities of military life or for other reasons. It seems plausible that (for example) a servicemember with an un- or underemployed spouse who would prefer to work (or work more) might suffer relationship strains, or seek to leave the service, either of which might counteract any positive effect of specialization on military marriage or retention rates. There is some research evidence that spousal careers increase employee turnover, particularly when relocation is an issue. This literature includes one study showing that, among married Army officers, having an employed spouse is associated with lower retention four years later [25-26].

- Married men are more likely to reenlist or continue, but this relationship seems to dissipate as they progress through their careers [29-34].
- Married women are no more likely (and may be less likely) than single women to reenlist or continue [30-33].
- The aggregate finding of higher retention for married personnel is consistent across services, across time, and for both officers and enlisted servicemembers [35-36].

Pay Changes Under a Single-Salary System

This section examines the size of servicemember pay changes under an SSS and how these changes could differ by marital status. Pay changes for different servicemember groups will depend on how the SSS is implemented. To better understand the nature of SSS-related pay changes, therefore, we consider three implementation scenarios:⁹

1. **Full compensation.** Increase basic pay to fully compensate servicemembers for the loss of BAH (at the without-dependents level), BAS, and the tax advantage.
2. **Partial compensation.** Increase basic pay to partially compensate servicemembers for the loss of BAH, BAS, and the tax advantage, subject to the constraint that costs to the federal government are approximately the same before and after the change.
3. **Partial compensation with charges for military-provided housing.** Increase basic pay to partially compensate servicemembers for the loss of BAH, BAS, and the tax advantage, subject to the constraint that costs to the federal government are approximately the same before and after the change. In addition, institute rental charges to servicemembers living in military-provided housing.

The data used to calculate these pay changes come from the Office of the Under Secretary of Defense for Personnel and Readiness's Selected Military Compensation Tables report for FY 2019. These tables report average pay levels across regions and do not incorporate location-based pay differences.

Scenario 1: Full compensation

Table 1 shows, by paygrade, the after-tax income changes resulting from adoption of scenario 1 (the full-compensation scenario).

⁹ These scenarios have been developed by the Institute for Defense Analyses (IDA) as summarized in the memorandum, "Key Elements in Analysis of Potential Salary Systems," Mar. 6, 2019. These scenarios are illustrative, intended to convey a sense of the potential pay changes that might result from adoption of an SSS, and do not necessarily exhaust the variety of options that DOD might have in implementing an SSS.

Table 1. Pay changes under a full compensation SSS scenario

Paygrade	BAH recipients				Non-BAH recipients			
	Single		Married		Single		Married	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
Commissioned officers								
O-10	\$-	-%	-\$1,919	-1%	\$28,644	21%	\$32,053	22%
O-9	\$-	-%	-\$2,915	-2%	\$28,452	21%	\$30,829	21%
O-8	\$-	-%	-\$3,040	-2%	\$28,644	22%	\$30,932	22%
O-7	\$-	-%	-\$3,011	-2%	\$28,644	25%	\$30,961	26%
O-6	\$-	-%	-\$1,729	-1%	\$28,428	29%	\$30,959	29%
O-5	\$-	-%	-\$2,141	-2%	\$26,436	33%	\$29,119	33%
O-4	\$-	-%	-\$926	-1%	\$25,224	36%	\$27,622	37%
O-3	\$-	-%	-\$737	-1%	\$22,260	40%	\$23,959	40%
O-2	\$-	-%	-\$1,033	-1%	\$19,308	42%	\$20,339	43%
O-1	\$-	-%	-\$1,431	-3%	\$17,208	50%	\$18,225	51%
O-3E	\$-	-%	-\$1,320	-1%	\$23,340	35%	\$25,464	36%
O-2E	\$-	-%	-\$2,000	-2%	\$21,552	40%	\$23,104	41%
O-1E	\$-	-%	-\$2,332	-3%	\$20,364	45%	\$21,440	45%
Warrant officers								
W-5	\$-	-%	\$2,503	2%	\$24,059	30%	\$26,561	31%
W-4	\$-	-%	-\$1,177	-1%	\$22,476	33%	\$24,599	33%
W-3	\$-	-%	-\$1,382	-2%	\$21,480	37%	\$23,218	37%
W-2	\$-	-%	-\$1,937	-3%	\$20,184	41%	\$21,451	41%
W-1	\$-	-%	-\$3,529	-5%	\$15,360	34%	\$16,175	35%
Enlisted								
E-9	\$-	-%	-\$1,855	-2%	\$22,080	34%	\$24,125	35%
E-8	\$-	-%	-\$1,608	-2%	\$21,178	40%	\$22,702	41%
E-7	\$-	-%	-\$2,484	-3%	\$19,656	42%	\$20,784	42%
E-6	\$-	-%	-\$2,420	-4%	\$19,212	48%	\$20,320	49%
E-5	\$-	-%	-\$1,012	-2%	\$18,192	55%	\$19,376	56%
E-4	\$-	-%	-\$2,384	-5%	\$15,108	54%	\$16,240	55%
E-3	\$-	-%	-\$2,586	-6%	\$15,288	63%	\$16,530	64%
E-2	\$-	-%	-\$806	-2%	\$15,732	68%	\$16,870	70%
E-1	\$-	-%	-\$3,510	-9%	\$13,716	67%	\$14,514	68%
Averages								
COs	\$-	-%	-\$1,229	-1%	\$21,952	40%	\$20,981	46%
WOs	\$-	-%	-\$1,646	-2%	\$20,142	37%	\$19,109	37%
Enlisted	\$-	-%	-\$1,997	-3%	\$15,557	61%	\$16,806	61%

Source: Authors' calculations using pay tables from Selected Military Compensation Tables, 2019 [12].

BAH recipients

By design, single servicemembers currently receiving BAH see no change in after-tax income under this scenario; they are fully compensated for the loss of BAH at the without-dependents level. Married servicemembers currently receiving BAH experience, on average, a small decline in after-tax income because they are not fully compensated for the loss of the with-dependents level of BAH. This pay decline ranges from 1 to 3 percent for commissioned officers (COs), 1 to 5 percent for warrant officers (WOs), and 2 to 9 percent for enlisted servicemembers. In general, married servicemembers at lower paygrades who currently receive BAH would suffer the largest declines in after-tax income under this scenario. Except for junior enlisted and some warrant officers, however, the treatment of married and single BAH recipients, on average, differs by only a few percentage points (equivalent to at most \$2,500).

Nonrecipients

Table 1 also shows that, in the absence of other policy changes, servicemembers who currently do not receive BAH would enjoy large pay increases under this SSS implementation scenario. These pay increases range in size from an average of about 40 percent for COs and WOs to about 60 percent for enlisted members. There is little difference in the size of the pay increase for married and single nonrecipients, except for COs: married COs earn a bit higher (46 percent) average pay increase than single COs.

Scenario 2: Partial compensation

Table 2 shows after-tax pay changes resulting from adoption of scenario 2, in which basic pay increases are limited to meet the criterion that an SSS generate, at most, minimal additional costs to the federal government.¹⁰

¹⁰ The pay changes shown in Table 2 represent one specific set of pay changes meeting the criterion that military compensation costs to the federal government remain about the same after SSS adoption. IDA analysts constructed this particular scenario by increasing basic pay by a percentage that varies according to paygrade. The specific percentage changes applied to each paygrade were determined using a linear programming model designed to choose the set of percentages that minimizes the variation across paygrades in losses among married BAH recipients. These percentages ranged from 34 to 95 percent for enlisted, 20 to 38 percent for WOs, and 4 to 47 percent for COs, with lower paygrades receiving higher percentage increases.

Table 2. Pay changes under a partial compensation SSS scenario

Paygrade	BAH recipients				Non-BAH recipients			
	Single		Married		Single		Married	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
Commissioned officers								
O-10	-\$30,059	-17%	-\$33,912	-18%	-\$1,415	-1%	\$60	0%
O-9	-\$29,890	-17%	-\$33,692	-18%	-\$1,438	-1%	\$52	0%
O-8	-\$29,017	-17%	-\$32,610	-18%	-\$373	0%	\$1,362	1%
O-7	-\$24,808	-17%	-\$29,299	-18%	\$3,836	3%	\$4,673	4%
O-6	-\$22,222	-17%	-\$26,031	-18%	\$6,206	6%	\$6,657	6%
O-5	-\$18,136	-16%	-\$22,435	-18%	\$8,300	10%	\$8,825	9%
O-4	-\$17,586	-18%	-\$19,361	-18%	\$7,638	10%	\$9,187	11%
O-3	-\$8,185	-10%	-\$7,320	-8%	\$14,075	24%	\$17,376	28%
O-2	-\$6,770	-10%	-\$6,029	-8%	\$12,538	26%	\$15,343	30%
O-1	-\$5,342	-10%	-\$6,553	-11%	\$11,866	33%	\$13,103	35%
O-3E	-\$9,346	-10%	-\$8,824	-9%	\$13,994	20%	\$16,218	22%
O-2E	-\$7,859	-10%	-\$4,859	-6%	\$13,693	24%	\$16,802	28%
O-1E	-\$6,868	-10%	-\$3,547	-5%	\$13,496	28%	\$16,446	33%
Warrant officers								
W-5	-\$14,864	-14%	-\$14,312	-12%	\$9,195	11%	\$9,747	11%
W-4	-\$12,169	-13%	-\$13,650	-13%	\$10,307	14%	\$12,126	16%
W-3	-\$10,616	-13%	-\$10,921	-12%	\$10,864	17%	\$13,679	21%
W-2	-\$9,798	-14%	-\$10,484	-13%	\$10,386	20%	\$12,904	24%
W-1	-\$5,355	-9%	-\$7,291	-11%	\$10,005	21%	\$12,413	25%
Enlisted								
E-9	-\$9,060	-10%	-\$10,396	-10%	-\$4,291	-5%	\$15,584	21%
E-8	-\$7,750	-10%	-\$7,658	-9%	\$13,428	24%	\$16,652	28%
E-7	-\$6,972	-10%	-\$7,543	-10%	\$12,684	25%	\$15,725	30%
E-6	-\$6,125	-10%	-\$7,430	-11%	\$13,087	31%	\$15,310	35%
E-5	-\$5,304	-10%	-\$6,247	-11%	\$12,888	37%	\$14,141	39%
E-4	-\$4,452	-10%	-\$7,673	-16%	\$10,656	36%	\$10,951	36%
E-3	-\$4,850	-12%	-\$8,278	-18%	\$10,438	41%	\$10,838	40%
E-2	-\$6,369	-16%	-\$7,738	-18%	\$9,363	39%	\$9,938	39%
E-1	-\$3,806	-11%	-\$7,251	-18%	\$9,910	46%	\$10,773	48%
Averages								
COs	-\$8,084	-11%	-\$14,902	-14%	\$11,580	22%	\$13,284	29%
WOs	-\$9,051	-12%	-\$10,887	-13%	\$10,396	18%	\$12,709	23%
Enlisted	-\$5,130	-11%	-\$7,282	-12%	\$10,560	39%	\$11,342	39%

Source: Calculations provided to CNA by the Institute for Defense Analyses (IDA).

BAH recipients

Under scenario 2, both single and married BAH recipients would see declines in after-tax pay. Pay decreases would range from 10 to 17 percent for single COs currently receiving BAH and from 5 to 18 percent for married members. On average, married COs would do a bit worse than singles, though, at lower paygrades, married COs would see smaller percentage decreases than singles. Pay decreases would range from 9 to 14 percent for single WOs and from 11 to 14 percent for married WOs, with married WOs taking, on average, slightly larger pay decreases. For enlisted, pay decreases for single servicemembers would range from 10 to 16 percent; for married members, decreases would range from 9 to 18 percent. Again, on average, married enlisted would receive somewhat larger pay cuts than singles. Also, and unlike COs, for enlisted members, pay cuts would be concentrated in the lower ranks. With the exception of junior enlisted, the differences in pay changes between married and single servicemembers appears to be small.

Nonrecipients

Under scenario 2, both single and married servicemembers who do not currently receive BAH would receive substantial pay increases (with the exception of higher ranking COs in paygrades O-6 and above). Lower ranking COs would receive pay increases in the range of 20 to 30 percent, WOs would receive increases in the range of 10 to 25 percent, and enlisted members would receive about a 40 percent pay increase, on average.

Scenario 3: Partial compensation with charges for military-provided housing

Under the first two SSS implementation scenarios, both single and married servicemembers not currently receiving BAH (that is, living in military-provided quarters) would receive large pay increases. This is the case because all servicemembers would be paid according to the same basic pay table, and BAH would be incorporated into a servicemember's basic pay regardless of whether he or she previously was paid BAH.

Charging rent to servicemembers living in military-provided housing would prevent current non-BAH recipients from receiving this windfall pay increase. The third SSS implementation scenario considered here involves instituting such housing rents. Following IDA analyses, we assume that the level of rent charged is determined by a servicemember's valuation for military housing. This valuation is assumed to be a function of BAH payments and to vary with the servicemember's paygrade, according to Table 3.

Table 3. Estimate of the value of government-provided housing as a percentage of BAH

Officer			Enlisted		
Paygrade	Single	Married	Paygrade	Single	Married
O-4 and above	100%	100%	E-6 and above^a	100%	100%
O-3	80%	100%	E-5	80%	80%
O-2	60%	60%	E-4	60%	60%
O-1	40%	60%	E-3	40%	60%
			E-2	0%	60%
			E-1	0%	60%

Source: Calculations provided by the Institute for Defense Analyses (IDA).

^a Includes Warrant Officers.

Under scenario 3, current non-BAH recipients living in military-provided housing are charged housing rents according to Table 3. It is assumed that single junior enlisted (E-1s and E-2s) who must live in barracks by policy will not be charged rent. Table 4 summarizes the implications of this policy for a servicemember's take-home pay.

