Research Report

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Increasing Efficiency and Incentives for Performance in the Army's Selective Reenlistment Bonus (SRB) Program

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About This Research Report

This report documents research and analysis conducted as part of a project entitled *Improving the Efficiency and Effectiveness of Special and Incentive Pays in the Army*, sponsored by the Assistant Secretary of the Army for Manpower and Reserve Affairs. The purpose of the project was to help the Army determine how to best set special and incentive pays to increase incentives for higher performance and to more efficiently achieve Army recruiting and retention objectives.

RAND Arroyo Center

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Summary

The Army requested that RAND Arroyo Center provide analyses to improve the setting of special and incentive (S&I) pays, focusing on its selective reenlistment bonus (SRB) program. SRBs are a monetary incentive offered to qualified soldiers who reenlist for an additional obligated service (AOS) in the Regular Army in certain military occupational specialties (MOSs). The purpose of the improvement would be to help modernize the SRB program by increasing the bonuses' efficiency and their incentives for higher performance as part of the Army's talent management strategy. While past research consistently found that reenlistment bonuses increase the likelihood that a service member reenlists and continues to serve, there is little evidence on how they increase performance.

Since the beginning of fiscal year (FY) 2011, the Army has used what it calls the *Tiered SRB program*, in which soldiers who reenlist receive a lump-sum dollar amount. For each MOS, the Army assigns a tier level to each rank or paygrade, whereby a higher tier corresponds to higher SRB dollar amounts, and, within each tier, the SRB amount varies with grade and AOS. For example, an infantry soldier in MOS 11B who is eligible to reenlist and is an E-5 could be assigned to Tier 2 and would be eligible to receive a lump sum that varies in dollar amount depending on the length of the AOS selected.

One notable attribute of the Tiered SRB program from the standpoint of performance incentives is that it provides the same SRB to soldiers regardless of whether they are promoted faster or slower than their peers, given their grade, MOS, and AOS length. To the extent that those promoted more slowly are poorer performers, the Army's SRB program offers the same SRB to poorer performers and to superior performers. Thus, an infantry soldier in 11B who is an E-5 would receive the same SRB if he or she had three years of service (YOS), i.e., had been promoted more quickly to E-5, or had ten YOS, i.e., had failed to be promoted to E-6 within ten years.

In this report, we describe four alternative courses of action (COAs) for reforming the setting of Army SRBs to enhance performance incentives while sustaining retention in a given MOS.[1] To develop the COAs, we sought input from personnel and compensation managers within each service and the Office of the Secretary of Defense (OSD) on ways to improve how SRBs are set, as well as input from the military manpower literature for past SRB reform ideas to increase performance incentives. Unlike the Army's current approach, the COAs would pay higher SRBs to soldiers who are promoted faster and, by assumption, who perform better than their peers. The COAs do this by setting the SRB dollar amount contingent on YOS within a given grade. For example, soldiers who are E-5s with four or fewer YOS would receive a higher SRB than soldiers with more than four YOS. The COAs differ in terms of the dollar amounts and the YOS cutoff criteria within each grade. Importantly, to provide an apples-to-apples comparison of performance, the SRB dollar amounts for each COA were selected to produce the same overall retention effect as the current approach, though the specific dollar amounts to produce this common retention effect varied across COAs for a given MOS and across MOSs for a given COA.

The COAs are summarized in Table S.1. COAs 1, 3, and 4 have the feature that soldiers who are promoted slower receive no SRB, while COA 2 would pay an SRB to these soldiers—but a smaller dollar amount than to those who are promoted faster. COA 1 offers the same SRB, regardless of grade, to those who are promoted faster, while COA 3 offers SRB amounts that are a multiple of basic pay, thereby incorporating the performance incentives embedded in the basic pay table. Because SRBs are proportionate to basic pay in COA 3, the SRB dollar amounts are higher for those in higher grades. COA 4 is similar to COA 1 except that the YOS

[1] We considered an additional COA for MOS 11B but did not consider it for other MOSs because it did not improve predicted performance.

TABLE S.1
Summary of COAs

	YOS criteria?	Do those who are promoted slower receive an SRB?	Is the SRB dollar amount for faster promotion to a given grade higher at higher grades?
Current approach case	No	Yes	No
COA 1	Yes	No	No
COA 2	Yes	Yes, but the SRB is smaller than the SRB for fast promotion	No
COA 3	Yes	No	Yes
COA 4	Yes, and more stringent than COAs 1–3	No	No

NOTE: Speed of promotion is determined for each grade by whether the soldier meets the YOS cutoff criterion for that grade. The YOS that defines the cutoff criterion for each grade is lower (more stringent) for COA 4. Specific dollar amounts for each COA are shown in the main text and in Appendix D.

cutoff criterion is more stringent. For example, rather than an eligibility cutoff of four YOS for an E-5, the cutoff is three YOS under COA 4 for an E-5.

To assess the COAs in terms of their effects on performance, retention, and cost relative to the current Tiered SRB program's approach, we extended RAND's dynamic retention model (DRM) and estimated models for a set of MOSs using longitudinal data on individual soldiers from the Defense Manpower Data Center (DMDC). These data track soldiers' careers from entry through 2019, starting in the year 2000. The set of MOSs belongs to a list of Army Career Management Fields (CMFs) that the Army identified as critical for the purpose of setting SRBs at the time of our analysis and include the following:

- MOS 11B (infantry) (N = 34,538)
- 14E (Patriot fire control enhanced operator/maintainer) (N = 2,099)
- 17E (electronic warfare specialist) (N = 139)
- 18B (special forces weapons sergeant) (N = 90)
- 35F (intelligence analyst) (N = 6,399)
- 68P (radiology specialist) (N = 598).

Given the estimated parameters of the DRM models for each MOS, we then simulate retention in these MOSs, as well as the average performance of soldiers and SRB costs. Our DRM simulation coding assumes that promotion speed depends on performance, which, in turn, depends on innate ability. We do not observe ability. Instead, we treat ability as a unitless index, and then we make assumptions about how ability affects promotion speed. We also make assumptions about the distribution of ability among entrants, how ability affects external opportunities, and the disutility of increased effort. These assumed parameters are calibrated or chosen so that we can replicate the observed retention profile of soldiers within each MOS.[2] Given the simulation capability and model estimates, we assess the retention, performance, and cost of the alternative COAs relative to the current Tiered SRB program approach.

2 The simulation code we develop builds on our analysis for the 13th Quadrennial Review of Military Compensation (QRMC) (Asch, Mattock, and Tong, 2020).

Key Findings

The Army's Current SRB Structure Is Predicted to Reduce Performance Incentives

Under the Army's current Tiered SRB program, soldiers who are promoted slower receive the same SRB as faster-promoted soldiers in the same MOS and tier (given additional obligation length). Given that faster promotion is one of the ways, if not the most important way, that the Army, as well as the other services, financially reward superior performance, an implication of the current SRB structure is that it does not incorporate the performance incentives provided by the promotion process.

Using estimated DRM models for each MOS, we simulated how SRBs, as currently structured, would affect performance relative to a baseline case of no SRBs. To report results on ability, we first compute each member's simulated percentile in the ability distribution (e.g., the 50th percentile would represent the median) and then report the overall ability of the force in terms of the mean ability percentile. To assess the extent to which the structure of SRBs affects the selective retention of higher-ability personnel into higher grades—i.e., ability sorting—we also report the average ability percentile by grade. While we present results for all MOSs in a single table below, it is important to recognize that the simulated percentiles are not comparable across MOSs because the percentiles are measured relative to the 50th percentile for a given MOS, and the 50th percentile is not the same across MOSs.