Table 4. Pay changes under partial compensation with housing charges SSS scenario

Paygrade	BAH recipients				Non-BAH recipients			
	Single		Married		Single		Married	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
Commissioned officers								
O-10	-\$30,059	-17%	-\$33,912	-18%	-\$30,059	-21%	-\$33,912	-22%
O-9	-\$29,890	-17%	-\$33,692	-18%	-\$29,890	-21%	-\$33,692	-22%
O-8	-\$29,017	-17%	-\$32,610	-18%	-\$29,017	-21%	-\$32,610	-22%
O-7	-\$24,808	-17%	-\$29,299	-18%	-\$24,808	-21%	-\$29,299	-23%
O-6	-\$22,222	-17%	-\$26,031	-18%	-\$22,222	-21%	-\$26,031	-23%
O-5	-\$18,136	-16%	-\$22,435	-18%	-\$18,136	-21%	-\$22,435	-24%
O-4	-\$17,586	-18%	-\$19,361	-18%	-\$17,586	-24%	-\$19,361	-24%
O-3	-\$8,185	-10%	-\$7,320	-8%	-\$3,733	-6%	-\$7,320	-12%
O-2	-\$6,770	-10%	-\$6,029	-8%	\$954	2%	\$2,520	5%
O-1	-\$5,342	-10%	-\$6,553	-11%	\$4,982	14%	\$1,309	3%
O-3E	-\$9,346	-10%	-\$8,824	-9%	-\$4,678	-7%	-\$10,566	-14%
O-2E	-\$7,859	-10%	-\$4,859	-6%	\$762	1%	\$1,739	3%
O-1E	-\$6,868	-10%	-\$3,547	-5%	\$5,350	11%	\$2,183	4%
Warrant officers								
W-5	-\$14,864	-14%	-\$14,312	-12%	-\$14,864	-18%	\$14,311	-16%
W-4	-\$12,169	-13%	-\$13,650	-13%	-\$12,169	-17%	-\$13,650	-17%
W-3	-\$10,616	-13%	-\$10,921	-12%	-\$10,616	-17%	-\$10,921	-17%

Paygrade	BAH recipients				Non-BAH recipients			
	Single		Married		Single		Married	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
W-2	-\$9,798	-14%	-\$10,484	-13%	-\$9,798	-19%	-\$10,484	-19%
W-1	-\$5,355	-9%	-\$7,291	-11%	-\$5,355	-11%	-\$7,291	-15%
Enlisted								
E-9	-\$9,060	-10%	-\$10,396	-10%	-\$26,371	-31%	-\$10,396	-14%
E-8	-\$7,750	-10%	-\$7,658	-9%	-\$7,750	-14%	-\$7,658	-13%
E-7	-\$6,972	-10%	-\$7,543	-10%	-\$6,972	-14%	-\$7,543	-14%
E-6	-\$6,125	-10%	-\$7,430	-11%	-\$6,125	-15%	-\$7,430	-17%
E-5	-\$5,304	-10%	-\$6,247	-11%	-\$1,665	-5%	-\$2,170	-6%
E-4	-\$4,452	-10%	-\$7,673	-16%	\$1,591	5%	-\$223	-1%
E-3	-\$4,850	-12%	-\$8,278	-18%	\$4,323	17%	-\$632	-2%
E-2	-\$6,369	-16%	-\$7,738	-18%	\$9,363	39%	-\$667	-3%
E-1	-\$3,806	-11%	-\$7,251	-18%	\$9,910	46%	-\$41	0%
Averages								
COs	-\$8,084	-11%	-\$14,902	-14%	-\$5,438	-6%	-\$3,043	-2%
WOs	-\$9,051	-12%	-\$10,887	-13%	-\$9,746	-17%	-\$9,020	-16%
Enlisted	-\$5,130	-11%	-\$7,282	-12%	\$4,227	18%	-\$788	-2%

Source: Calculations provided to CNA by the Institute for Defense Analyses (IDA).

BAH recipients

Under scenario 3, pay changes to servicemembers currently receiving BAH are identical to those in scenario 2. Current BAH recipients are not affected by this policy.

Nonrecipients

Under scenario 3, most servicemembers who live in military-provided housing and do not currently receive BAH will be charged housing rents that will counteract the increase in basic pay under an SSS. The exception (under the policy considered here) will be single junior enlisted E-1s and E-2s who must live in barracks. As a result, single junior enlisted servicemembers still would receive large pay increases under an SSS. Married junior enlisted and more senior enlisted members and officers would not receive large pay increases under scenario 3, however. In general, higher ranking enlisted (E-6 and above), WO's, and higher ranking officers (O-4 and above) would receive the largest pay cuts under scenario 3.

Marriage and Retention: Data Analysis

Our original objective was to separately identify and estimate the relationship between (1) compensation and marriage and (2) marriage and retention. Our approach uses quarterly snapshots of Defense Manpower Data Center's (DMDC's) active component files for each of the four services, a single data source for enlisted and officer personnel in all four services that allows us to observe changes in compensation, marital status, and retention over time.¹¹ However, the deficiencies in data related to servicemembers' compensation are so great that we are unable to assess the effects of income on the marriage decision.¹² As a result, in this analysis, we will (1) rely on estimates of the effect of income on marriage taken from the literature on the civilian population and (2) use the DMDC data to estimate the relationship between marital status and retention. This section provides the details of our estimates of the latter effect: the relationship between marital status and military retention.

Empirical strategy

Our choice of empirical methodology for estimating the relationship between marital status and retention is driven by three factors:¹³

- **Reverse causality:** the need to isolate the effects of marriage on reenlistment separate from any effect that reenlistment may have on marriage
- **Omitted variables:** the need to mitigate possible omitted variables bias
- **Additional data limitations:** especially the difficulty in observing contract or obligated service lengths

¹¹ These data are available for all personnel (officer and enlisted) who were in the service since 2000, and include time-invariant characteristics specific to the servicemember (race, gender, date of accession, number of dependents at accession, etc.) and characteristics of the member's service during each quarter (DOD occupation code, paygrade, unit identification code (UIC) location, home of record, etc.).

¹² The DMDC pay files have fields that are both important and problematic. The basic pay and allowances fields are consistently filled in with values that match stated policy, but many of the incentive pays are not. For instance, Hazardous Duty Incentive Pay, which is hundreds of dollars per month, is often reported in tens of thousands of dollars. Likewise, we see persistent large negative values in other incentive pays. While an isolated instance may represent a "correction" of an earlier too-large amount, these large negative amounts frequently are persistent.

¹³ Two approaches that would be most effective in dealing with direction-of-causality and omitted variable issues are an *instrumental variables technique* and a *two-way fixed-effect estimation* applied to panel data of cohorts working in the DOD occupational codes. We attempted both of these approaches in our analyses of officers and enlisted personnel. Neither of these approaches proved useful in the particular circumstances of our analysis.

First, for changes in marital status that happen near the retention decision, it is unclear in which order the marriage and retention decisions actually happened (as opposed to when they were recorded). There are lags between when servicemembers decide to marry and actually marry, as well as when they decide to (or not to) retain and when they are eligible to actually do so (and, thus, the decision is recorded). Accurate estimates of the impact of marital status on retention depend on identifying situations in which the marriage and retention decisions were made sequentially (and in that order). In reality, especially for changes in marital status made near the retention decision, it is possible that the marriage and retention decisions were made jointly or that the retention decision was made first.

The second major concern for our analysis is the possibility of some unobserved omitted factor influencing both marriage and retention. This can manifest in several ways. For instance, policies aimed at improving the employment outcomes of military spouses might increase both the likelihood that servicemembers get married and the likelihood that they retain. It also is possible that differences in cultural norms among the general population mean that servicemembers who tend to get married when they are young also are the kind of people who tend to retain in the military. In this case, marriage would not be a cause of retention, it would be a signal that the servicemember is more likely to naturally retain (or vice versa). Likewise, contrasting retention rates across years where more (or fewer) servicemembers are married may simply signal years where there are more (or fewer) servicemembers of this type. In this scenario, marriage rates would serve as a potential signal in future retention forecasts but would not have a causal effect on retention.

A third challenge has been the nature of the DMDC data that are available to support this study. In addition to the problems with the compensation data already mentioned, other measures that would have been useful in our analysis, such as the lengths of enlisted contracts and officers' current obligated service, either are not gathered by DMDC or are of poor quality.

We use quarterly snapshots of DMDC's active component enlisted and officer files for each of the services. The data allow us to identify changes in servicemembers' personal and military characteristics across time, including their marital status, their paygrades, their occupations/communities, and so on. Our analysis requires that we examine the complete service histories of everyone in our sample (to assess, for example, their marital status since entering the military), and, for this reason, we have excluded those who were in the military in 2000 but who accessed at an earlier date. We also have excluded those who entered the military in recent years and whose reenlistment decisions are not yet evident. Finally, we have excluded the small portion of personnel who are married at the time of accession.

Our explanatory variable of interest is an indicator of whether a servicemember marries after accession but before the end of his or her eighth quarter of service (2 YOS). On one hand, we assume that this is early enough in the careers of service personnel to be unlikely that their

later reenlistment decisions will have a substantial influence on their marriage decisions, thus helping us to deal with the reverse causality issue. On the other hand, 2 YOS should be late enough in a servicemember's career that a sufficiently large proportion have married and we can derive statistically significant and economically meaningful results about the effects of marriage on reenlistment.

Because there are sharp differences between officers and enlisted servicemembers and the laws and policies that regulate their careers, we have conducted separate analyses for these two groups. For similar reasons, within our analyses of officers and enlisted personnel, we have undertaken separate estimations for each of the four armed forces.

Findings

Enlisted

In this subsection, we show our results for enlisted personnel. We summarize the results as follows. For enlisted men, being married by the eighth quarter of service is associated with higher retention. For enlisted women, the effect is smaller: marriage is associated with higher retention only in the Army, and we do not observe any statistically significant relationship between marriage and retention for enlisted women in the Air Force, Navy, or Marine Corps.

Empirical methodology for enlisted analysis

Using individual-level data for each service, we use a linear probability approach—an ordinary least squares (OLS) regression of a binary retention variable on servicemembers' marital status early in their service careers (generally, their status at the end of eight quarters of service).

For our analysis of enlisted personnel, we define retention in the early years of service to be YOS 4 to YOS 6.5—remaining in the military for at least 26 quarters (6.5 YOS) conditional on having served 16 quarters (4 YOS). This definition captures reenlistment among those with the longest enlistment contracts, and it also is a good proxy for those who sign shorter contracts.

We have included in our regressions control variables for occupation, time of accession, and other servicemember-specific independent variables, including race/ethnicity, gender, age at accession, Armed Forces Qualification Test (AFQT) score, accession quarter or year, and DOD occupation code. Inclusion of these latter two variables helps us to control for unobserved factors that can vary over time and that might bias our estimates of the relationship between marriage and retention (e.g., changes in civilian labor market conditions, or changes in preferences for military service over time; or differences in promotion potential or working conditions across occupations).

Summary of results for enlisted personnel

Table 5 shows, for the enlisted personnel in our dataset who accessed between 2000 and 2006, the incidence of marriage by the end of the eighth quarter (2 YOS), and Table 6 shows our regression results.

Table 5. Share of enlisted (enlisted at age 18) who have ever been married, by service and timing

	Army	Navy	Air Force	USMC
First observation	0.02	0.01	0.02	0.00
End of YOS 1	0.08	0.10	0.12	0.09
End of YOS 2	0.20	0.20	0.22	0.20
End of YOS 3	0.33	0.29	0.30	0.32
End of YOS 4	0.49	0.36	0.39	0.44

Source: CNA tabulations of DMDC data (for enlisted personnel who accessed 2000 to 2006).

Table 6. Retention differences (YOS 4 to YOS 6.5) for married versus unmarried enlisted, by gender and service

	Navy		Army		Air Force		USMC	
	Men	Women	Men	Women	Men	Women	Men	Women
Retention difference	7.7	-0.9	8.5	3.5	5.3	1.1	11.2	1.7
	(0.3)	(0.9)	(0.2)	(0.6)	(0.3)	(0.7)	(0.4)	(1.9)
Average retention	60.3	55.4	61.8	58.6	69.3	67.9	54.4	56.5

Source: CNA estimates from DMDC data.

Note: Coefficients represent percentage points. Standard errors are in parentheses.

One empirical result that is consistent for all the services is that, for enlisted men, being married by the eighth quarter of service is associated with higher retention. This effect is largest in the Marine Corps where the likelihood of retention past 6.5 years is 11.2 percentage points (pp) higher among married men than among single men. The effect of marriage for men is smallest in the Air Force, where marriage is associated with a 5.4 pp greater retention likelihood. Among enlisted women, marriage is associated with higher retention only in the Army, where married women are 3.5 pp more likely to retain to 6.5 years than those who are unmarried. We do not observe any statistically significant relationship between marriage and retention for women in the Air Force, Navy, or Marine Corps.

Our estimation results are consistent with other studies that have looked at the effects of marriage on retention among samples of enlisted military personnel. These studies have typically found that married servicemembers reenlist at a rate that is 8 to 16 pp higher than for unmarried members [37-39].

Officers

In this subsection, we show results for officers, which can be summarized as follows. We find that male officers who are married at the end of their second year of service historically have had higher rates of retention at three to nine years of commissioned service (YCS)—that is, retention to 9 YCS conditional on having reached 3 YCS. The opposite holds for women; female officers who are married at the end of their second year of service historically have had lower rates of retention at YCS 3 to YCS 9. These historical relationships are consistent across services, across time, and across alternative measures of early-career retention.

As discussed, when trying to estimate the effect of income changes on marriage rates (and the downstream effects of these changes in marriage rates on retention), our choice of methodology is dominated by three concerns: marriage and retention decision order, unobserved variable effects, and data limitations.

The limited accurate information available in DMDC data, especially inaccurate pay information, greatly constrains the statistical models that are feasible for this analysis.

Data limitations for officers

There are additional limitations to the DMDC data (beyond the inaccurate pay information) that affect our analysis for officers.

First, there is no identification of the end of officers' current obligated service, including the Minimum Service Requirement (MSR) signaling the end of their first contracts. In general, MSR can be identified using the source through which officers entered service (one of the service academies, officer candidate school, etc.), but there are community-by-community exceptions (aviators have later MSRs). After MSR, there is no way to identify whether officers are serving on a year-to-year basis or have incurred additional obligation through different means. As a result, our ability to examine the historical relationship between marital status and later retention is hampered by our inability to identify who was and was not eligible to leave at a particular YCS.

Second, our information about the loss decision is limited. The data include both a loss date and a loss reason, but the data include examples of officers with an early loss date and loss reason recorded each quarter who nonetheless continued in the service (and received promotions, etc.) for years. For that reason, we use officers' final observation in the dataset as their final quarter in the service; however, the lack of consistent loss code data prevents us

from categorizing the type of loss (or trying to identify in-contract versus end-of-contract losses later in officers' careers for those who incur additional obligation).

Empirical methodology for officer analysis

Recall that we have two principal concerns about estimating the effect of marital status on retention: reverse causality and omitted variables.¹⁴

Our empirical strategy focuses on carefully identifying how the retention of married and single officers has differed over the past two decades. We expect marital status to vary by observable officer characteristics (notably, age) that also may be correlated with retention, so we include controls for several variables.¹⁵ Following the implied suggestions from previous literature, we estimate the historical relationship separately for men and women. As we show below, this has a notable effect on our results.

Since, as we discussed earlier, we cannot observe an accurate MSR for all officers, we estimate differences in retention at YCS 3 to YCS 9; that is, the share of officers (who still were in service at YCS 3) who retained to YCS 9. YCS 3 is at least one year before MSR for all officers, and YCS 9 is several years past MSR for most officers (with aviators being a notable exception). Furthermore, since the earliest MSR in our data is four years of service, we measure marital status at the end of YCS 2 to reduce the likelihood that the (actual, not recorded) retention decision preceded the marriage decision. Finally, as our marital status variable of interest, we use whether an officer has ever been married.¹⁶ We do so to avoid the complications arising from separations, divorces, and remarriages that are outside the scope of our study.

Our final model is a linear probability model that estimates the historical pp difference in retention for those who had, at some point, been married (compared to those who had not) with controls for the variables listed previously.

¹⁴ There is a statistical strategy—instrumental variables—to deal with both of these concerns at the same time, but that strategy involves making assumptions that, for our data, were dubious and require validity tests that our proposed implementation did not pass. Another potential solution is aggregating observations to the community level and relying on “fixed effects” to account for any unobserved third factors. The estimates from this “aggregation” strategy were very sensitive to small changes in the length of service at which we measured whether officers were married. This lack of stability combined with no convincing argument about which “marital timing” choice is correct suggests that the aggregation strategy is a poor one in this circumstance.

¹⁵ In particular, we included indicator variables for racial/ethnic groups, commissioning source, initial (non-student) occupational group, the fiscal year of accession, and the age at accession. We excluded officers who were married when we first observed them in the data, as well as officers we did not observe in the first year of service.

¹⁶ Formally, the variable is defined as whether an officer does not have a marital status value of being single, never married.

Summary of results for officers

We begin our discussion of results by noting the share of officers who have been married by different years of commissioned service. Since this will vary based on the average age at commissioning (which can vary across time and across services), we show marriage rates for officers who commissioned at age 22 (this is strictly illustrative; we do not include the same restriction in our analysis). As Table 7 shows, being married (or divorced/separated) at commissioning is uncommon in all of the services, though it is notably more common in the Air Force. By the end of YCS 2 (our preferred measure of marital timing), around a quarter of officers in our dataset are married or have previously been married.

Table 7. Share of officers (commissioned at age 22) who have ever been married, by service and timing

	Army	Navy	Air Force	USMC
First observation	0.04	0.03	0.12	0.06
End of YCS 1	0.17	0.11	0.20	0.17
End of YCS 2	0.27	0.20	0.31	0.26
End of YCS 3	0.37	0.29	0.40	0.35
End of YCS 4	0.45	0.37	0.49	0.45

Source: CNA tabulations from DMDC data.

As Table 8 shows, officers who were married at the end of their second YCS have historically retained differently than those who were single. The differences vary substantially by gender: married women have been less likely to retain than single women in all of the services. The effect is quite large for the Marine Corps in particular, where married women are approximately 12 pp less likely to retain than single women. In contrast, married men are more likely to retain than single men in all of the services, with the largest difference for the Army.

Table 8. Retention differences (YCS 3 to YCS 9) for married versus unmarried officers, by gender and service

	Navy		Army		Air Force		USMC	
	Men	Women	Men	Women	Men	Women	Men	Women
Retention difference	2.9	-4.5	7.6	-3.5	2.8	-5.0	5.1	-11.7
	(0.9)	(1.7)	(0.6)	(1.3)	(0.7)	(1.4)	(1.1)	(4.1)
Average retention	58.4	41.2	47.2	39.2	67.4	43.6	48.2	39.6

Source: CNA estimates from DMDC data.

Note: Coefficients represent percentage points. Standard errors are in parentheses.

The main takeaway for officers—that married men are more likely to retain than single men, while the reverse holds for women—is not overly dependent on our choice of marital timing. Our results are substantively similar regardless of whether we use marital status at the end of the first, second, or third year (results not shown). In all cases, the estimated direction of the relationship is similar as are the main takeaways (the gap between married and single men is always largest in the Army, while the gap between married and single women is largest in the Marine Corps). Likewise, the results are similar to retention gaps from the year before MSR to the year after MSR.¹⁷ Our estimates also largely align with previous research, which has found retention rates for married male officers on the order of 3 to 9 pp higher than those for unmarried male officers but has found little or no (or in some cases, a negative) effect for women [5, 36, 40-41].¹⁸

¹⁷ This result excludes those in the aviation and medical communities.

¹⁸ Kraus et al. (2013), for example, also found a negative effect of marriage on retention for female Navy officers. Parcell, Smirnov, and Kraus (2018) found that female Navy officers with military spouses are more likely to leave the Navy than single female officers [40-41].

Income Changes and Marriage Behavior: Implications for Retention

In this section, we examine the implications of our data analysis and the literature for the relationship between income changes, changes in marriage behavior, and changes in retention. Because of the data limitations described in previous sections, we were unable to include compensation variables in our own statistical analyses. As a result, we combine our statistical results on marriage and retention with the literature's findings on both (a) marriage and retention and (b) compensation and marriage to bound the size of retention changes that might be expected from a move to an SSS.

Assumptions

We consider the effects of a \$10,000 reduction in income for a servicemember.¹⁹ This reduction is similar in magnitude to the typical reduction some servicemembers would face under the three SSS implementation scenarios we considered. (Under the partial compensation scenarios summarized in Table 2 and Table 4, for example, married junior enlisted BAH recipients would see pay cuts on the order of \$7,000 or \$8,000, while married junior officers would see reductions of \$6,000 or \$7,000.) Two key sets of assumptions follow.

Income and marriage

Schneider (2011) found that every \$10,000 of additional income increases the likelihood of marriage by 1 percent in a total income model, while Watson and McLanahan (2011) found that, for income below the marriage bar, 10 pp higher income (that is, closer to the marriage bar) increases the probability of marriage by 2.4 pp [21, 42].²⁰ We assume that the marriage bar for enlisted servicemembers is the RMC of the median enlisted member, and that the marriage bar for officers is the RMC of the median officer.²¹ RMC for the median enlisted

¹⁹ This is the size of the income change considered by Schneider (2011), although his analysis reported effects for an income increase rather than a reduction.

²⁰ Note that we are assuming that income reductions of a given size have the same magnitude effect (but opposite in sign) on marriage rates as do income increases of the same size.

²¹ This definition assumes that enlisted servicemembers compare their incomes to those of other enlisted members, and that officers compare their incomes to those of other officers, If servicemembers also compare their

servicemember (who would have rank E-4) is about \$50,000, so a 10 pp income increase would be equivalent to about \$5,000 (see Table 12 in Appendix A). For the median officer (rank O-3), RMC is around \$100,000, so a 10 pp increase below the marriage bar is equivalent to about \$10,000.²² For people in the 25-to-34-year-old age group that Watson and McLanahan studied, a 2.4 pp increase in the marriage rate would be equivalent to a 3–5 percent increase for military (enlisted) and a 4–11 percent increase for civilians [13]. We will, therefore, consider a range of effects of income on marriage from 1 to 15 percent. We will consider the cases of (1) 25-year-old enlisted members with 6 YOS, of whom about 50 percent are married, and (2) 28-year-old officers with 6 YOS, of whom about 56 percent are married [13].

Marriage and retention

The literature and our own statistical estimates have found marriage effects on retention on the order of 5 to 16 pp for male enlisted and from 3 to 9 pp for male officers [36-39, 45]. We will use these estimates as our range of effects for marriage on retention in this analysis.

Enlisted results

Table 9 shows the potential range of effects on marriage and retention of a \$10,000 decrease in income for a 25-year-old enlisted member with 6 YOS, using the foregoing set of assumptions.²³

incomes to those outside the military, then results showing that RMC for servicemembers is above the median level for civilians with similar characteristics (see, for example, Grefer et al. 2011 or Hosek et al. 2018) imply that a higher percentage of servicemembers will be above the marriage bar than we assume in our analysis [43-44]. This, in turn, implies that the marriage and retention effects of any SSS pay changes would be even smaller than those we report, which would reinforce our conclusion of small effects. We also do not consider nonmonetary forms of compensation in our analysis. To the extent that servicemembers have better health care and other nonmonetary benefits than do those outside the military, the implications of taking nonmonetary benefits into account are also likely to be fewer servicemembers below the marriage bar, and smaller effects on marriage and retention behavior from SSS-related pay changes.

²² We note that our assumptions about the marriage bar for servicemembers are consistent with our data on the percentage of servicemembers who are married (see Table 5 and Table 7), which shows a large increase in the marriage rate for both enlisted and officers over the first four years of service.

²³ Table 9 does not take into account the gender differences in the effect of marriage on retention discussed in the last section. We focus here on the results for men because those represent the strongest potential adverse effects on retention from changes in marriage behavior. Differences across services are accounted for in the range of effects across columns in Table 9.

Table 9. Range of effects of a \$10,000 income reduction on enlisted retention

Effect of income on marriage rate (%)	Marriage rate	Effect of marriage on retention (pp)			
		5	8	12	16
Baseline	50.0%	34.0%	34.0%	34.0%	34.0%
-1	49.5%	34.0%	34.0%	33.9%	33.9%
-5	47.5%	33.9%	33.8%	33.7%	33.6%
-10	45.0%	33.8%	33.6%	33.4%	33.2%
-15	42.5%	33.6%	33.4%	33.1%	32.8%

Note: Calculations for a 25-year-old enlisted member with 6 YOS.

Source: CNA calculations.

For 25-year-old enlisted members with 6 YOS, about 50 percent are married, and the continuation rate to 7 YOS is about 34 percent [13]. The “Marriage rate” column shows the effects of the \$10,000 income reduction on the percentage married, under different assumptions about the size of the effect (ranging from a 1 percent to a 15 percent reduction in the marriage rate). For the largest effect, 15 percent, the percentage married would fall to 42.5 percent. The columns below “Effect of marriage on retention” show calculations for what would happen to the retention rate under a range of assumptions about the size of the effect of the change in the marriage rate on retention. For example, the “5” column calculates the effect on the retention rate under the assumption that the difference between the retention rate for married and single enlisted is 5 pp. At baseline, with half of 25-year-old enlisted members married and half single, the implication is that the continuation rate for married enlisted 25-year-olds is about 36.5 percent, while the rate for singles is 31.5 percent (producing the average effect of 34 percent).

The table cells show what happens to the baseline continuation rate under the different assumptions about the size of the income effect on marriage and about the size of the effect of marital status on retention. For example, the cell corresponding to row “-15” and column “16” shows what happens to the baseline retention rate under the assumption that a \$10,000 income reduction will decrease the marriage rate by 15 percent, and that married enlisted servicemembers are 16 pp more likely to continue than single enlisted servicemembers. The 16 pp difference in retention implies that, at baseline, the retention rate for married enlisted 25-year-olds is about 42 percent, while the retention rate for singles is about 26 percent. If the percentage married falls to 42.5 percent, the retention rate might be expected to fall to $(42.5 \times 42) + (57.5 \times 26) = 32.8$ percent.

Table 9 shows that, at the high end of the range of assumptions, a \$10,000 income reduction might be expected to reduce the retention probability of a 25-year-old enlisted servicemember

with 6 YOS from 34 percent to about 32.8 percent. This represents a 1.2 pp decrease, or about 3.5 percent. This represents an upper bound on the range of potential effects; any actual effect is likely to be smaller than this.

Officer results

Table 10 shows the results of performing the same analysis, but this time for a 28-year-old officer with 6 YOS.

Table 10. Range of effects of a \$10,000 income reduction on officer retention

Effect of income on marriage rate (%)	Marriage rate	Effect of marriage on retention (pp)		
		3	5	9
Baseline	56.0%	55.0%	55.0%	55.0%
-1	55.4%	55.0%	55.0%	55.0%
-5	53.2%	54.9%	54.9%	54.8%
-10	50.4%	54.8%	54.7%	54.5%
-15	47.6%	54.8%	54.6%	54.3%

Note: Calculations for a 28-year-old officer with 6 YOS.

Source: CNA calculations.

At the high end of the range of assumptions for officers (a 15 percent reduction in marriage percentage and a 9 pp difference in retention probability between married and single officers), a \$10,000 income reduction would be expected to reduce the retention probability of a 28-year-old officer with 6 YOS from 55 percent to about 54.3 percent—a decrease of 0.7 pp, or 1.3 percent.

Summary

These calculations imply that the effect of income changes on retention through changes in marriage behavior are likely to be small, for both enlisted and officers. A \$10,000 pay cut would be expected to reduce enlisted retention by at most 3 to 4 percent, and for officers by at most a little more than 1 percent. Again, because these are upper bounds, the actual effects are likely to be smaller.²⁴

²⁴ Note that a pay cut of \$10,000 may well have larger total retention effects than just those induced by changes in marriage behavior. Our analysis, though, focuses only on marriage-induced retention changes. The larger potential retention effects are beyond the scope of our study.

Implications for Force Inventory

In this section, we present our force inventory modeling analysis results. The objective of this part of the analysis is to take our findings on the effect of compensation on marriage behavior, and of marriage behavior on retention, and examine the likely implications for (1) the proportion of married and single servicemembers in the force and (2) how much force size might change, under different scenarios for implementing an SSS. The implications for force size are important for assessing the effect of an SSS on military readiness because an SSS that generates significantly decreased retention and force size will have further implications for recruiting and accession policy, and the experience level, quality, and cost of the force.²⁵

Methodology

First, we created a baseline model of the current force structure. To produce a model of the current cohort of servicemembers, we generated a representative cohort in which paygrades are assigned based on the observed paygrade distribution. Within paygrades, we assigned ages proportionally based on the observed age distribution. We also assigned time-in-grade and months of service by sampling an empirical triangular distribution within each paygrade. We assigned marital status according to gender and age. To model accessions, we then generated a representative annual accession cohort (using a similar method), based on the characteristics of those who accessed in FY 2018 and FY 2019. Continuation rates by YOS were based on observed continuation rates between FY 2015 and FY 2019, stratified by gender and marital status (thus capturing the effect of marital status on retention). Baseline annual marriage probabilities (by age and gender) are based on DMDC marital status changes over the last 5

²⁵ In reality, it is force composition rather than force size that is of primary concern. Most of the services would adjust endstrength by increasing retention or recruiting efforts in response to a potential force size reduction, depending on the service's needs. On one hand, increased recruiting effort would result in a younger, less experienced force that might be cheaper from a cost perspective, but also might raise readiness concerns (especially for the Air Force, Army, and Navy, whose servicemember profiles generally are older and more experienced than those of the Marine Corps). Meeting endstrength needs through increased retention, on the other hand, could result in an older, more experienced force that would be more expensive, and with different personnel readiness concerns (e.g., potentially higher operational tempos for junior servicemembers, of which there will be fewer, which could, in turn, have downstream retention effects). Although our model is not designed to consider this broader set of outcomes, it can provide insight into the potential need for future increases in recruiting or retention efforts as a result of changes in marriage behavior due to an SSS.

years. This baseline model shows what we would expect the force size to look like in the future (out to 10 years), under the current RMC structure.

We then modified the baseline model to examine the implications for percentage married and force size of the three different SSS implementation scenarios: full compensation, partial compensation, and partial compensation with housing rents. The pay changes under each of the three scenarios are those in Table 1, Table 2, and Table 4. We assumed that a marriage bar eliminates the effect of income on marriage for enlisted servicemembers in paygrades E-5 and above and officers in paygrades O-4 and above. For servicemembers below these marriage bars, we assumed that a \$10,000 change in income changes the probability of getting married by 2 percent (twice the size of the effect for civilians identified by Schneider (2011) [21]).²⁶

Enlisted

Here we present the results of our force inventory model for enlisted servicemembers. Overall, the model predicts small effects on both the marriage rate and force size from each of the three SSS implementation scenarios identified in the above paragraph. To investigate what might happen if an SSS produces substantially larger effects on marriage behavior than our analysis (to this point) indicates is likely, we also present results for two additional scenarios:

- One in which a SSS drives military marriage rates down to civilian levels
- Another in which military marriage rates are driven down to a level that is an average of current military and civilian marriage rates

Navy

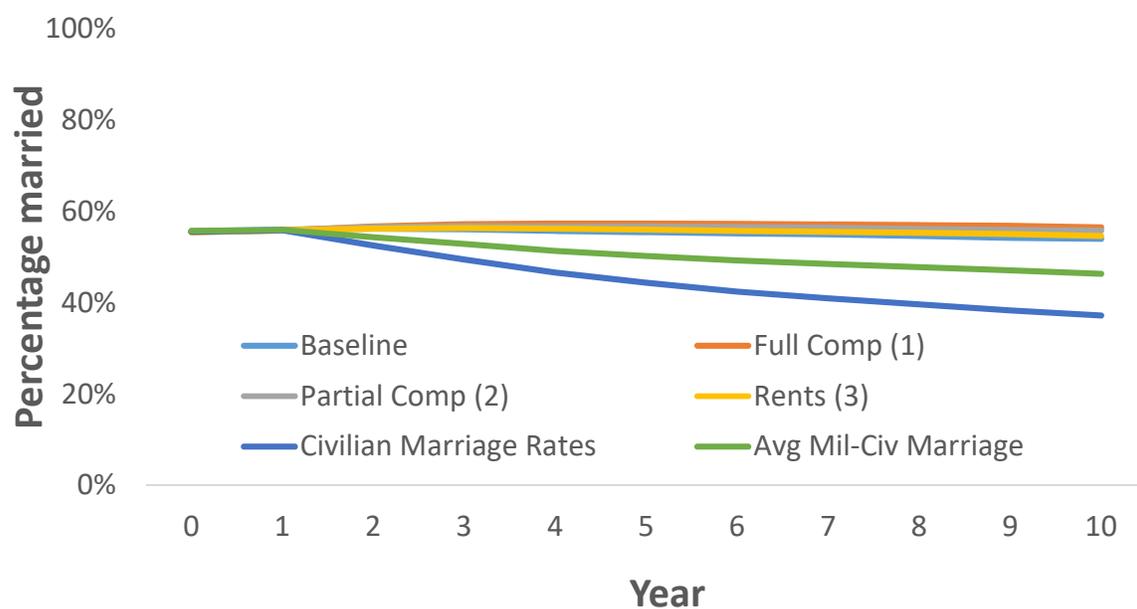
Figure 3 shows the predictions of our model for marriage rates of Navy enlisted Sailors under the three SSS implementation scenarios.