We first consider how average performance would be predicted to change among soldiers in the senior grades in each MOS under the current approach case. A decline in performance among those in higher grades could be particularly detrimental if the productivity of enlisted and senior leaders affected the productivity of those in the junior and mid-grades. Relative to the baseline case of no SRBs, we find that SRBs, as currently structured, would slightly reduce the mean ability percentile in the upper grades for all the MOSs we considered (see Table S.2). For example, the change in the mean percentile is –1.7 and –1.9 for MOSs 14E and 35F for soldiers in the grade of E-8, respectively, and –5.7 for MOS 68P, though the reductions are smaller for MOSs 17E and 18B. A priori, we would expect SRBs to increase retention overall, among both better and poorer performers. Our finding that the current structure slightly reduces average performance in the upper grades implies that the retention of poorer performers is more responsive to SRBs—and those soldiers have a stronger incentive to stay and be promoted to the upper ranks, given their poorer civilian opportunities—than is the retention of better performers who face better external opportunities. That is, the retention of poorer performers increases by more than the retention of superior performers, and this effect is more apparent at the upper grades. The smaller effects for 17E and 18B could be because these occupations are already highly selective in terms of ability, so the variance of ability is quite small at upper grades. We also find that the average ability percentile across the force for each MOS generally falls only slightly, implying that the higher retention of poorer performers in the upper grades is offset to some extent by higher retention of better performers in the lower grades. (The exceptions are MOS 11B, where there is no overall change, and MOS 68P, where there is a larger change.) The implication of these results is that the current structure of the Tiered SRB program does not measurably improve performance incentives relative to offering no SRBs at all overall but does reduce performance incentives in the upper grades.

Restructuring SRBs to Reward Faster Promotion to Each Grade Would Improve Performance Incentives

Our simulations show that performance would improve if the Army restructured SRBs to depend on YOS for each grade. The restructuring would provide higher SRBs to those promoted faster to the grade, and either no SRB or a lower SRB to those promoted more slowly to the grade. We find that average performance would

TABLE S.2
Performance Results, by MOS, for Current Approach Case: Mean Simulated Ability Percentile Relative to Baseline Case, by Grade

	Average Across the Force	E-5	E-6	E-7	E-8
MOS 11B					
Baseline case	64.6	57.1	74.8	80.8	87.7
Current case	64.6	57.2	73.4	79.6	86.0
Current – baseline	0.0	0.1	–1.4	–1.2	–1.7
MOS 14E					
Baseline case	64.5	55.1	75.0	81.6	88.4
Current case	64.2	54.8	73.6	81.4	86.8
Current – baseline	–0.3	–0.3	–1.4	–2.2	–1.6
MOS 17E					
Baseline case	56.5	53.6	54.5	56.6	58.2
Current case	56.3	53.6	54.3	56.3	58.1
Current – baseline	–0.2	0.0	–0.2	–0.3	–0.1
MOS 18B					
Baseline case	55.2	50.5	53.0	57.9	58.7
Current case	55.1	50.8	52.8	57.2	58.2
Current – baseline	–0.1	0.3	–0.2	–0.7	–0.5
MOS 35F					
Baseline case	63.4	56.0	71.7	79.6	85.8
Current case	63.2	56.1	70.1	77.0	83.9
Current – baseline	–0.2	0.1	–1.6	–2.6	–1.9
MOS 68P					
Baseline case	62.9	53.7	74.6	79.5	87.5
Current case	61.2	53.0	70.1	73.0	81.8
Current – baseline	–1.7	–0.7	–4.5	–6.5	–5.7

NOTES: Results that should be regarded as exploratory are grayed out. Percentiles are not comparable across MOSs; lower average percentiles for MOSs 17E and 18B are indicative of the highly selective nature of these MOSs and the percentile measure being normed to the high average ability within these MOSs. Under the baseline case, no SRB is offered, while under the current approach case, the SRBs are the same across grade and YOS. Ability is a unitless measure in the model, with an assumed mean and standard deviation for the accession cohort. We compute the percentile of the ability distribution for each member in the force.

be improved by restructuring SRBs relative to average performance under the Army's current SRB approach for each MOS we considered, with results for COA 4 for each MOS shown in Table S.3. (For brevity, we do not show results for COAs 1–3 here but do so in the main text.)

The COAs differed in terms of the degree of improvement in the average performance of soldiers in a given MOS, with the largest improvement occurring under COA 4, the alternative with more-restrictive criteria for defining slow versus fast promotion for each grade. For example, average ability increases by 0.7

TABLE S.3

Performance Results, by MOS, for COA 4 Relative to Current Approach Case: Difference in Mean Simulated Ability Percentile, by Grade

	Average Across the Force	E-5	E-6	E-7	E-8
MOS 11B					
COA 4 – current	0.7	–0.3	1.3	1.7	2.1
MOS 14E					
COA 4 – current	1.7	0.4	2.4	3.0	2.5
MOS 17E					
COA 4 – current	0.4	0.0	0.1	0.7	0.8
MOS 18B					
COA 4 – current	0.1	–0.2	0.5	2.2	2.3
MOS 35F					
COA 4 – current	0.9	–0.3	1.3	3.4	2.9
MOS 68P					
COA 4 – current	1.3	0.3	2.1	3.7	2.4

NOTES: Under the current approach case, the SRBs are the same across grade and YOS. Under COA 4, SRB depends on YOS within each grade. Ability is a unitless measure in the model, with an assumed mean and standard deviation for the accession cohort. We compute the percentile of the ability distribution for each member in the force.

percentiles in MOS 11B in Table S.3, compared with 0.2 under COA 1, 0.3 under COA 3, and 0.1 under COA 2 (not shown).

We also find that ability sorting, meaning the selective retention and promotion of higher-ability soldiers to higher grades, would also improve in each COA for each of the MOSs we examined relative to the Army's current approach. The largest improvement would be under COA 4, as shown in Table S.3 for 11B. For example, the average ability percentile would increase among E-7s by 1.7 percentiles and by 2.1 among E-8s.

While the COAs with the less-restrictive YOS cutoff criteria are predicted to produce smaller improvements in average ability and in the retention of higher-ability personnel in the upper grades, they would still be an improvement over the current approach case. Among these COAs, the least improvement is predicted for COA 2, where even slower-promoted soldiers would receive an SRB. The implication is that offering an SRB to those who are promoted slower, even a smaller amount, could produce the same retention effect but would improve performance the least. On the other hand, we find that setting the SRB amounts as a multiple of basic pay, but only for faster-promoted soldiers, e.g., COA 3, would have a larger effect than both COA 2 and COA 1 for four of the MOSs we considered (11B, 14E, 17E, and 18B). For the other two MOSs (35F and 68P), we found that COA 3 would produce either about the same or slightly less performance improvement as COA 1. The implication is that setting SRB dollar amounts as a multiple of basic pay would enable the Army to take advantage of the performance incentives embedded in the basic pay table.

In sum, regardless of which MOS we considered, restructuring SRBs to reward those who are promoted faster would increase performance incentives relative to the current approach used by the Army.