Our force inventory model predicts little change in the overall enlisted marriage rate in any of the three SSS implementation scenarios. In fact, for the first two scenarios (full compensation and partial compensation), our model predicts small increases over the next five years in the proportion of enlisted Sailors who are married. At the five-year point, for example, the baseline projection is for about 55 percent of enlisted Sailors to be married (about the same as now), while under the full compensation and partial compensation SSS implementation scenarios the percentage of enlisted Sailors who are married is projected to increase to about 57 percent. The intuition behind these projections is that, under these two SSS implementation scenarios,

²⁶ Note that this 2 percent effect is at the low end of the range of marriage effects analyzed in Table 9 and Table 10 (1 to 15 percent). This reflects our best assessment of the likely size of the effect of pay changes on marriage rates.

some Sailors (those currently not receiving BAH) will see relatively large pay increases, which will drive up marriage rates faster than the marriage rate reductions due to the pay reductions to other servicemembers. Even under the third scenario, partial compensation with housing rents charged to those currently not receiving BAH (which would reduce much of those pay increases), our model predicts that the percentage of enlisted Sailors who are married will remain about the same as under the current pay structure. The reason for this is that pay reductions under this scenario, especially for those not currently receiving BAH, are concentrated at the middle and senior levels, where the effects of income and marriage are assumed to be smaller.

Figure 3. Navy enlisted marriage rates under SSS scenarios



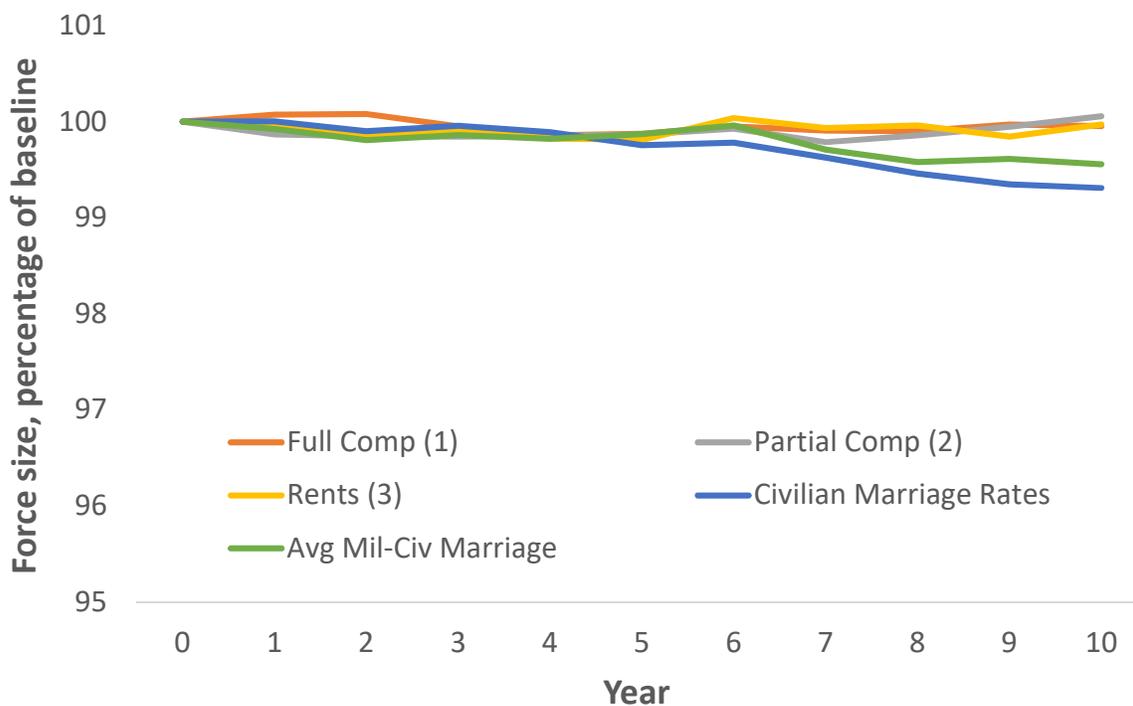
Source: CNA.

It's possible that we are underestimating the effects of moving to an SSS on enlisted marriage behavior. To account for this possibility, we also consider the two additional scenarios in which an SSS drives military marriage rates down either to civilian levels (labeled "civilian marriage rates" in Figure 3) or to an average of current civilian and military marriage rates ("average military-civilian marriage rates" in Figure 3). Under the "civilian marriage rates" scenario, the model projects the percentage of enlisted Sailors who are married to fall from 55 percent to 44 percent over five years. Under the "average military-civilian marriage rates" scenario, the percentage of enlisted Sailors who are married would fall to 50 percent over the five-year forecast. We can use these latter two scenarios to analyze the effects on force size for

potentially larger changes in marriage behavior than predicted under the three SSS implementation scenarios.

Figure 4 shows deviations from baseline force size for Navy enlisted Sailors, under the three SSS implementation scenarios and the two alternative scenarios (civilian marriage rate and average-civilian-military marriage rate).

Figure 4. Navy enlisted force size, deviations from baseline under SSS scenarios



Source: CNA.

Our force inventory model projects relatively small changes in Navy enlisted force size due to changes in marriage behavior under the SSS implementation scenarios. For the full and partial compensation scenarios, over a five-year forecast, the model projects that the number of Navy enlisted would be less than 400 fewer than under the baseline scenario (compared to a baseline inventory of about 277,000 Navy enlisted Sailors). For the partial compensation scenario with rents, the number of Navy enlisted is projected to be only about 500 fewer than under the baseline scenario. Even under the civilian marriage rate scenario, which assumes the largest effects of an SSS on marriage behavior, at the five-year point the number of Navy enlisted Sailors is projected to be only about 700 fewer than baseline, and only about 2,000

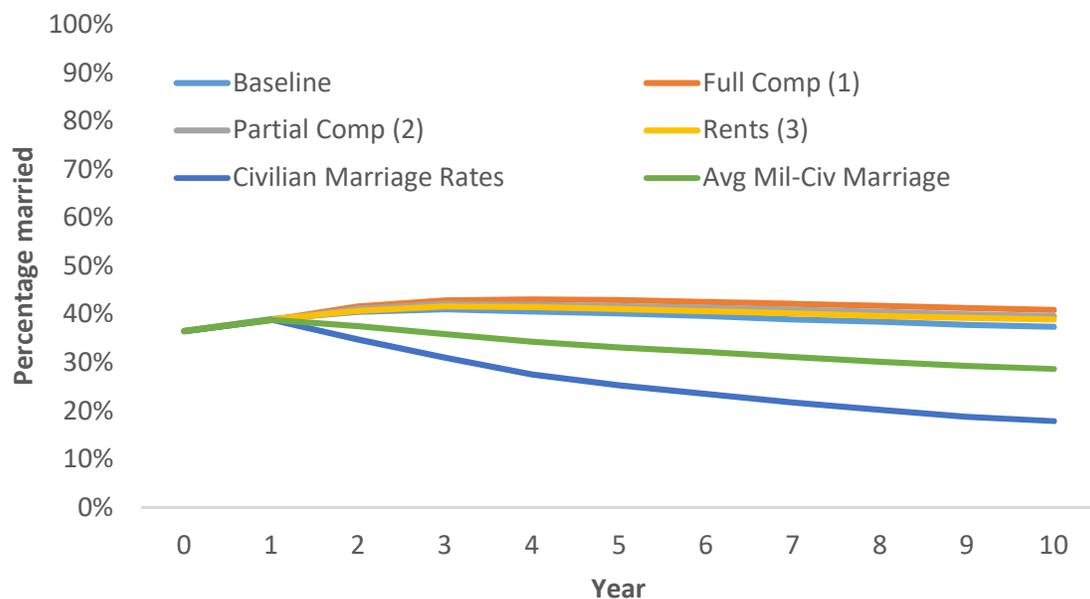
fewer at the 10-year point (less than a 1 percent deviation from baseline). Overall, then, the effects of changes in marriage behavior on the number of Navy enlisted Sailors appear to be small, even under the most extreme assumptions.

The intuition for this result is, first, that the effect of even relatively large changes in marriage behavior appear to have only small effects on retention. The calculations presented in Table 9, for example, suggest that even relatively large assumptions about the effects of income on marriage behavior result in reductions in retention probability on the order of 3 to 4 percent for enlisted (and this is probably an upper bound on the effect's size). In addition, the size of the effects of income on marriage behavior, and of marriage behavior on retention, are not uniform, but rather vary by servicemember characteristics. Changes in income tend to have the strongest effects for younger and more junior enlisted; mid-grade senior enlisted are likely to be affected less by SSS-related pay changes, which mutes any effect for the force as a whole.

Marine Corps

Figure 5 shows model results for the marriage rates of enlisted Marines under the three SSS implementation scenarios.

Figure 5. Marine Corps enlisted marriage rates under SSS scenarios

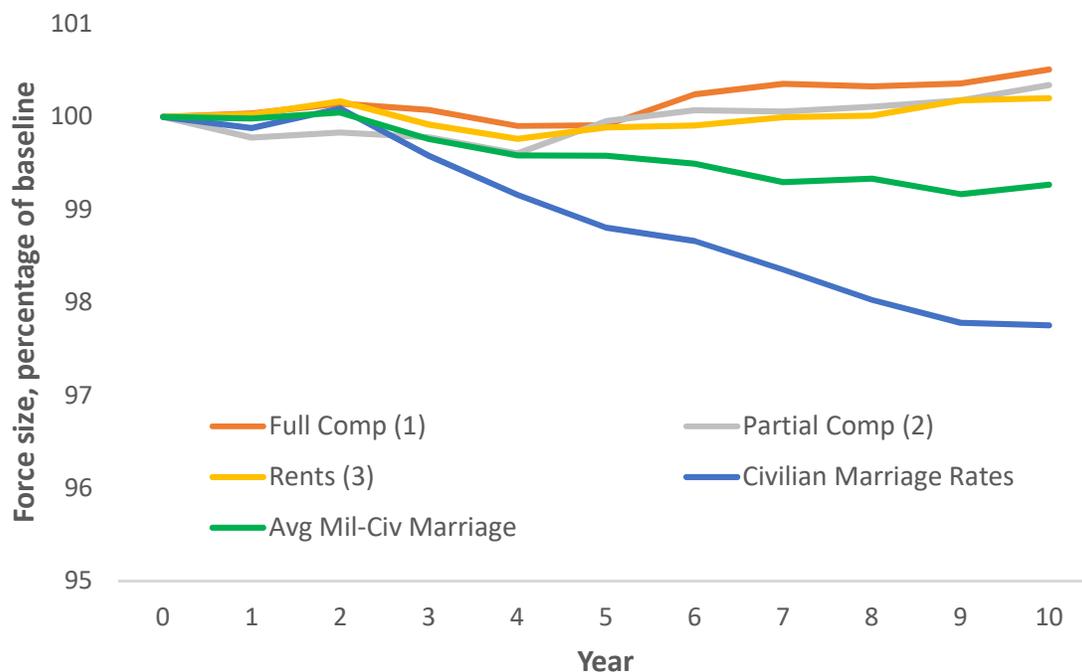


Source: CNA.

As with Navy enlisted, our model predicts only small changes in the overall Marine Corps enlisted marriage rate resulting from any of the three SSS implementation scenarios. The forecast percentage of Marines married after 10 years ranges from 39 percent under the partial compensation with rents scenario to 41 percent under the full compensation scenario (compared with a baseline of 37.5 percent).

Figure 6 shows deviations from baseline force size for enlisted Marines, under the three SSS implementation scenarios and the two alternative scenarios of civilian marriage rate and average-civilian-military marriage rate.

Figure 6. Marine Corps enlisted force size, deviations from baseline under SSS scenarios



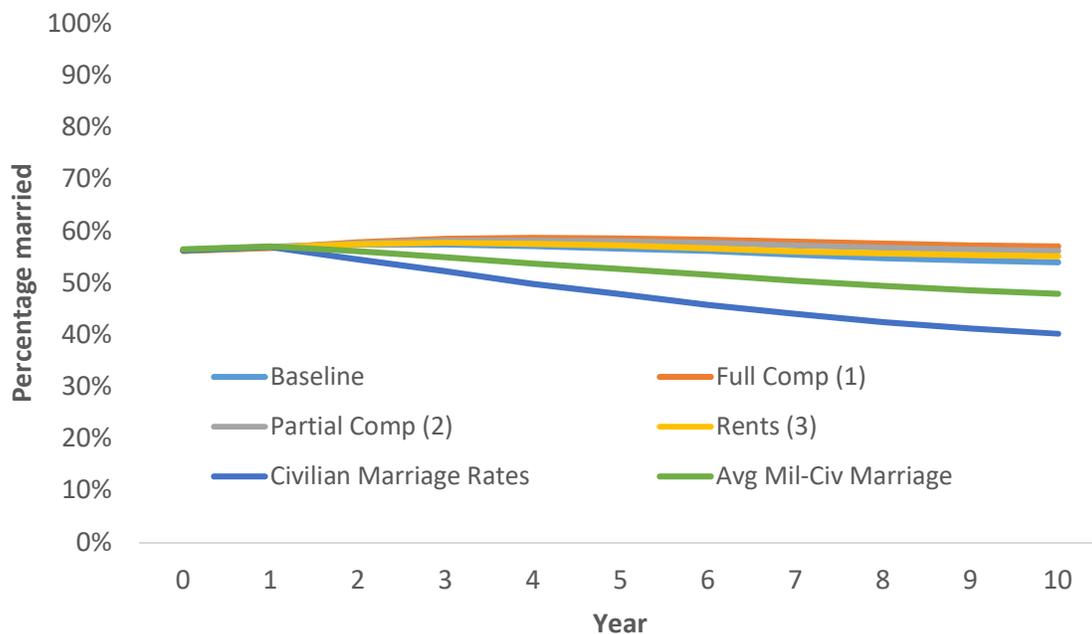
Source: CNA.

Again, our model projects relatively small changes in Marine Corps enlisted force size due to changes in marriage behavior under the SSS implementation scenarios. Under each of the three scenarios, the deviation of force inventory from baseline at the 10-year mark is one-half of 1 percent—a few hundred Marines relative to a baseline of about 160,000. The upper-bound civilian marriage rates scenario forecasts a deficit of about 2 percent (roughly 3,000 Marines) at the 10-year point relative to baseline, although it is unlikely that any of the SSS implementation scenarios would have this large an effect on marriage rates.

Air Force

Figure 7 shows model results for the marriage rates of Air Force enlisted under the three SSS implementation scenarios.

Figure 7. Air Force enlisted marriage rates under SSS scenarios

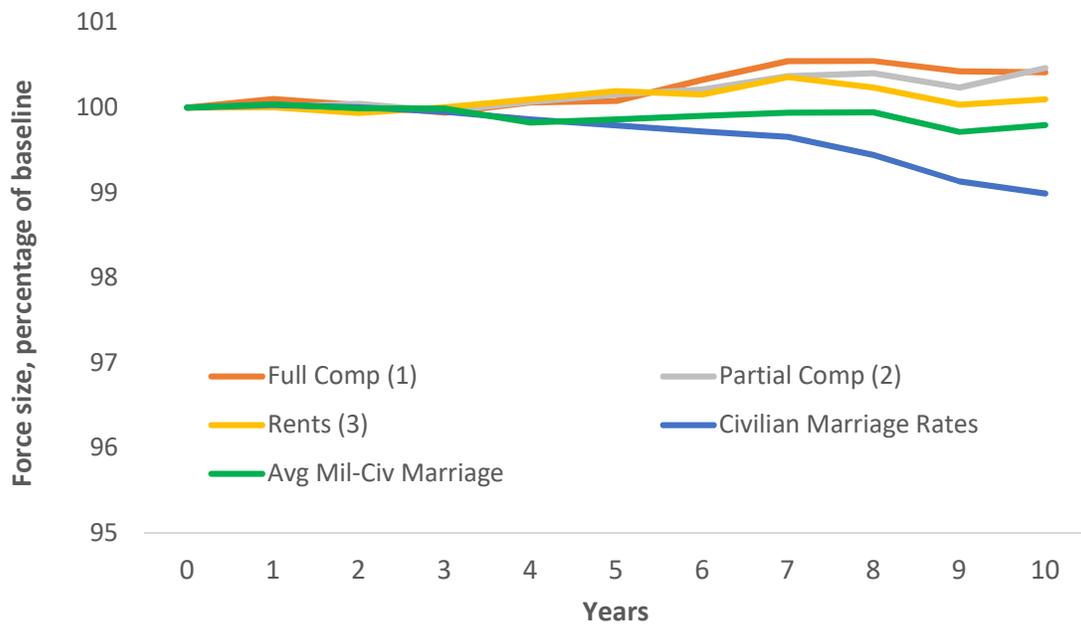


Source: CNA.

As before, our model suggests that none of the three SSS implementation scenarios results in enlisted Airmen marriage rates that are very different from baseline (about 54 percent at the 10-year point). The three SSS scenarios result in marriage rates ranging from 55 to 57 percent.

Figure 8 shows projected deviations from baseline force size for Air Force enlisted, under the three SSS implementation scenarios and the two alternative civilian marriage rate and average-civilian-military marriage rate scenarios.

Figure 8. Air Force enlisted force size, deviations from baseline under SSS scenarios



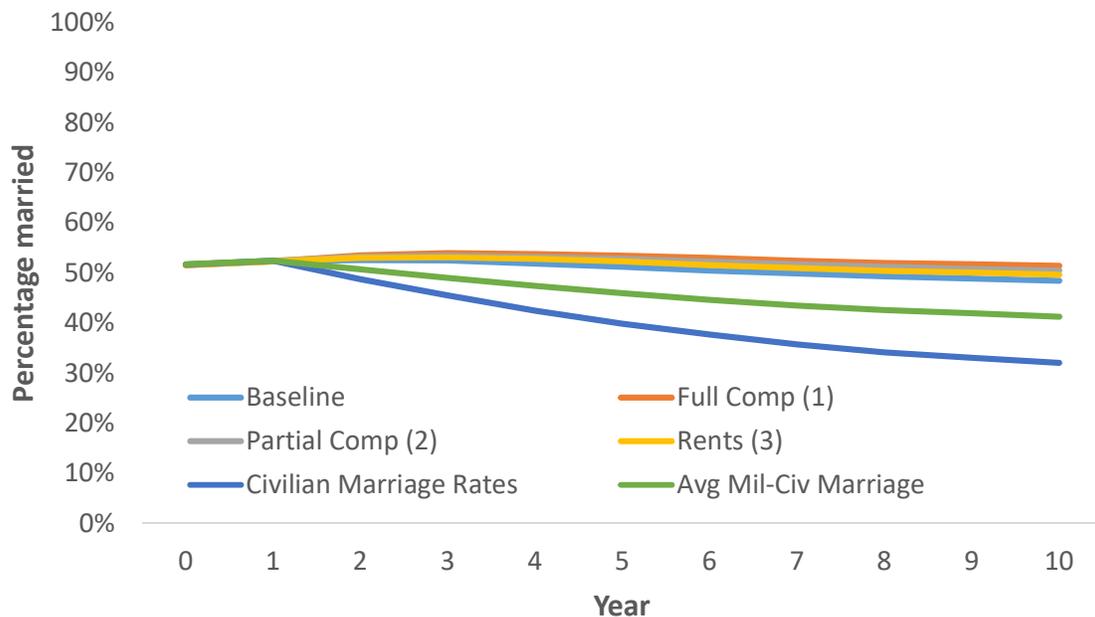
Source: CNA.

Under each of the three SSS scenarios, the deviation of force inventory from baseline at the 10-year mark is actually positive, but small (one-half of 1 percent or less—less than 1,000 Airmen relative to a baseline of about 260,000). The upper-bound civilian marriage rate scenario forecasts a potential deficit of about 1 percent (roughly 2,000 Airmen) at the 10-year point relative to baseline, although the effects from SSS implementation would likely be smaller than this.

Army

Figure 9 shows model results for the marriage rates of Army enlisted under the three SSS implementation scenarios.

Figure 9. Army enlisted marriage rates under SSS scenarios

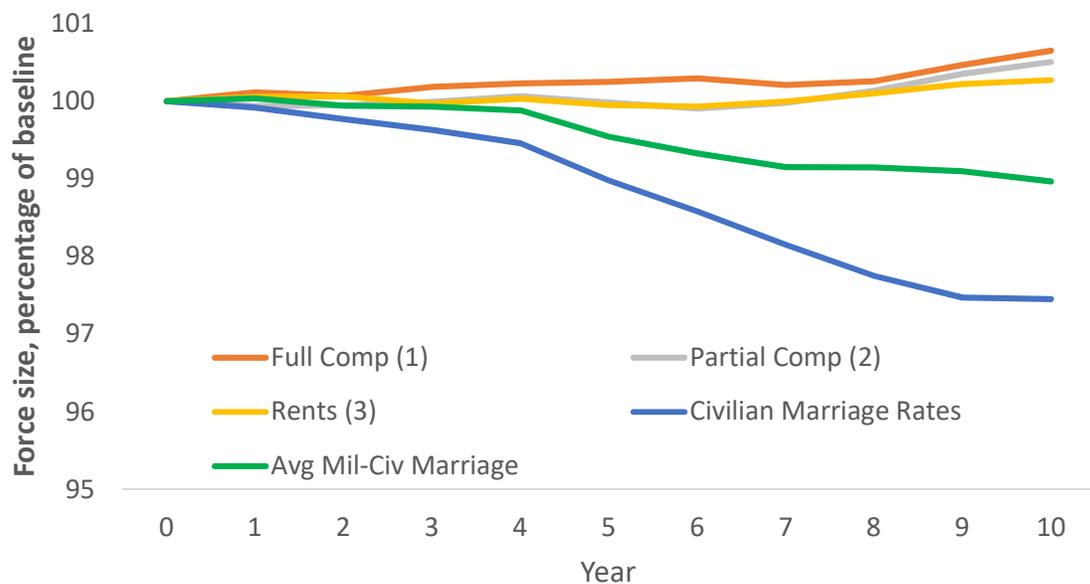


Source: CNA.

The model's results here are similar to those for the Navy, Marine Corps, and Air Force—a relatively small effect of any of the three SSS implementation scenarios on Army enlisted Soldier marriage rates. The marriage rate at the 10-year mark under each of the three SSS implementation scenarios ranges from 50 to 51 percent, which deviates little from the baseline of 48.5 percent.

Figure 10 shows the potential effects of these changes in marriage behavior on the projected deviations from baseline force size for Army enlisted, under the three SSS implementation scenarios and the two alternative civilian marriage rate and average-civilian-military marriage rate scenarios.

Figure 10. Army enlisted force size, deviations from baseline under SSS scenarios



Source: CNA.

Again, the results are similar to those for Navy, Marine Corps, and Air Force enlisted—relatively small (and positive) deviations from baseline (ranging from 0.3 to 0.7 percent, or about 1,000 to 2,000 Soldiers at the 10-year mark) resulting from changes to marriage behavior under each of the three SSS implementation scenarios. The upper-bound civilian marriage rates scenario does result in a force size forecast of 2.5 percent below baseline (about 8,000 Soldiers) at the 10-year mark, although (to repeat) this is probably a larger effect than would actually be realized.

Officers

Overall, as with enlisted, the effects of the SSS scenarios on the percentage of officers married and the number of officers in the force appear to be small, even smaller than the effects for enlisted. Because the effects are small, we discuss the results for officers in Appendix D.

Summary

Overall, our model's implications are consistent for both enlisted and officers, and across all four services. Under any of the three SSS implementation scenarios we consider, the effects on marriage behavior and retention, and therefore projected force size, appear to be small.²⁷

One reason for these results is the pattern of pay changes under an SSS. Under two scenarios (the full and partial compensation scenarios), servicemembers not currently receiving BAH will see relatively large pay increases, which will drive up marriage rates faster than the marriage rate reductions due to the pay reductions to other members. Under the third partial compensation with housing rents scenario, pay reductions are concentrated at the middle and senior levels, where the effects of income and marriage are assumed to be smaller.

Further, the effect of even relatively large changes in marriage behavior appear to have only small effects on retention, whereas the size of the effects of income on marriage behavior, and of marriage behavior on retention, vary by servicemember characteristics. Changes in income tend to have the strongest effects for younger and more junior enlisted. Mid-grade senior enlisted are likely to be affected less by SSS-related pay changes, which mutes any effect for the force as a whole. For all of these reasons, the effect of the SSS scenarios on marriage behavior and retention are small.

²⁷ These results may appear to conflict with our earlier estimate of a potential 3 to 4 percent reduction in enlisted retention resulting from the effects of SSS-related pay changes on marriage behavior (see Table 9, Table 10, and the associated discussion). We emphasize that the 3 to 4 percent figure is an *upper bound* on the potential effect; our best guess is that any actual effects would be a fraction of this upper bound.

Conclusion

This report presents our findings on the extent to which, under an SSS, changes in servicemember pay could affect retention and force size because of changes in military marriage behavior. Overall, we find that the effects of an SSS on servicemembers' marriage behavior probably will be small and that any changes to military retention and force inventories as a result of these changes in marriage patterns also will be small.

In our study, we calculated pay changes by paygrade for married and single servicemembers under three different SSS implementation scenarios:

1. **Full compensation**—a scenario in which basic pay is increased to fully compensate for the loss of BAH (at the without-dependents level), BAS, and the tax advantage
2. **Partial compensation**—a scenario in which the increases in basic pay associated with the first scenario are reduced to achieve cost neutrality for the federal government
3. **Partial compensation with housing rents**—a scenario in which the military would establish charges for military-provided housing to reduce the large pay gains that servicemembers not currently receiving BAH (e.g., those living on base) would receive under the first two scenarios

These calculations show that, under scenarios 1 and 2—full compensation and partial compensation—servicemembers not currently receiving BAH will receive large pay increases (both married and single). Of those who do receive pay decreases, married junior enlisted servicemembers would receive the largest percentage reductions. Under scenario 3—partial compensation-housing rents—the large gains for most non-BAH recipients would be eliminated. Notably, even though an SSS would eliminate the increase in pay that servicemembers with dependents currently receive under BAH, married and single servicemembers tend to be treated similarly in each of the three scenarios.²⁸

Our literature review and data analysis do find links between the level of compensation and marital status (for civilians), and between marital status and military retention. The literature supports a marriage-bar hypothesis that income increases are associated with increases in marriage rates, but only up to a certain level (usually associated with a local community median income level). Both the literature and our own data analysis support the idea that

²⁸ The largest differences are between those who currently receive BAH (who tend to receive pay decreases on the order of 10 to 15 percent under the two partial compensation scenarios) and those who do not (who stand to receive compensation increases of 20 to 40 percent under the partial compensation scenario).

marital status has a positive effect on retention, in which the effects are strongest for men and strongest early in a servicemember's career. Our force inventory modeling analysis, however, suggests that the effects of the pay changes under any of the three SSS implementation scenarios on the percentage of military servicemembers who are married, and the resulting changes in force size, will be relatively small (probably less than 1 percent of baseline force inventories).

There are a number of reasons why the effects of an SSS on force inventories due to changes in marriage behavior might be limited. One reason is the pattern of pay changes under an SSS. The largest differences in how servicemembers are treated under an SSS are not between married and single members, but rather between those who currently receive BAH and those who do not. Under the first two scenarios (full compensation and partial compensation), servicemembers who do not currently receive BAH will receive large pay increases under an SSS. These pay increases actually could increase incentives for these members to marry, thus counteracting any reduction in marriage rates among those receiving pay reductions. With the possible exception of junior enlisted, it is not clear that married servicemembers will be at a significant pay disadvantage relative to single under an SSS.

A second reason why the effects of an SSS on marriage rates (and through marriage rates, on retention and force size) might be relatively limited is that not all servicemembers respond to pay changes in the same way. The effect of pay on marital status, and of marital status on retention, are largest for men and for servicemembers early in their careers. For mid-career or senior servicemembers, and for women, the effects are small to nonexistent (and in the case of female officers, may actually work in the opposite direction with respect to the effect of marital status on retention).

Finally, we considered a combined effect—the combination of the effect of compensation on marriage behavior and the effect of marriage behavior on retention. As we showed in Table 9 and Table 10, combining the two effects can result in an overall effect that is relatively small, even when the individual effects appear to be large.

Note that this study is not a comprehensive analysis of the potential effects of an SSS on military retention. We are focusing on retention changes induced by changes in marriage behavior. There may be additional retention effects of an SSS that we do not consider here. Our findings, however, indicate that marriage-induced effects on retention from an SSS are likely to be small, which means that the need for changes to recruiting and retention policies intended to counteract such effects should be limited.

Appendix A: Regular Military Compensation

This appendix provides information about how current regular military compensation (RMC) varies according to a servicemember's marital status.

Table 11 shows, by paygrade, average monthly BAH rates for servicemembers with and without dependents for FY 2019. Note that these rates represent averages across locations and do not include the location-specific component of BAH payments. Currently, the BAH payment differential between single and married servicemembers ranges from 10 to 31 percent, depending on rank. The largest differentials go to junior enlisted in paygrades E-1, E-3, and E-4 and to warrant officers in paygrade W-1.