Restructuring SRBs to Increase Performance Could Reduce SRB Costs per Soldier, but Not Always

We also simulated how the COAs would affect SRB and personnel costs per soldier relative to the current approach case. SRB costs per member will be affected by the change in the dollar values of the SRBs by YOS and the change in the number of soldiers receiving an SRB of a given amount. Personnel costs might also change because the mix of YOS and grade may change under alternative COAs relative to the current approach, though all COAs produce the same overall retention effect, relative to the baseline case, as does the current approach case. Personnel costs include not only SRB costs but also pay, allowances, and retirement accrual costs. We find that cost per soldier would be lower than the current approach for the COA with the most stringent criteria for YOS within a grade for MOSs 11B, 14E, and 35F. Consequently, restructuring SRBs would be unambiguously more efficient than the current case because the same overall force size would be achieved at less cost and with increased performance. For the other three MOSs we consider—namely, 17E, 18B, and 68P—all of the COAs, including the COA with the most-stringent YOS cutoff criteria, would produce higher SRB and personnel costs per soldier than the current approach case. Costs per soldier are higher in these MOSs because a very large SRB is required to induce a sufficient quantity of fast promoters to stay, and this can cause overall cost to increase even though slower promoters may receive a low or no SRB. Higher compensation is needed to induce higher retention among fast promoters to compensate for the lower retention of slow promoters receiving no SRB. Large SRBs are needed to get a large proportion of fast promoters—including those with lower taste for active service, who are less responsive to a given dollar increase in the SRB. The implication of these results is that for MOSs 17E, 18B, and 68P, restructuring SRBs would improve performance but would do so at a higher cost per soldier. Thus, while restructuring SRBs would be more effective in terms of increasing performance, whether doing so is more efficient depends on whether the improvement in performance incentives for these three occupations is worth the higher cost per soldier.

One approach that could increase the efficiency of a restructured Army SRB program would be to determine SRB dollar amounts using an auction. In an auction, soldiers within an MOS who are eligible for reenlistment (and who have been promoted faster) could bid the lowest SRB that they would be willing to accept to reenlist. An auction approach could have two potential advantages for the Army. First, it could lower the cost of the SRB program, potentially even for the MOSs in which we found that cost per soldier increased under a restructured SRB format. Past research suggests that an auction approach reduces cost by reducing the amount of "rent" paid to soldiers who would have reenlisted anyway. Second, it could potentially enhance the Army's current talent management efforts. A potential drawback of an auction is that it could introduce additional uncertainty into the bonus system because soldiers would need to consider the likelihood that they would not have a winning bid. The Army's Talent Alignment Process is a relatively new and decentralized market-style hiring system that matches Army personnel to jobs based on preferences. But, while it is "market-style," it does not rely on an actual market mechanism, such as an auction.

Does Faster Promotion Speed Indicate Factors Other Than Supply and Demand?

A fundamental assumption underlying our analysis is that faster promotion is an indicator of performance. But if faster promotion is due to factors beyond the control of individual members, such as supply and demand factors that cause promotion opportunities to vary across personnel, and not due to differences in performance, then restructuring SRBs based on promotion speed could be viewed as unfair. By supply and demand factors, we mean the number of service members eligible to be promoted, as well as the slots available to promote service members, both of which reflect the Army requirements or demand for personnel in each grade and the supply or retention decisions of Army personnel in each grade. Moreover, supply and demand factors of the military are also affected by civilian opportunities in the particular year that an individual is eligible for promotion. For example, if the economy is doing well, then civilian opportunities may be more attractive, and, subsequently, the Army may promote service members faster to sustain retention. In recent research for the 13th QRMC (Asch, Mattock, and Tong, 2020), we proxied for supply and demand factors using calendar year of promotion dummy variables, which capture whether there is something special about the year when the promotion occurs, such as the factors described above, that is driving promotion speed. Drawing from this work, we find that, while supply and demand factors explain some of the variation in promotion to E-4 and to E-5, a substantial share of the variation in promotion speed is not explained by these factors, suggesting that merit and performance still play an important role, especially for time to E-5 for the Army.

Wrap-Up

The analysis in this report shows that the Army could improve the setting of SRBs to increase incentives for higher performance and to increase efficiency for some MOSs. The results suggest that restructuring SRBs would therefore help modernize the Army's S&I pay program and help support its talent management strategy. Before a full-scale implementation of the new approach to SRBs, the Army might take several steps to gather additional information about the approach, especially for MOSs we do not consider in this project, such as surveying soldiers to gauge their reaction to the new bonus approach. The analytic approach we use could be further extended to other MOSs and could also be used to assess the retention, performance, and cost effects of other compensation policies for specific MOSs, such as the blended retirement system continuation pay and critical skills retention bonuses.

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CHAPTER ONE

Introduction

The objective of the Army's talent management strategy is to deliberately manage the talents of Army officers and soldiers so as to optimize their performance and enhance Army readiness (U.S. Army, 2016). Many of the Army's talent management initiatives have focused on reforms to Army personnel policy, as well as changes to the Army's personnel systems that assign service members to units. Less attention has been focused on how compensation might change to better support the Army's talent management strategy. In large part, this is because compensation law and policy, including the pay table, allowances, and retirement benefits, are set outside the Army, by Congress and the Office of the Secretary of Defense (OSD).

That said, Congress authorizes the services, including the Army, to use more than 60 special and incentive (S&I) pays to address specific manning needs or force-management issues. These S&I pays make up only about 7 percent of military compensation costs, but they are the primary way that compensation varies with occupation, assignment location, or type of duty for service members with the same rank and years of service (YOS) (Office of the Under Secretary of Defense for Personnel and Readiness, 2008). In particular, these pays are intended to provide the services with flexibility to recognize persistently higher civilian pay for similar skills in the military, onerous or dangerous working conditions or assignments, specialized skills and proficiencies, temporary fluctuations in supply-and-demand conditions, and high training costs. The flexibility stems from the ability of the services to turn some of these pays on and off and to target them to specific groups of personnel to achieve potentially different experience or grade mixes across occupations. S&I pays are also considered to be a more cost-effective means of addressing recruiting and retention challenges than across-the-board increases in basic pay.

Given their importance as a force management tool and the ability of the Army to set these pays (within the confines of existing authorities), unlike other military pay elements, the Army requested that the RAND Corporation's Arroyo Center provide analyses to improve the setting of S&I pays to increase efficiency and incentives for higher performance, as part of its talent management strategy. The Army requested that the project focus on retention incentives for enlisted soldiers and specifically on the Army's selective reenlistment bonus (SRB) program. Other than enlistment bonuses, SRBs are the most important S&I pay for soldiers from a budgetary perspective. For example, in fiscal year (FY) 2018, SRBs accounted for 63 percent of the $790 million the Army spent on S&I pay for enlisted personnel, other than enlistment bonuses (Department of the Army, 2019b). Furthermore, past research finds that SRBs increase the likelihood that a soldier reenlists and that SRBs are a more efficient means of increasing retention at the margin than increasing basic pay.[1]

The Army's SRB program is a monetary incentive offered to qualified soldiers who reenlist in the Regular Army (RA) for continued duty in certain Military Occupational Specialties (MOSs). The SRB is designed to increase the number of reenlistments in critical MOSs with higher amounts paid to those who sign up for longer periods of additional obligated service (AOS) (U.S. Army Human Resources Command,

[1] We review the literature on the estimated effects of SRBs on reenlistment in Appendix A. Evidence on the relative cost-effectiveness of bonuses versus pay is presented in Asch et al. (2010).

2019). The Army has changed the structure of its SRB program over time and, specifically, the eligibility criteria and the formula for determining dollar amounts. Since the beginning of FY 2011, the Army has used what it calls the *Tiered SRB program*, whereby soldiers who reenlist receive a lump-sum dollar amount. Because our analysis focuses on improving the setting of SRBs, we provide specific examples of the Tiered SRB program in Table 1.1 using two MOSs, 11B and 35P (infantry and cryptologic linguist, respectively).[2]

Panel A of Table 1.1 shows the assignment of tiers to MOS and to each grade within a MOS—a higher tier is assigned to more severely undermanned MOSs and to more undermanned grades within the MOS. For example, for 35P, E-6 and E-7 soldiers are assigned to Tier 6, while those in grades E-5 and below are assigned to Tier 10. In contrast, all soldiers in 11B, regardless of grade, are assigned to Tier 3. Note that the Army has a single Tier table for all MOSs. Panel B of the table shows the dollar values associated with Tiers 3, 6, and 10 in

TABLE 1.1
Examples of the Tiered SRB Program

Panel A: Tier Assignment

MOS	SL1 (E-1–E-4)	SGT (E-5)	SSG (E-6)	SFC (E-7)
11B	3	3	3	3
35P	10	10	6	6

Panel B: Dollar Amounts Assigned to Each Tier

	Rank	12–23 Months	24–35 Months	36–47 Months	48–59 Months	60 or More Months
Tier 3	PFC (E-3)	$1,200	$2,600	$4,300	$5,500	$8,300
	SPC (E-4)	$1,300	$2,800	$4,700	$6,000	$9,000
	SGT (E-5)	$1,400	$3,100	$5,100	$6,600	$9,900
	SSG/SFC (E-6–E-7)	$1,600	$3,500	$5,800	$7,500	$11,200
Tier 6	PFC (E-3)	$3,100	$6,600	$10,300	$16,200	$24,200
	SPC (E-4)	$3,400	$7,200	$11,300	$17,700	$26,400
	SGT (E-5)	$3,700	$8,000	$12,400	$19,900	$29,100
	SSG/SFC (E-6–E-7)	$4,200	$8,900	$13,900	$21,800	$32,600
Tier 10	PFC (E-3)	$5,400	$11,400	$19,900	$40,300	$60,200
	SPC (E-4)	$5,900	$12,400	$21,600	$43,900	$65,600
	SGT (E-5)	$6,500	$13,700	$23,800	$48,400	$72,200
	SSG/SFC (E-6–E-7)	$7,200	$15,300	$26,700	$54,200	$81,000

SOURCE: Authors' example based on Army MILPER message 19-261 on SRBs (U.S. Army Human Resources Command, 2019).

NOTE: SL1 has no definition and refers to ranks Private, Private First Class and Corporal; PFC = Private First Class; SPC = Specialist; SGT = Sergeant; SSG = Staff Sergeant; SFC = Sergeant First Class.

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[2] Appendix A provides a history of reenlistment bonuses in the Army, including a detailed description of the SRB program over the past two decades. As discussed in the Appendix, within a MOS, the Tiered SRB program also permits tiers to vary by location—what the Army calls *Total Active Federal Service* (TAFS) or what is generally referred to as *Total Active Federal Military Service* (TAFMS), *Special Qualification Identifier* (SQI), or *Additional Skill Identifier* (ASI). For simplicity, we do not consider these dimensions in our example.

our example. (Each SRB announcement has a schedule with Tiers 1–10, but we show only the referenced Tiers 3, 6, and 10 for simplicity). The higher tiers provide higher dollar amounts, and, within a tier, higher dollar amounts are assigned to longer obligations of continued service and, in most cases, to more senior ranks. For example, for an additional service obligation of 48 months, an E-4 Specialist (SPC) would receive a $6,000 SRB in Tier 3 but a $43,900 SRB in Tier 10.

Approach

To provide the Army with information on how to improve the setting of SRBs to increase efficiency and performance incentives, we first developed a set of alternative courses of action (COAs) to restructure Army SRBs. These COAs were developed after reviewing initiatives by the other services to improve the setting of SRBs, reviewing the military manpower literature for past SRB reform ideas, and reviewing the economics literature on the topic of setting compensation to increase performance incentives.

Our next step was to assess the COAs in terms of their effects relative to the current Tiered SRB program's approach on performance, retention, and cost. Ideally, the COAs would be evaluated using a randomized controlled trial methodology whereby Army enlisted personnel would be randomly assigned to control and test cells, and reenlistment, performance, and cost would be assessed before and after the assignment. However, such evaluations can be costly and time-consuming, and analysis is required, in any case, prior to the trial to identify the most promising COAs to consider in the trial. In place of experimental methods, we developed a modeling capability that is well-suited to provide quantitative estimates of the effects of policies that do not currently exist or that have no historical analog, such as the COAs we consider. This modeling capability is known as the *dynamic retention model* (DRM). RAND researchers have developed and used the DRM for a number of studies concerned with compensation reform, including an analysis of offering a Critical Skills Retention Bonus (CSRB) to special operations officers in the Army; an analysis of raising the cap on aviation bonuses for military pilots; and, most recently, an analysis of reforming the military basic pay table to increase performance incentives, conducted for the 13th Quadrennial Review of Military Compensation (QRMC).

For our analysis of Army SRBs, we estimated DRM models for a set of MOSs, using longitudinal data from the Defense Manpower Data Center (DMDC) on individual soldiers. These data track soldiers' careers from entry through 2019, starting in the year 2000. The set of MOSs belongs to a list of Army Career Management Fields (CMFs) that the Army identified as critical for the purpose of setting SRBs, listed in Table 1.2. We did not estimate models for every MOS in these CMFs but selected one MOS based on size or our ability

TABLE 1.2
List of Critical Occupations Identified for the Project

CMF	Description	MOSs Included in CMF
11	Infantry	**11B** 11C 11H 11M
14	Air Defense Artillery	**14E** 14G 14H 14J 14P 14S 14T
17	Cyber	17C **17E**
18	Special Forces	**18B** 18C 18D 18E 18F
35	Military Intelligence	**35F** 35G 35H 35L 35M 35N 35P 35Q 35S 35T 35W 35Y
68	Medical	68A 68B 68C 68D 68F 68H 68J 68K 68L 68M 68N **68P** 68Q 68R 68S 68T 68U 68V 68W 68X 68Y

to estimate models with a good fit (as we will discuss in greater detail in Chapter Four). The selected MOSs were 11B, 14E, 17E, 18B, 35F, and 68P. These are highlighted in bold in Table 1.2.

These MOSs vary considerably in size, leading to a large difference in the sample size we used to estimate the DRM models. MOS 11B is the largest, at 34,538 soldiers, followed by 35F at 6,399, 14E at 2,099, 68P at 598, 17E at 139, and 18B at 90. Unfortunately, the CMFs of highest interest (Special Forces and Cyber) also tend to be among the MOSs with the lowest sample size. A low sample size limits our ability to estimate statistically significant parameters for the DRM models.