Table 11. Monthly BAH rates, FY 2019

Paygrade	Monthly BAH rates		Difference (\$/month)	Pct. difference
	Without dependents	With dependents		
Commissioned officers				
JCS/CC	\$2,387	\$2,831	\$444	19%
O-10	\$2,387	\$2,831	\$444	19%
O-9	\$2,387	\$2,831	\$444	19%
O-8	\$2,387	\$2,831	\$444	19%
O-7	\$2,387	\$2,831	\$444	19%
O-6	\$2,369	\$2,724	\$355	15%
O-5	\$2,203	\$2,605	\$402	18%
O-4	\$2,102	\$2,379	\$277	13%
O-3	\$1,855	\$2,058	\$203	11%
O-2	\$1,609	\$1,781	\$172	11%
O-1	\$1,434	\$1,638	\$204	14%
O-3E	\$1,945	\$2,232	\$287	15%
O-2E	\$1,796	\$2,092	\$296	16%
O-1E	\$1,697	\$1,981	\$284	17%
Warrant officers				
W-5	\$2,020	\$2,221	\$201	10%
W-4	\$1,873	\$2,148	\$275	15%
W-3	\$1,790	\$2,050	\$260	15%
W-2	\$1,682	\$1,949	\$267	16%

Paygrade	Monthly BAH rates		Difference (\$/month)	Pct. difference
	Without dependents	With dependents		
W-1	\$1,280	\$1,642	\$362	28%
Enlisted				
SEA	\$1,840	\$2,165	\$325	18%
E-9	\$1,840	\$2,165	\$325	18%
E-8	\$1,765	\$2,026	\$261	15%
E-7	\$1,638	\$1,939	\$301	18%
E-6	\$1,601	\$1,895	\$294	18%
E-5	\$1,516	\$1,699	\$183	12%
E-4	\$1,259	\$1,552	\$293	23%
E-3	\$1,274	\$1,593	\$319	25%
E-2	\$1,311	\$1,473	\$162	12%
E-1 >4	\$1,143	\$1,502	\$359	31%
E-1 <4	\$1,143	\$1,502	\$359	31%

Source: Selected Military Compensation Tables, 2019.

Note: These rates represent averages across locations and do not include the location-specific component of BAH payments.

Overall, these cross-location BAH differentials result in RMC differentials of about 5 percent for married enlisted servicemembers and 1 percent for married officers. Table 12 displays these cross-location RMC differences by paygrade. The largest marriage differential is received by married junior enlisted in paygrades E-1 to E-4. As before, these figures represent cross-location averages and do not incorporate the location-specific component of BAH.

Table 12. Annual difference in RMC, married versus single servicemembers, FY 2019

Pay-grade	Common components		Single			Married			RMC difference	
	Basic pay	BAS	BAH	Tax advantage	RMC	BAH	Tax advantage	RMC	Total/year	Pct.
Commissioned officers										
O-10	\$189,601	\$3,053	\$28,644	\$15,835	\$237,133	\$33,972	\$11,608	\$237,234	\$101	0%
O-9	\$188,329	\$3,032	\$28,452	\$15,729	\$235,542	\$33,744	\$11,530	\$236,635	\$1,093	0%
O-8	\$180,331	\$3,053	\$28,644	\$15,388	\$227,415	\$33,972	\$11,367	\$228,722	\$1,307	1%
O-7	\$156,746	\$3,053	\$28,644	\$13,019	\$201,462	\$33,972	\$10,746	\$204,516	\$3,054	2%
O-6	\$135,118	\$3,053	\$28,428	\$10,512	\$177,111	\$32,688	\$10,079	\$180,938	\$3,827	2%
O-5	\$108,992	\$3,053	\$26,436	\$9,309	\$147,790	\$31,260	\$9,596	\$152,901	\$5,111	3%
O-4	\$91,706	\$3,053	\$25,224	\$8,803	\$128,786	\$28,548	\$7,422	\$130,729	\$1,943	2%
O-3	\$70,669	\$3,053	\$22,260	\$7,335	\$103,317	\$24,696	\$4,010	\$102,428	(\$889)	-1%
O-2	\$54,740	\$3,053	\$19,308	\$6,169	\$83,269	\$21,372	\$3,450	\$82,615	(\$654)	-1%
O-1	\$39,210	\$3,053	\$17,208	\$4,116	\$63,587	\$19,656	\$4,093	\$66,012	\$2,425	4%
O-3E	\$85,628	\$3,053	\$23,340	\$8,052	\$120,072	\$26,784	\$6,143	\$121,608	\$1,536	1%
O-2E	\$67,034	\$3,053	\$21,552	\$7,017	\$98,656	\$25,104	\$3,840	\$99,031	\$374	0%
O-1E	\$54,637	\$3,053	\$20,364	\$6,554	\$84,608	\$23,772	\$3,831	\$85,293	\$686	1%
Warrant officers										
W-5	\$106,178	\$3,030	\$24,059	\$8,552	\$141,818	\$24,058	\$7,536	\$140,802	(\$1,017)	-1%
W-4	\$89,331	\$3,053	\$22,476	\$7,874	\$122,734	\$25,776	\$6,334	\$124,494	\$1,759	1%
W-3	\$74,356	\$3,053	\$21,480	\$7,179	\$106,068	\$24,600	\$4,307	\$106,315	\$248	0%
W-2	\$60,307	\$3,053	\$20,184	\$6,459	\$90,002	\$23,388	\$3,800	\$90,547	\$545	1%
W-1	\$53,641	\$3,053	\$15,360	\$5,001	\$77,055	\$19,704	\$3,473	\$79,871	\$2,816	4%
Enlisted										
E-9	\$81,402	\$4,433	\$22,080	\$7,978	\$115,893	\$25,980	\$5,764	\$117,579	\$1,686	1%
E-8	\$64,055	\$4,432	\$21,178	\$7,270	\$96,936	\$24,310	\$3,932	\$96,730	(\$206)	0%
E-7	\$55,165	\$4,433	\$19,656	\$6,767	\$86,020	\$23,268	\$3,917	\$86,782	\$762	1%
E-6	\$44,737	\$4,433	\$19,212	\$5,780	\$74,162	\$22,740	\$4,976	\$76,886	\$2,725	4%
E-5	\$35,785	\$4,433	\$18,192	\$4,344	\$62,754	\$20,388	\$5,147	\$65,753	\$2,999	5%
E-4	\$29,027	\$4,433	\$15,108	\$2,724	\$51,291	\$18,624	\$4,615	\$56,698	\$5,407	11%
E-3	\$24,300	\$4,433	\$15,288	\$2,689	\$46,710	\$19,116	\$4,255	\$52,104	\$5,394	12%
E-2	\$22,608	\$4,433	\$15,732	\$2,750	\$45,522	\$17,676	\$4,092	\$48,809	\$3,286	7%
E-1 >4	\$20,171	\$4,433	\$13,716	\$2,436	\$40,755	\$18,024	\$4,121	\$46,749	\$5,994	15%
E-1 <4	\$18,648	\$4,433	\$13,716	\$2,401	\$39,198	\$18,024	\$3,910	\$45,015	\$5,817	15%

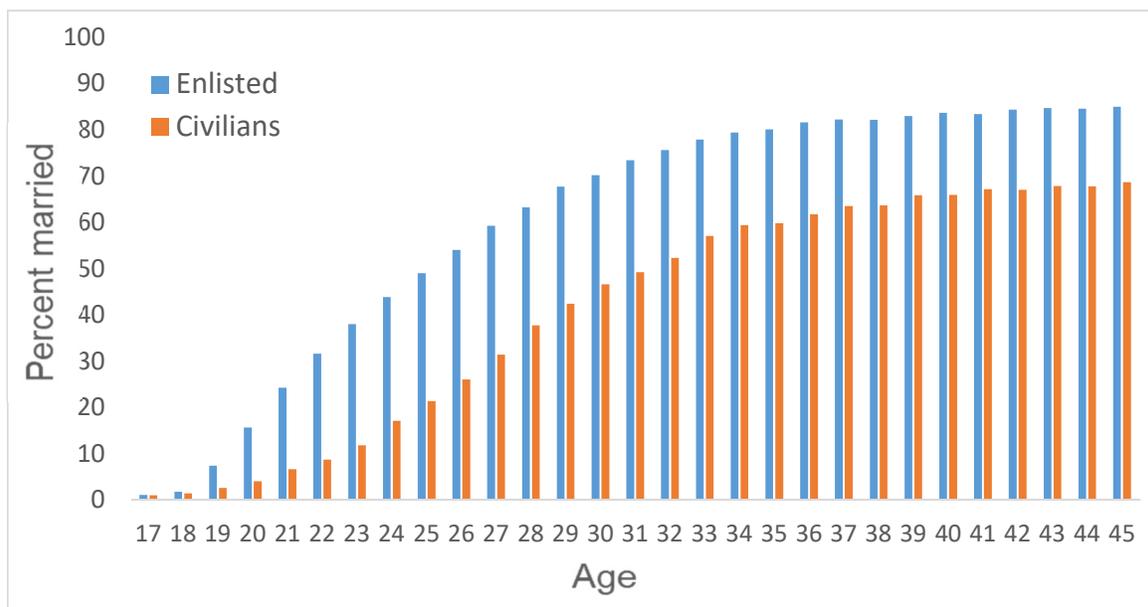
Source: Selected Military Compensation Tables, 2019.

Note: These rates represent averages across locations and do not include the location-specific component of BAH payments.

Appendix B: Civilian and Military Marriage Rates

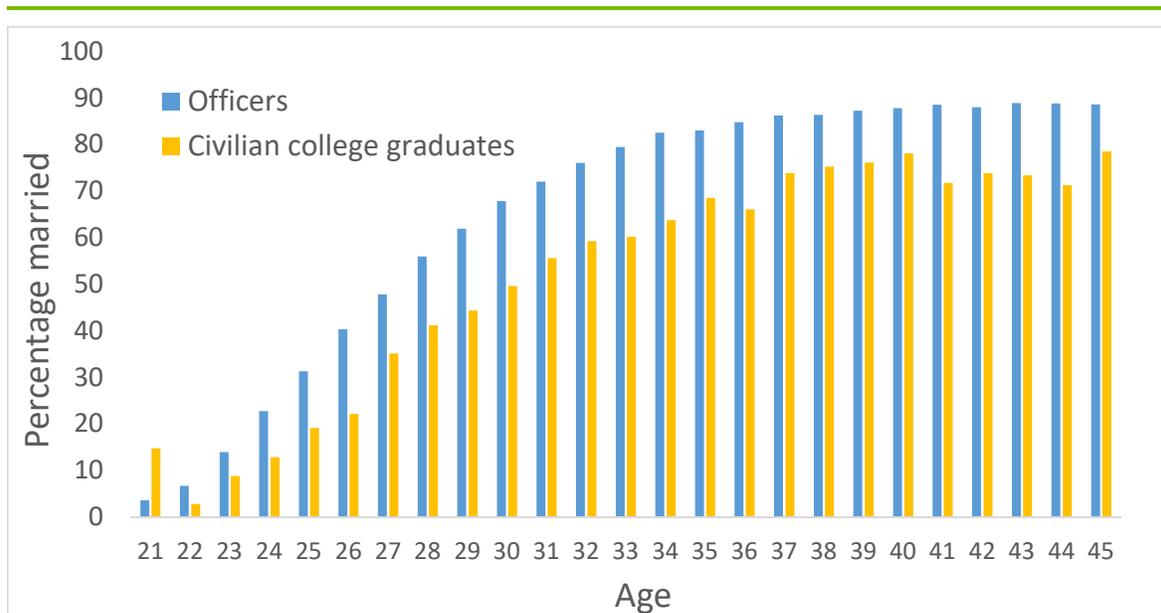
In this appendix, we provide additional information on differences in military and civilian marriage behavior. Figure 11 and Figure 12, respectively, show the percentages of enlisted members and officers who were married at the end of FY 2017 by age, compared with their civilian counterparts. Compared with civilians, servicemembers—both enlisted and officers—generally marry at younger ages and at higher rates. For example, among 23-year-old male enlisted servicemembers, more than one-third are married, compared with less than one-sixth for civilian men of this age. What drives this phenomenon? It may be that the services attract personnel who have a higher-than-average propensity to marry. Alternatively, the culture of the military or the compensation offered to servicemembers may encourage marriage.

Figure 11. Marriage rates for enlisted, compared with civilian counterparts



Source: Population Representation in the Military Services - Fiscal Year 2017.

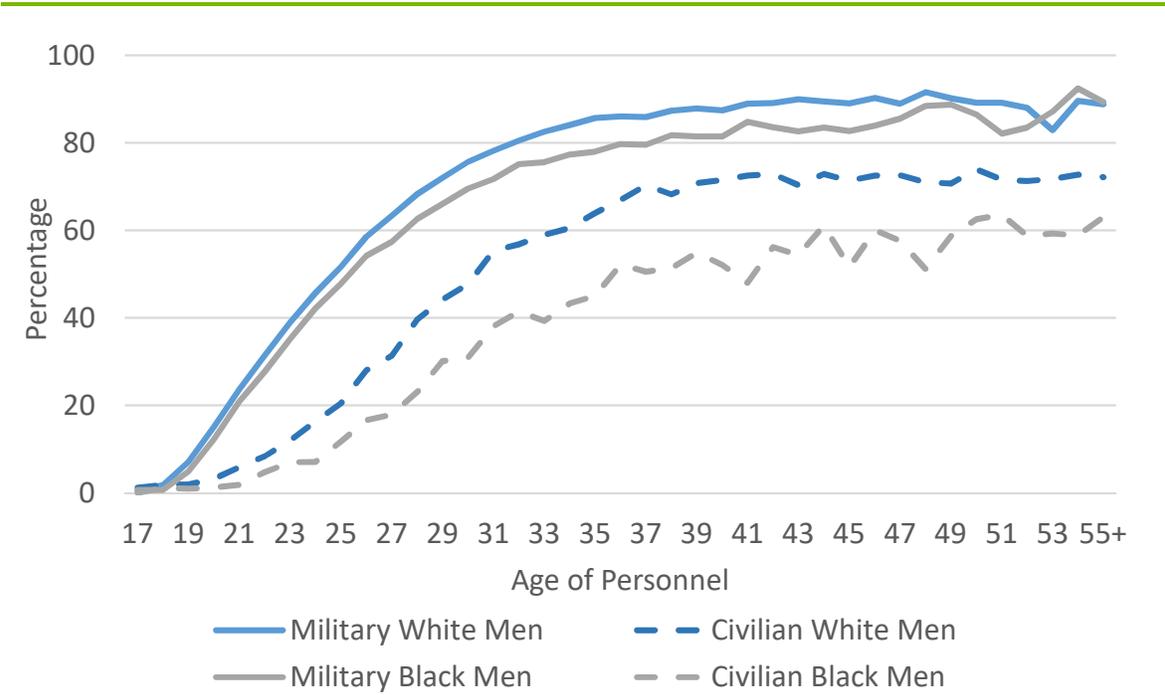
Figure 12. Marriage rates for officers, compared with civilian counterparts



Source: Population Representation in the Military Services - Fiscal Year 2017.