Given the estimated parameters of the DRM models for each MOS, we then developed computer code to simulate how the current SRB approach and the COAs would affect retention in these MOSs, as well as the average performance of soldiers and SRB costs. Our DRM simulation coding assumed that promotion speed depends on performance, which, in turn, depends on innate ability. We did not observe ability. Instead, we treated ability as a unitless index, and then we made assumptions about how ability affects promotion speed. We also made assumptions about the distribution of ability among entrants, how ability affects external opportunities, and the disutility of increased effort. These assumed parameters were calibrated or chosen so that we could replicate the observed retention profile of soldiers within each MOS.[3] Given the simulation capability and model estimates, we assessed the retention, performance, and cost of the alternative COAs relative to the current Tiered SRB program approach.

Organization of the Report

The next chapter describes the insights from the other services and the literature for the purpose of developing the COAs for restructuring the Army SRB program that we present in Chapter Three. Chapter Four then presents a description of the DRM methodology, data, model estimates, and simulation capability. In Chapter Five, we present the simulation results. Chapter Six summarizes our conclusions, including the policy implications of our findings.

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3 The simulation code we developed builds on our analysis for the 13th QRMC. As discussed in that work (Asch, Mattock, and Tong, 2020), we conduct sensitivity analyses to assess the extent to which results are sensitive to assumptions. We found that our main conclusions were unchanged qualitatively under alternative assumptions.

CHAPTER TWO

Insights from Discussions with Service Managers and from the Literature on Restructuring SRBs

To develop alternatives for improving the setting of SRBs to increase efficiency and performance incentives, we sought input from two sources. First, we held discussions with personnel and compensation managers within each service and OSD. While the discussions covered the broader topic of setting any of the S&I pays to increase performance incentives, they also covered ways of improving the setting of SRBs. In this chapter, we review what we learned from these discussions. Next, we reviewed the military manpower literature for three purposes. First, we investigated past ideas for SRB reform, and second, we reviewed analysis on how the structure of the basic pay across grades (upon which SRB amounts often depend) and promotion speed could affect performance incentives. Because of the importance of promotion speed as a reward for performance, we also reviewed the results of a recent study on the extent to which promotion speed reflects factors other than individual performance, such as supply and demand factors.

This chapter summarizes our findings from these sources. The next chapter presents the COAs we developed drawing from these sources.

Discussions with Manpower and Compensation Managers

We had half a dozen meetings with personnel managers from each service and within the Office of the Under Secretary of Defense for Personnel and Readiness, both civilian and uniformed. These managers were in positions of authority relevant to military compensation and retention and were familiar with how SRBs are set. We summarize the key insights from these discussions pertaining to the setting of SRBs and the use of S&I pays for performance incentives.

SRBs Are Used to Achieve Additional Objectives Beyond Increased Reenlistment

Our discussions revealed that the services use SRBs for additional purposes other than expanding the number of reenlistments among those in a given occupational specialty. One of these purposes is to provide an incentive for lateral transfers or skill-channeling whereby enlisted members in an oversubscribed occupational specialty are induced to transfer to a harder-to-fill specialty. Another purpose is to induce members to take particular assignments. For example, the Marine Corps gives an "infantry operational force" kicker that requires marines not only to reenlist for 48 months but to obligate to take only deployable assignments and to spend 36 of the 48 months in operational units. Nondeployable assignments are ones such as recruiter or instructor assignments. Kickers are additional bonus amounts over and above the SRB for all eligible personnel. The Marine Corps also gives SRB kickers to marines who reenlist earlier.

Another purpose discussed is to use SRBs or other retention incentives to induce members to complete certain certifications or other knowledge-, experience-, or skill-related requirements for an occupation or an assignment within that occupation. For example, in some cases, the Army requires soldiers to have particular SQIs or ASIs to be eligible for an SRB. Acquisition of these SQIs and ASIs requires certification that requirements have been met. Similarly, for SRB eligibility related to some high-tech ratings, the Navy requires not only a particular rating specialty but also a certification in a particular Navy enlisted classification. For surface warfare officers and aviators, the Navy offers a retention bonus kicker to those who are screened for department head and who obligate for additional service.

The Navy is also piloting a program whereby SRBs are being used as a performance incentive, as we discuss in the next subsection.

Using SRBs and Other Retention Incentives to Increase Performance Incentives

In addition to operating as a credentialing incentive, the Navy's retention bonus kicker for the surface warfare officer community is also a performance incentive because those who achieve department head are also the best performers. Thus, the kicker is a retention incentive for the best performers. The personnel managers we met also argued that skill-based pay can provide a retention incentive for better performers because often, only the best performers are able to qualify for the courses that lead to the credential.

For enlisted personnel, the Navy has also been piloting an SRB program in a small set of surface warfare ratings that gives a kicker to sailors with good performance reviews over the past three cycles. The Navy computes SRBs as a multiple of monthly basic pay and months of additional obligation divided by 12. The kicker is a 0.5 addition to the SRB multiplier. For example, if the base multiplier is 0.5, the total multiplier would be 1.0, and the SRB would be computed as *1.0 × monthly basic pay × months of additional obligation/12*. The Navy is still fine-tuning the pilot, including the definition of who is eligible. For example, we were told that the criteria for eligibility appeared overly narrow, initially, so fewer sailors than expected have taken the kicker. One challenge faced by the Navy with setting the SRB kickers based on performance is ensuring consistency in the measurement of performance, given the potential for differences in how different raters evaluate a given type of performance. Another challenge mentioned by the Navy is that performance reviews occur only when sailors are promoted, but promotions occur only when a billet becomes vacant in the higher grade. Consequently, there are high-performing sailors who may not be evaluated owing to slow promotion speeds in their rating. Slow promotion speed could be caused by factors other than performance, such as unusually high retention in the rating, that serve to reduce the number of billets that are vacant. Put differently, a disadvantage mentioned by the Navy of using the promotion system to reveal performance, from the standpoint of setting SRBs based on performance, is that promotions may not occur quickly for some sailors because of supply and demand or other factors that cause promotion speeds to be slow. As we will discuss later in this chapter, analysis of promotion timing to the grades of E-4 and E-5 in each service shows that these external factors explain a share but not all of the variation in promotion timing.

An important limitation of using SRBs to reward superior performance mentioned by some of the personnel and compensation managers we met is that SRBs are paid only when reenlistment occurs. Consequently, those who are not eligible for reenlistment but who are superior performers would be ineligible for this source of pay for performance. A counterargument is that service members are forward-looking—they take into account their expectations about future pay and bonuses—when they make retention decisions. Consequently, better performers who are not currently eligible for reenlistment may base their current retention decisions, in part, on the expectation of eligibility for an SRB in the future.

The discussions also revealed that using SRBs to reward better performance can have advantages. As a retention incentive, they can directly target the retention of better performers while reducing the incentive of poorer performers to stay. Furthermore, SRBs lock in the retention of better performers because of the additional service obligation that comes with SRBs. These features are in contrast to those of many other S&I pays that are monthly payments that do not require a service obligation and whose eligibility criteria do not depend on performance, such as imminent danger pay, which compensates service members serving in a designated combat zone or in an area designated as an imminent danger area.

Concerns About Military Pay-for-Performance, in General

Our discussions also covered the broader topic of pay-for-performance in the military. Uniformly, the managers expressed concern about how such a system would be implemented to ensure accuracy, transparency, and consistency in the measurement of performance while limiting bureaucracy and cost. Today, performance reviews are decentralized, relying on the inputs of unit commanders. While these commanders are closest to the soldier, relying on such a decentralized approach to implement pay-for-performance would raise the stakes and would lead to increased concerns about lack of consistency across commanders on how they rate performance, as well as the honesty of the system in light of potential favoritism. But a centralized approach could reduce the accuracy of the performance reviews and could be highly costly to implement. Even beyond the issue of centralization or decentralization of reviews, many of the managers expressed concern about the lack of transparency of even the current system of reviews. For example, one manager said, "there are code words, such as 'excellent,' that are used to communicate to a promotion board that a service member is awful. Someone worthy of promotion would have a code word like 'awesome.'"

A broader concern is that military performance is often difficult to measure, given that service members work in teams toward common performance or readiness objectives. Furthermore, as one manager remarked, "in the military, it's not always easy to define ahead of time what the performance objective will be." This contrasts with federal and, specifically, U.S. Department of Defense (DoD) civil service employees who can receive bonuses if they meet a prespecified performance objective. A related concern that we heard was that the inability to accurately measure performance relative to an objective would lead the services to focus on those aspects of performance that are amenable to measurement and easily compared across members, such as the physical elements of service (e.g., rifle range results), rather than a more accurate portrayal of overall performance.

In addition to concerns about measurement of performance, some managers raised the issue of how superior performers would be compensated. In particular, monetary incentives are not the only means of reward. Some managers mentioned the positive role of ribbons and badges that are visible to other members and that confer status in a way that a monetary reward may not.

Issues Regarding the Restructuring of SRBs

Another area of discussion was the structure of SRBs and three topics: the payment of SRBs as a single lump sum or a partial lump sum with annual anniversary payments, the use of zones or a range of YOS to define SRB eligibility, and the use of a multiplier formula to define SRB dollar amounts. Table 2.1 summarizes current service policy with respect to each of these topics.

TABLE 2.1
Overview of Currently Used SRB Formula Elements, by Service

	Lump Sum Without Anniversary Payments	Use of Zones	Use of Multiplier Formula
Army	Yes	No	No
Navy	No	Yes	Yes
Air Force	No	Yes	Yes
Marine Corps	Yes	Yes	No

Single Lump-Sum Payments

As shown in Table 2.1, the Army pays SRBs as a single lump sum at the time of reenlistment. For example, in Table 1.1, an E-4 reenlisting in a Tier 10 MOS for 36 months would receive a single lump-sum payment of $21,600. In contrast, the Navy and Air Force pay an initial amount, such as half of the SRB at the time of reenlistment, and the remaining half in equal anniversary payments over the remaining years of the obligation. For example, if the service member reenlists for three years for a total SRB of $21,600, he or she would receive $10,800 (or $21,600/2) at reenlistment, $5,400 (or $10,800/2) after one year, and the remaining $5,400 at the end of the second year. The Marine Corps also pays single lump sums.

The managers discussed the pros and cons of a single lump sum versus an anniversary payment approach. Because service members discount future dollars, meaning a dollar paid in the future is worth less today than the same dollar paid today, single lump-sum payments give a higher expected value, creating a larger retention effect. Hosek and Peterson (1986) studied the effects of a DoD-wide switch to lump-sum bonus payments in 1979, and Barry (2001) estimated the effect of the Marine Corps (again) switching to lump-sum bonus payments in FY 2001. Both studies find similar evidence supporting this hypothesis—specifically, that a single lump sum increased reenlistment by around 30 percent, relative to an anniversary payment approach. The larger retention effect for the same dollar amount means that the single lump sum approach is more efficient than the anniversary approach, and the services could reduce the total SRB amount to achieve the same retention effect when it is paid in this manner. Another advantage is from a budgeting standpoint. Obligations for anniversary payments incurred in the current FY must be included in the service budget in future years, complicating the budgeting process.

That said, anniversary payments also have advantages. As one manager mentioned, anniversary payments also have a positive retention incentive because otherwise, there might be a significant number of members who would leave without completing their SRB-linked service obligation. The possibility of forgoing a future anniversary payment by leaving provides a positive incentive to remain for the entire obligation. Another advantage highlighted by past studies, though not mentioned by the managers we met, is that an anniversary payment could increase if the member received a promotion during the service obligation. While such a policy would increase SRB costs, it would increase the monetary return to promotion, thereby increasing incentives for better performance. It would also extend the "reach" of SRBs with respect to incentivizing performance, by allowing this aspect of the SRB to persist across the years of additional obligation. We discuss the literature in more detail below.

Zones

Zones are predetermined levels of experience or TAFMS that are required for a service member to be eligible for an SRB. Members facing a reenlistment decision in Zone A have between 17 months and six YOS. Those in Zone B have between six and ten YOS, and those in Zones C, D, and E have between ten and 14 YOS, 14 and 18 YOS, and 18 and 20 YOS, respectively (Office of the Under Secretary of Defense, Comptroller, 2020). As shown in Table 2.1, the Army is the only service that does not use zone to define eligibility, though on a limited, ad hoc basis, the Army can and does use total additional federal service to define eligibility.

The Army told us that a disadvantage of using zones to define eligibility is that a service member who reenlisted in a given zone cannot receive another SRB while in the same zone. For example, a member with three YOS who reenlists for an additional two-year obligation would be a Zone A reenlistment. When the two years is completed, the member would have five YOS and would still be considered in Zone A. Consequently, the member could not receive another SRB. The inability to receive another SRB within the same zone limits flexibility to offer SRBs as needed to meet staffing needs. The Army said that when it needs to target SRBs to specific YOS, it will use TAFMS when it defines tiers. For example, in the top panel of Table 1.1, the Army might use different tier designations for 11B with between six and ten YOS than for all 11Bs.[1]

The advantage of zones is that they allow the services to target SRBs to specific experience levels. While not specifically mentioned by the managers we met, such targeting embeds a performance incentive. In the absence of any experience requirement, when SRBs are paid as a single lump sum, the same SRB is paid to a service member who is promoted slowly as to a member promoted more quickly. To the extent that faster promotion speed reflects superior performance, better and poorer performers would receive the same SRB. For example, an E-4 with two YOS would receive the same SRB as an E-4 with eight YOS. In contrast, with an experience requirement, such as would be the case if SRB eligibility depended on being in Zone A, the E-4 with two YOS would be eligible for the SRB, but not the E-4 with eight YOS.

Multipliers

Table 2.1 shows that the Navy and Air Force compute SRBs using the multiplier formula, meaning that the amount of the SRB equals the multiplier × monthly basic pay × months of obligation divided by 12. For example, if the service sets the multiplier to 0.5, an E-4 with two YOS who reenlists for 36 months in 2020 would receive $3,567.60 (0.5 × $2,378.40 × 36/12). One disadvantage of the multiplier formula highlighted by the personnel managers we spoke with is that it is less transparent to the service member than a dollar amount. For example, the E-4 might think a multiplier of 0.5 is too small to bother with reenlistment—without realizing that this multiplier translates to over $3,500. Furthermore, multipliers appear to lead to more data entry errors, or at least data errors that are not caught in a timely manner, than the use of explicit dollar amounts. Another disadvantage that we heard is that multipliers can constrain the service's flexibility in setting SRBs—say, if the service prefers to set the same SRB regardless of grade or YOS.