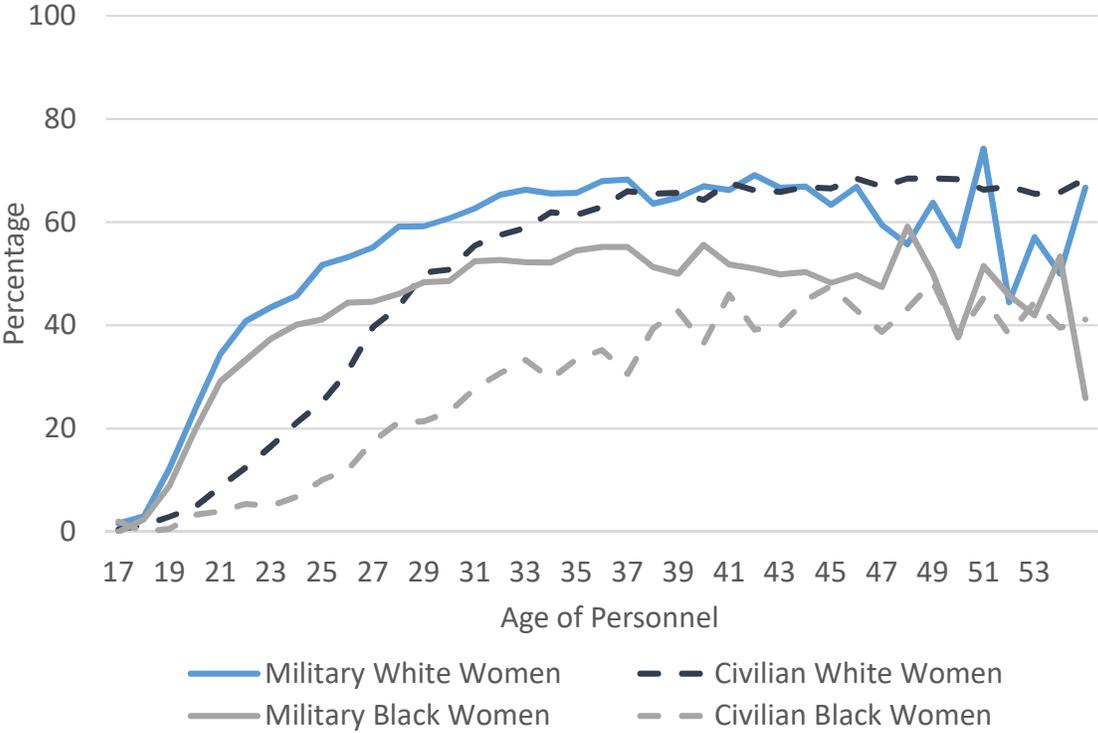
Another difference between military and civilian marriage patterns is a much smaller racial gap in the armed forces, as shown in Figure 13 and Figure 14. As Figure 13 illustrates, there is little difference between white male and black male servicemembers in the likelihood of being married. In the civilian sector, however, white men are much more likely to be married than black men. There continues to be a racial gap among women in the services, but this difference is substantially smaller than among civilians (see Figure 14).

Figure 13. Marriage rates for men by age and race, military and civilian, FY 2016



Source: Population Representation in the Military Services - Fiscal Year 2017.

Figure 14. Marriage rates for women by age and race, military and civilian, FY 2016



Source: Population Representation in the Military Services - Fiscal Year 2017.

Appendix C: Summary of Literature on Compensation, Marriage, and Retention

This appendix provides brief summaries of the quantitative findings of several important studies of the relationships between compensation, marriage, and retention in the military.

Table 13 summarizes the results of studies linking income and marriage behavior. Overall, the literature supports the marriage-bar hypothesis that income matters for marriage behavior only up to a certain income level. Also, income effects on marriage may be stronger for couples who already are cohabitating.

Table 13. Summary of income and marriage studies

Authors	Group studied	Findings
Schneider (2011)	Sample of dual household and cohabitating couples	<u>Total income model</u> : For every \$10,000 of additional income, marriage likelihood increases by 1 percent in any given year (logit specification) [21].
Sassler and McNally (2003)	Sample of cohabitating couples from National Survey of Families and Households	<u>Total income model</u> : There is no correlation between cohabitating couples' earnings, their propensity to marry, or their likelihood of divorce [46].
Watson and McLanahan (2011)	Sample of native-US-born non-Hispanic white men ages 25 to 34	<u>Marriage-bar model</u> : For income below marriage bar (local reference group median income), 10 pp higher income is associated with 2.4 pp greater marriage probability. For incomes above group median, there is no effect of income on marriage (linear probability specification) [42].
Ishizuka (2018)	Sample of cohabitating couples	<u>Marriage-bar model</u> : For income below marriage bar, 10 pp higher income is associated with an 8.4 pp greater probability of marriage. For income over the marriage bar, no significant effect (proportional hazards specification) [7].

Table 14 summarizes the literature on the relationship between marriage and retention. It shows a positive effect of marriage on retention that is strongest for men, strongest early in a servicemember's career, and tends to fade over time.

Table 14. Summary of marriage and retention studies

Authors	Service	Findings
Asch et al. (2010)	Army (enlisted)	Zone A reenlistment is 15 pp higher for Soldiers with a dependent [37].
Buddin (2005)	Army (enlisted)	Zone A reenlistment rate for married Soldiers is 7.8–16 pp higher than for unmarried Soldiers [38].
Hattiangadi et al. (2004)	Marine Corps (enlisted)	For Marines, Zone A reenlistment rate is 13.4 pp higher for married or those with dependents, Zone B is 11.8 pp higher, and Zone C is 5.1 pp higher [39].
Huff and Parcell (2015)	Navy (officers)	Conventional SWOs: Married men's retention rate is 3 pp higher. Nuclear field SWOs: Married men's retention rate is 9.5 pp higher than that of unmarried men [45].
Asch et al. (2012)	All (officers)	Married officers' retention rate is 5.3 pp higher at O-3 and 1.4 pp lower at O-5 than that of unmarried officers [36].

Table 15 summarizes the results of the literature on compensation and military retention.

Table 15. Summary of compensation and retention studies

Authors	Service	Findings
Basic pay		
Asch, Hosek, and Mattock (2013)	Army (enlisted)	For enlisted Soldiers at 4 YOS, 1 percent basic pay increase associated with 2.9 percent force size increase [47].
Hansen and Wenger (2002)	Navy (enlisted)	For Navy enlisted, a 1 percent basic pay increase associated with a 1.5 percent retention rate increase [48].
Hansen and Moskowitz (2006)	Navy (officers)	For Navy aviators, a 1 percent basic pay increase associated with a 0.55 percent retention rate increase [49].
Koopman (2010)	Navy (officers)	For Navy officers, a 1 percent basic pay increase associated with a 0.5 percent retention rate increase [50].
Retention pays		
Asch et al. (2010)	Air Force (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 1.3 pp retention increase at Zone A • 1.4 pp retention increase at Zone B [37].
Asch et al. (2010)	Army (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 8.9 pp retention increase at Zone A • 5.1 pp retention increase at Zone B [37].
Asch et al. (2010)	Navy (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 2.5 pp retention increase at Zone A

Authors	Service	Findings
		• 0.9 pp retention increase at Zone B [37].
Huff et al. (2019)	Navy (enlisted)	1-level increase in SRB multiplier associated with 2.2 pp retention increase at Zone A [51].
Asch et al. (2010)	Marine Corps (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 3.5 pp retention increase at Zone A • No retention increase at Zone B [37].
Quester et al. (2006)	Marine Corps (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 2–3 pp retention increase at Zone A • 3.8–7.8 pp retention increase at Zone B [11].
Hattiangadi et al. (2004)	Marine Corps (enlisted)	1-level increase in SRB multiplier associated with: <ul style="list-style-type: none"> • 6.6 pp retention increase at Zone A • 7.2 pp retention increase at Zone B • 3.5 pp retention increase at Zone C [39].
Asch et al. (2013)	Navy (officers)	For SOF officers at 15–18 and 20–23 YOS, 25 percent increase in retention bonus associated with 3.7 percent force size increase [47].

Although the studies discussed here are only a small selection of the extensive literature on this topic, they confirm the following:

- Military and civilian pay levels significantly influence the retention decisions of both enlisted and commissioned officer servicemembers.
- Early-career servicemembers are more responsive to pay changes than are later career servicemembers.
- Pay decreases should be expected to cause a drop in retention in all services and among servicemembers of all levels. Though the studies covered here report their findings as the effect of a pay increase on retention, they also provide evidence that a reduction in pay would result in decreased retention. The size of the effect may change slightly when the policy change involves a reduction in pay since the marginal effect of pay on retention may vary across the range of pay.

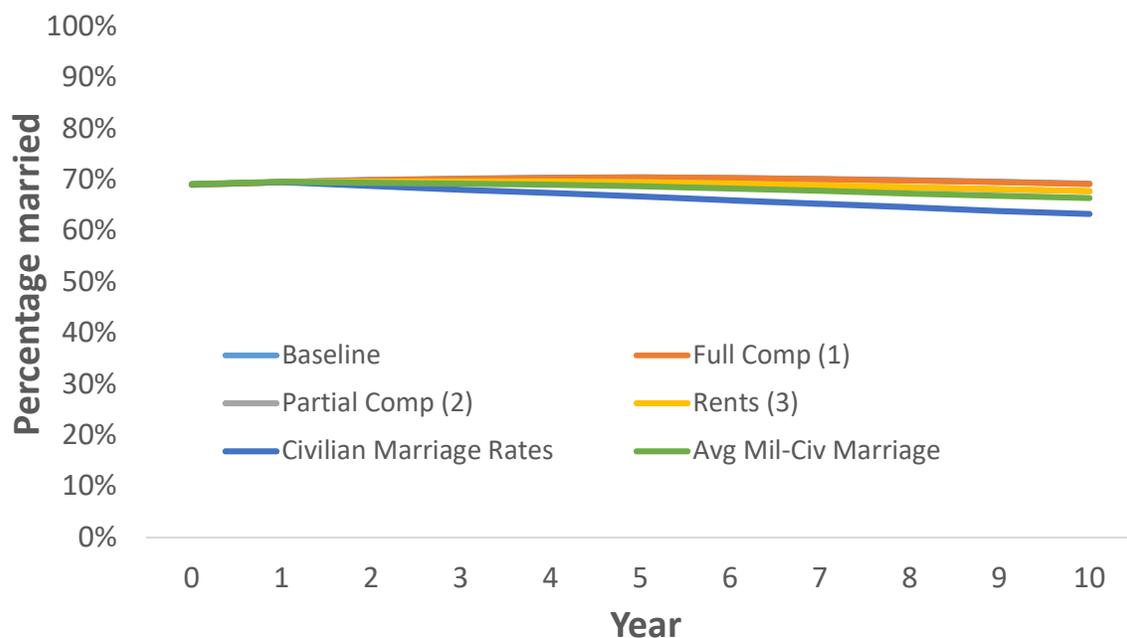
Appendix D: Force Inventory Model Results for Officers

In this appendix, we present model results for officers. Overall, as with enlisted, the effects of the SSS scenarios on the percentage of officers married and number of officers in the force appear to be small.

Navy

Figure 15 shows model results for marriage rates of Navy officers. The model predicts only small changes in officer marriage rates under any of the three SSS implementation scenarios.

Figure 15. Navy officer marriage rates under SSS scenarios

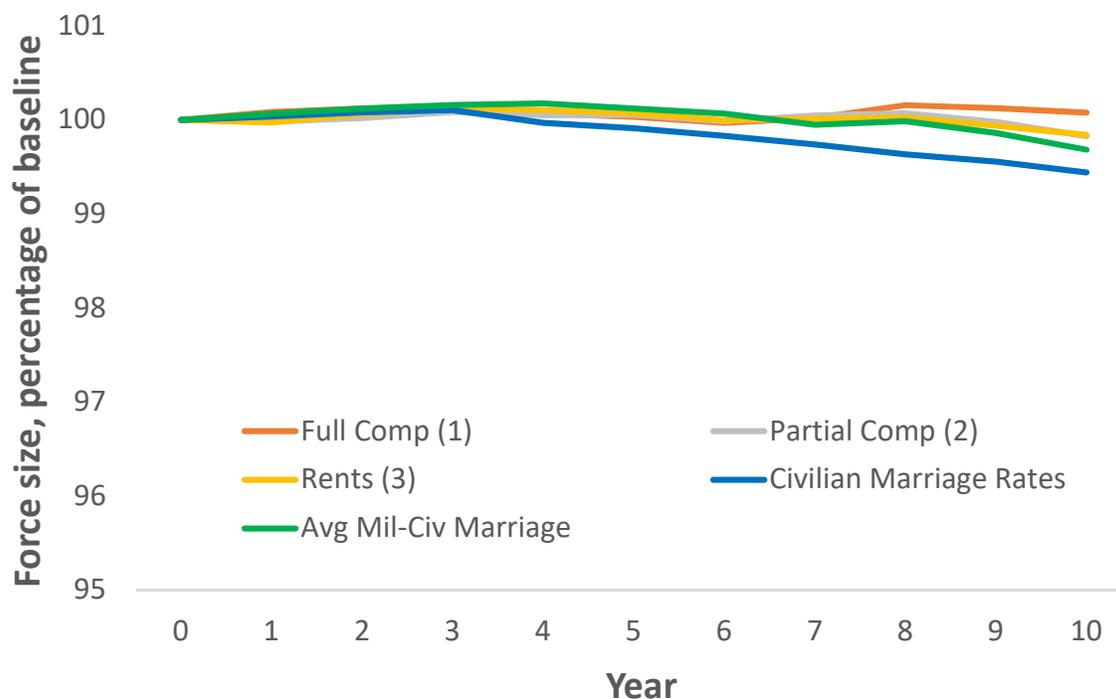


Source: CNA.

At the 10-year point, about 69 percent of Navy officers are forecast to be married under the full compensation scenario (about the same as the baseline model), while just less than 68 percent will be married under either of the two partial compensation scenarios (with or without rents), just over a 1 pp decrease, or about 2 percent lower than baseline. Under the civilian marriage rates scenario, the percentage of married officers would fall to about 63 percent.

Figure 16 shows model results for deviations from baseline in the number of Navy officers due to these changes in marriage behavior, again over a 10-year forecast period. As with enlisted, the deviation sizes are relatively small.

Figure 16. Navy officer force size, deviations from baseline under SSS scenarios



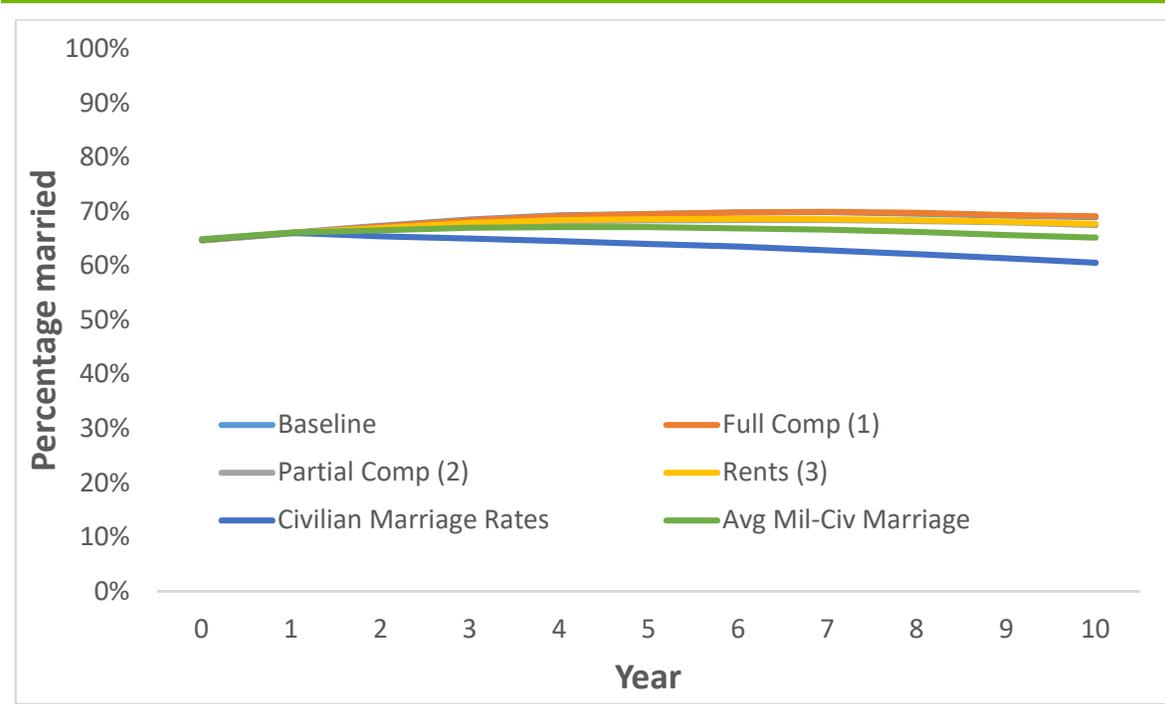
Source: CNA.