Multipliers have advantages. While not mentioned by the managers we met, the advantages have been highlighted by the literature, as we will discuss below. In particular, basing the SRB amount on basic pay means that the positive performance incentives embedded in the military pay table are also embedded in the SRB formula. While the Army and Marine Corps—the two services that do not use the multiplier formula—set SRBs to generally increase with pay grade and therefore promotion, whether they embed the performance incentives observed in the pay table is unclear, especially given that SRBs are frequently changed over time. While the Marine Corps also uses zones—so that SRBs vary to some extent with YOS, similar to the pay table—this is not the case with the Army. The Tiered SRB program used by the Army gives the same SRB, for a given tier and grade, regardless of YOS. We discuss the literature on the performance incentives embedded in the pay table next.

Insights from the Military Manpower Literature on SRB Reform, Performance Incentives, and Promotion Speed

To assist in the development of the COAs, we also reviewed the military manpower literature. In addition to reviewing past estimates of the retention effects of SRBs in Appendix A, we reviewed past studies that have proposed reforms to the SRB setting process. We summarize the latter studies here. In addition, given that SRBs have traditionally been set as a multiple of basic pay, we review analysis of how the structure of the pay table across grades and the promotion system affect performance incentives. Finally, in light of concerns

[1] In practice, the use by the Army of YOS as a criterion since the advent of the Tiered SRB program has been very limited. In particular, a Zone C–specific SRB was offered in a small number of occupations (e.g., CMFs 18, 35P, 37F, 38B, and 89D) from early 2011 to late 2013. Only since the middle of 2019 has YOS been used as a criterion, and only in higher tiers for E-6s and E-7s in CMF 18.

regarding whether promotion speed reflects performance, we review the results of a recent study that quantified the extent to which promotion speed reflects factors external to individuals, such as supply and demand factors.

Literature on SRB Reform

A number of past studies have considered alternative reforms to the setting of SRBs, either to improve their efficiency in terms of inducing a given retention effect or in terms of promoting greater incentives for performance. A review of these studies is presented in Appendix A. Here, we briefly summarize some of the key reforms considered in the literature.

As discussed above, past studies find that setting SRBs as single lump payments is more efficient than setting them as partial lump sums with anniversary payments. Although spreading out the payments discourages attrition before the service obligation is complete, service members discount future payments relative to payments made in the current period, so a single lump sum in the current period has a larger retention effect than the same SRB spread out over several years.

Another recommended reform in the literature is to link SRBs to performance by making them a function of pay grade and, therefore, promotion, and in particular to allow any anniversary payments to increase if those who reenlist are promoted to a higher grade during their service obligation. Currently, installment or anniversary payments are based on the pay, and therefore the pay grade, at the time of reenlistment. The reform would allow the anniversary payment to change as pay increases as a result of promotion.

Another line of research has considered setting SRBs through an auction process in which eligible personnel would be allowed to bid the lowest SRB required to induce them to reenlist. Those with the strongest preference to stay in service would bid the lowest SRB amount, and SRB amounts would rise until a sufficient amount was reached to induce the needed number of eligible personnel to reenlist in a given occupation.[2] The Navy has used a similar approach for setting Assignment Incentive Pay to match sailors with less-desirable assignments, and this approach reduced costs and increased member satisfaction (Golfin, Lien, and Gregory, 2004). Research suggests that an auction-based SRB process would have the potential to save costs by reducing rents paid to people who would have reenlisted either without an SRB or with a lower SRB than was offered. On the other hand, an auction system could add further uncertainty into the bonus system.

Because the Army already uses a single lump sum approach, the COAs we developed continue to be in the form of a lump sum, as we discuss in the next chapter. Since this approach does not involve anniversary or installment payments, we do not consider any COA that bases anniversary payments on grade at the time of payment. We also do not consider an auction approach, since such an approach would be a fundamental change in how the Army sets bonuses—though we recommend that the Army consider such an approach in the future. Instead, the COAs we develop incorporate performance incentives by setting the SRB amounts based on promotion speed. As we describe in the next chapter, faster promotion speed and the rewards associated with promotion are an important way that the Army and the other services reward performance.

Literature on Performance Incentives Embedded in the Pay Table

Research shows that the quality of Army soldiers recruited increases with the level of military pay relative to civilian pay.[3] It also suggests that the structure of basic pay across grades, meaning how military basic pay

2 This procedure is known as a *reverse Dutch auction*.

3 A large literature provides estimates of the relationship between military pay and recruit quality. A summary of these studies can be found in Warner (2010) and in Asch (2019a).

increases with each subsequent promotion, can also affect soldier quality and the incentives for work effort, as we discuss in this subsection.[4]

The structure of basic pay across grades can affect performance incentives because an important source of military compensation that is contingent on performance is the rewards associated with promotion. The performance incentives embedded in the pay table are important from the standpoint of setting SRBs because traditionally, the Army's SRB formula based the SRB on a soldier's basic pay at the time of reenlistment. Consequently, the incentives embedded in the pay table would also affect the incentives embedded in the SRBs.

As in the other services, an important Army talent management objective is to sharpen the competition for promotion over an Army career so that the most qualified Army personnel rise to the top of the organization in terms of rank. The military's hierarchical rank structure affects promotions across the ranks. Subject to individual qualifications, personnel are promoted through the lower enlisted ranks with virtual certainty using time-in-grade or time-in-service requirements. But beyond the junior ranks, promotions are competitive, and only a fraction of those seeking advancement are promoted. The competition at the upper ranks is tighter because those who are eligible for promotion are increasingly similar in terms of their qualifications.

One way to accomplish strong performance incentives over a military career is through bigger pay spreads associated with promotion (e.g., larger intergrade pay spreads), among other policies. Such spreads motivate harder work in the quest for advancement. More important, larger spreads encourage those who are more able to remain in service and therefore help maintain the quality of the promotion pool. And by improving the talent pool and by inducing those who are more able to work harder, larger intergrade spreads prevent less-qualified members from being promoted (referred to as *climbing*).

How well does the current enlisted basic pay table structure provide these incentives? Whether the pay table is structured appropriately ultimately comes down to whether the Army and the other services are satisfied with the performance of their personnel. Even so, a direct look at the structure of the pay table can provide information on whether the pay table is structured so that pay raises increase with promotion (i.e., is "skewed") or whether it appears compressed.

Figure 2.1 draws from Figure 6 in Asch (2019b) to show how basic pay in the 2018 military basic pay table varies with grade, assuming a hypothetical YOS history for enlisted personnel. For example, in 2018, pay of an E-1 is 56 percent of pay of an E-5, while the pay of an E-9 is 224 percent.