At the 10-year point, even under the most extreme civilian marriage rates scenario, the forecast for Navy officer force size is only about 0.5 percent below baseline (equivalent to just over 200 officers relative to a baseline of about 53,000). The deviations from baseline associated with the SSS implementation scenarios are even smaller, on the order of about 0.2 percent below baseline for the two partial compensation scenarios.

Marine Corps

Figure 17 shows model results for marriage rates of Marine Corps officers.

Figure 17. Marine Corps officer marriage rates under SSS scenarios

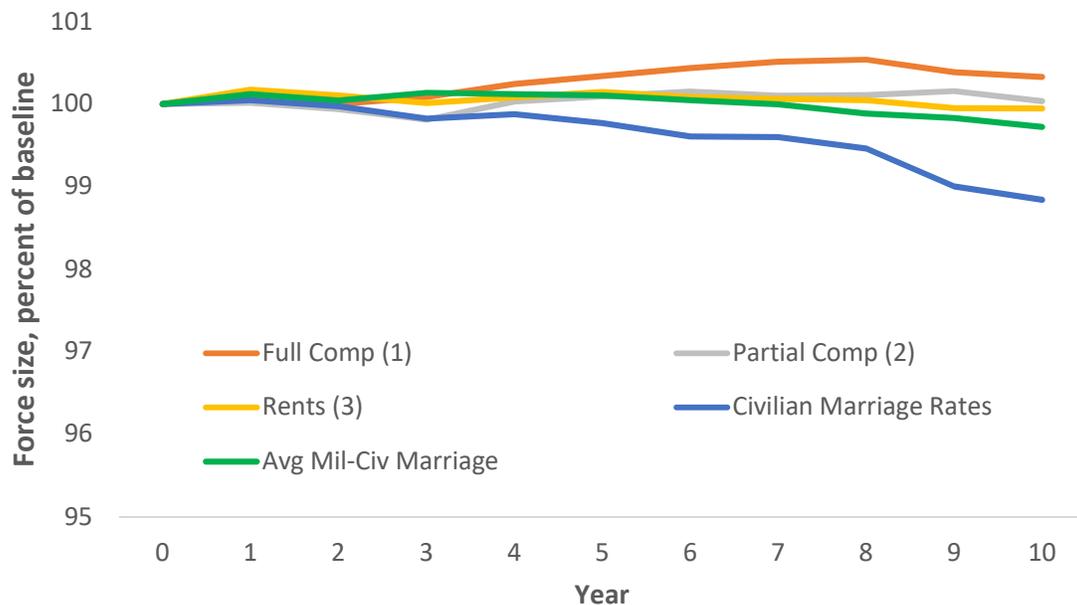


Source: CNA.

At the 10-year point, the percentage of Marine Corps officers forecast by the model to be married ranges from 68 to 69 percent compared to the baseline of 69 percent, so there is virtually no difference between marriage rates at baseline and under any of the three SSS implementation scenarios.

Figure 18 shows model results for deviations from baseline in the number of Marine Corps officers over a 10-year forecast period.

Figure 18. Marine Corps officer force size, deviations from baseline under SSS scenarios



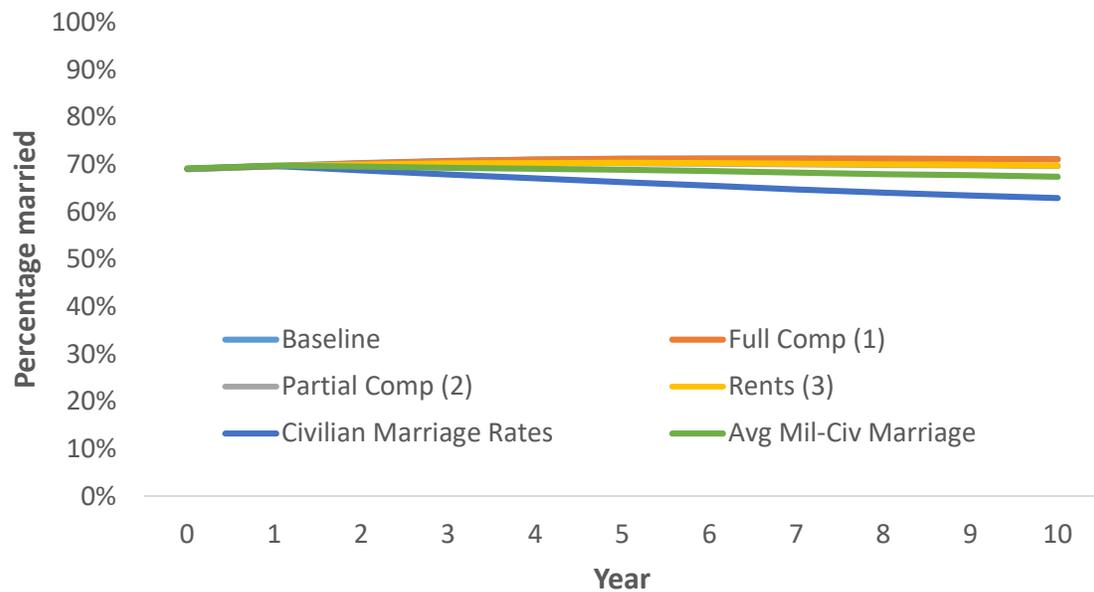
Source: CNA.

As would be expected from the negligible effects on marriage behavior, there is almost no deviation from baseline in Marine Corps officer forecasts under any of the three SSS implementation scenarios. Even under the upper-bound civilian marriage rates scenario, the model forecasts only about a 1-percent negative deviation relative to baseline (less than 200 officers relative to a baseline of about 19,000), further suggesting that the likely effects of the SSS scenarios considered here on Marine Corps officer inventory are likely to be small.

Air Force

Figure 19 shows the model's forecasts for Air Force officer marriage rates under the different SSS implementation scenarios.

Figure 19. Air Force officer marriage rates under SSS scenarios

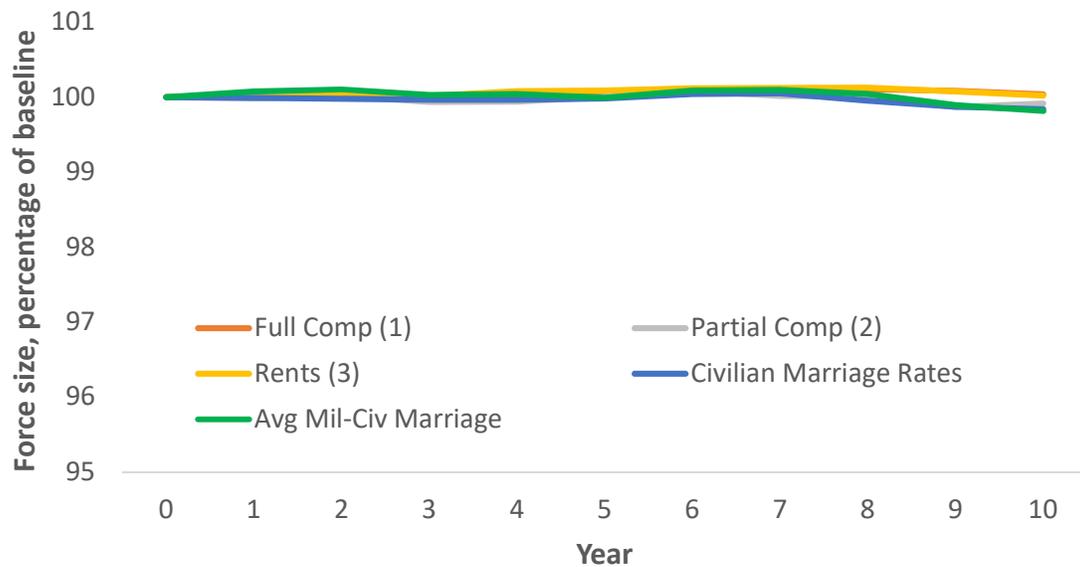


Source: CNA.

Again, there is very little difference between the model's baseline forecast for Air Force officers' marriage rate (about 71 percent) and the forecasts under the three SSS implementation scenarios (which range from 70 to 71 percent).

Figure 20 shows the model's results for force size with respect to Air Force officers.

Figure 20. Air Force officer force size, deviations from baseline under SSS scenarios



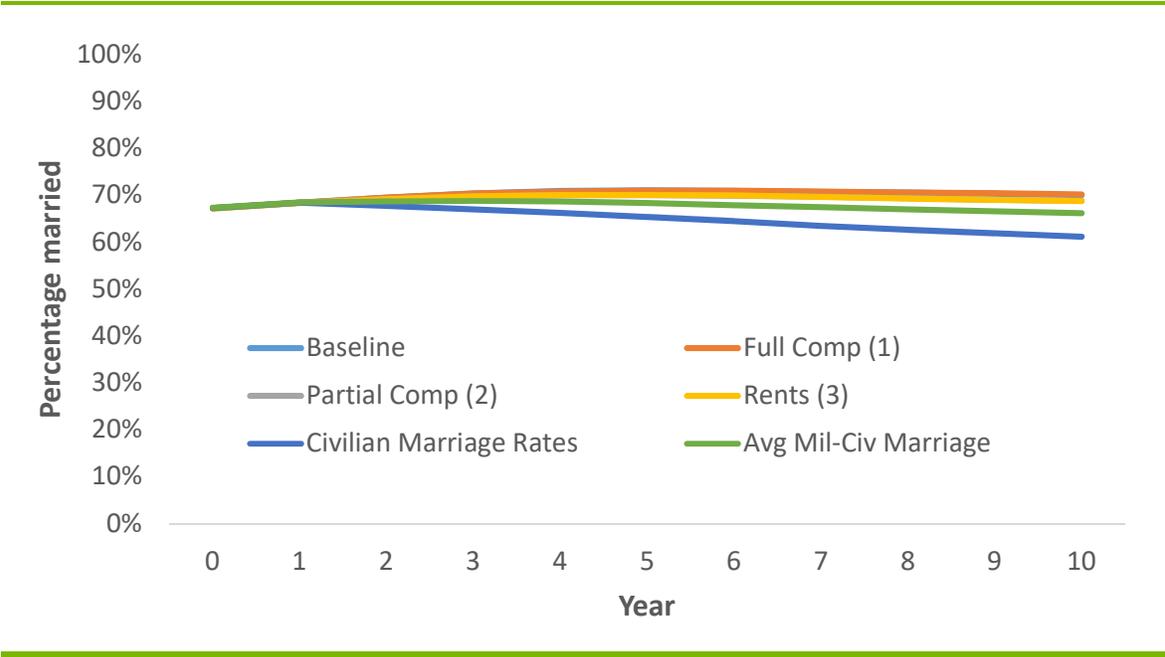
Source: CNA.

There is almost no deviation from the baseline Air Force officer force size forecast under any of the three SSS implementation scenarios. Even under the upper-bound civilian marriage rates scenario, there is almost no difference from the baseline forecast.

Army

Figure 21 shows the model’s forecasts for Army officer marriage rates under the different SSS implementation scenarios.

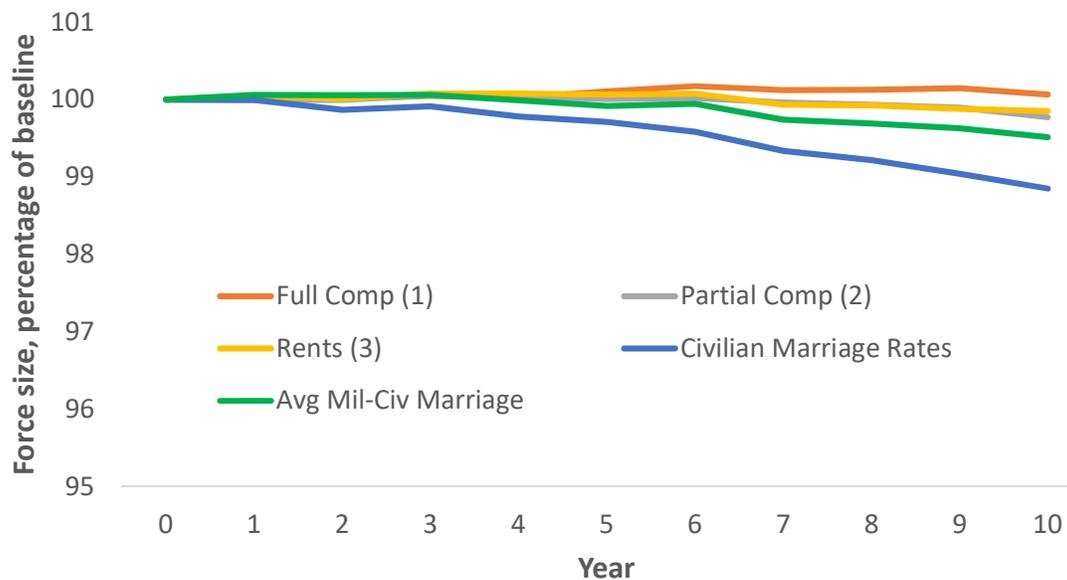
Figure 21. Army officer marriage rates under SSS scenarios



Source: CNA.

As before, there very little difference between the baseline forecast for Army officer marriage rate and those of any of the three SSS implementation scenarios. Figure 22 presents the model’s forecasts for Army officer force size.

Figure 22. Army officer force size, deviations from baseline under SSS scenarios



Source: CNA.

There is very little deviation from baseline under any of the SSS implementation scenarios. The model forecasts for the two partial compensation scenarios a negative deviation of about 0.1 to 0.2 percent, the equivalent of 100 or 200 Soldiers relative to a baseline of about 78,000. Again, even for the upper-bound civilian marriage rates scenario, the model forecasts a negative deviation of about 1 percent below baseline (equivalent to less than 1,000 Soldiers).

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Abbreviations

AFQT	Armed Forces Qualification Test
BAH	basic allowance for housing
BAS	basic allowance for subsistence
BRS	Blended Retirement System
CoL	cost of living
DMDC	Defense Manpower Data Center
DOD	Department of Defense
IDA	Institute for Defense Analyses
MSR	Minimum Service Requirement
NDAA	National Defense Authorization Act
OLS	ordinary least squares
pp	percentage point
QRMC	Quadrennial Review of Military Compensation
RMC	Regular Military Compensation
SSS	Single-Salary System
UIC	unit identification code
WO	warrant officer
YCS	years of commissioned service
YOS	years of service

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