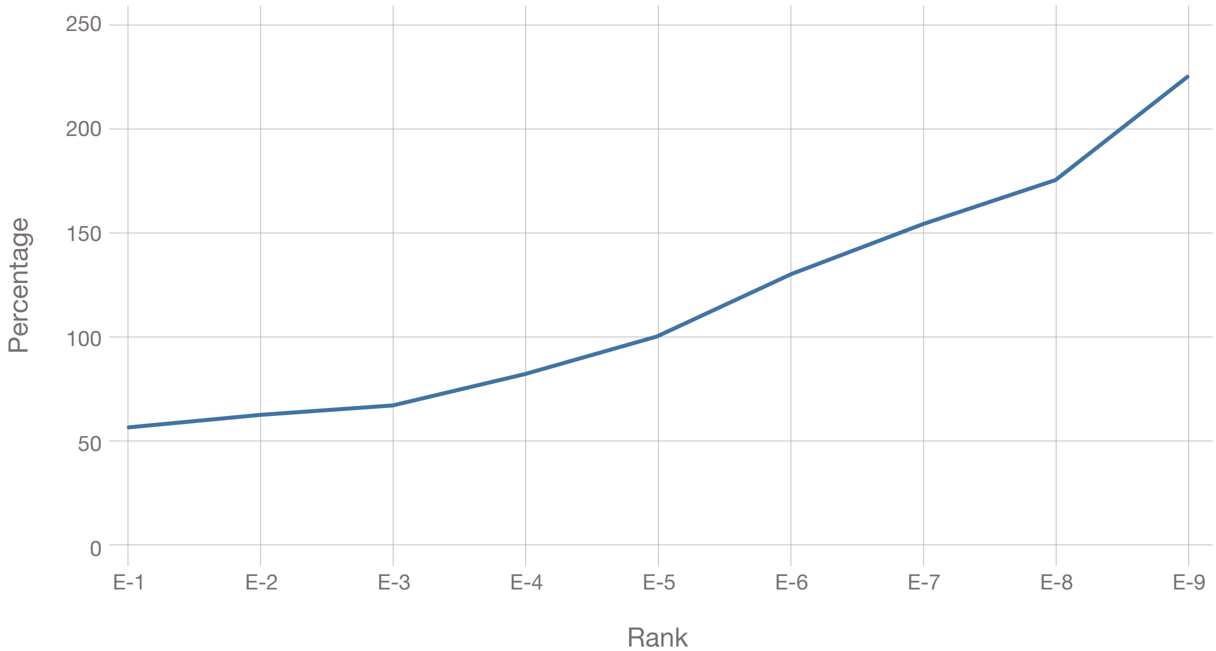
The structure of enlisted basic pay in Figure 2.1 suggests that it was skewed in the sense that pay increases between E-1 and E-3 were smaller than later pay increases, making the structure relatively flat between E-1 and E-3. The pay increase rose at the promotion to E-4 and was linear until E-8. The pay increase rose again at the promotion to E-9. In short, the structure of enlisted pay suggests that it embeds incentives for performance. The implication is that setting SRBs to depend on basic pay would also embed these incentives. As we discuss in more detail in Chapter Three, the third COA we consider would structure the Army's SRB program so that the dollar amount depended on basic pay. While the other COAs do not set SRBs as a multiple of basic pay, they do take advantage of the performance incentives embedded in the promotion process to set higher SRBs for those promoted faster.

Results on the Extent to Which Promotion Speed Reflects External Factors Versus Performance

One of the concerns regarding the use of promotion speed as an indicator of performance and as an input to setting pay-for-performance is that it could result in inequitable differences in pay stemming from differ-

[4] Past studies that have examined the relationship between the structure of military pay and performance include Asch (2019b); Asch and Warner (1994); Asch, Romley, and Totten (2005); and Congressional Budget Office (1995).

FIGURE 2.1
Basic Pay Relative to Pay of an E-5 in 2018 (in Percentage)



SOURCE: Figure 6 in Asch (2019b).

ences in promotion speed that are caused by factors beyond the control of individual members. In particular, if promotion speed varies primarily because of supply and demand factors that cause promotion opportunities to vary across personnel and not because of differences in performance, then setting performance-related pay based on promotion speed would exacerbate pay differences in ways unrelated to performance.[5]

In recent analysis for the 13th QRMC, RAND researchers considered empirical evidence regarding the role of supply and demand factors in enlisted promotion speed (Asch, Mattock, and Tong, 2020). The analysis examined the extent of variation in time to promotion within each service and across entrants in a given cohort within a service, including the Army, focusing on time to promotion to E-4 and E-5. It also estimated the extent to which variation in time to promotion is attributable to factors outside an individual's control, such as supply and demand factors. Supply and demand factors include the numbers of service members eligible to be promoted and of the slots available into which to promote them, reflecting the service requirements for personnel in each grade and the supply or retention decisions of soldiers in each grade. Supply and demand factors of the military are also affected by civilian opportunities in the particular year that an individual is eligible for promotion. For example, if the economy is doing well, then civilian opportunities may be more attractive, and consequently, the Army may promote service members faster to sustain retention. Calendar year of promotion dummy variables are used to proxy for supply and demand factors. These dummy variables measure the extent to which there is something unique about the year when the promotion occurs, such as the factors described above, that is driving promotion speed. The analysis used data from DMDC's active-duty master and pay files on enlisted service members who entered active duty between FY

[5] There is a separate literature examining the role of military compensation in addressing supply and demand issues within occupations (Congressional Budget Office, 2007). This research compared military cash compensation with that of civilians by occupation and demonstrated that relative increases in military cash compensation had little impact on resolving occupational shortages or surpluses.

2001 and FY 2013 and tracked them through 2018.[6] In the analysis, time to promotion is measured in months of service until promotion.

To describe the degree of variation in times to promotion in each service and across services, the study measured the difference between time to promotion for those in the 10th percentile and time to promotion for those in the 90th percentile of the distribution of time to promotion (i.e., those in the 10th percentile are promoted faster than those in the 90th percentile). By taking the difference between these two percentiles, the study approximated how much time to promotion differs between those who are promoted the fastest versus those who are promoted the slowest while excluding outliers (i.e., those with extreme values of time to promotion).

Table 2.2 draws from Tables 7.1 and 7.2 in Asch, Mattock, and Tong (2020) to show the 90th, 50th, and 10th percentiles of times to promotion by service, as well as the difference between the 90th and the 10th. The study found that Army enlisted service members were promoted the fastest to E-4 and to E-5 compared with members in the other services, as seen by comparing median promotion times (the 50th percentile). The study also found that the difference in months to promotion between the 10th and 90th percentiles of time to E-4 are the smallest for the Army and Air Force, while the difference between the 10th and 90th percentiles of time to E-5 is greatest for the Army.

The study also assessed the extent to which the variation in promotion times reflects differences in MOS, entry year, or calendar year—that is, factors other than those specific to individuals, such as performance. Promotion times can vary substantially across MOSs because of different training times and promotion requirements across occupations. Entry year would explain variation in time to promotion caused by conditions prevailing at the time of accessions, while calendar year of promotion would capture factors related to supply and demand conditions at the time of promotion. For example, a robust economy could induce more individuals to exit active-duty service for civilian opportunities. This would improve promotion opportunities for those who stay in service, thereby reducing promotion time. Because promotion calendar year

TABLE 2.2

Months to Promotion to E-4 and to E-5 from Entry at the 10th, 50th, and 90th Percentiles

	Army	Air Force	Marine Corps	Navy
Months to E-4				
10th percentile	19	24	21	17
50th percentile	24	30	32	32
90th percentile	35	36	44	48
Difference (90th–10th)	16	12	23	31
Months to E-5				
10th percentile	34	51	41	39
50th percentile	46	60	51	52
90th percentile	80	79	72	81
Difference (90th–10th)	46	28	31	42

SOURCE: Asch, Mattock, and Tong (2020), from Tables 7.1 and 7.2.

6 The sample of enlisted service members was restricted to those without prior enlisted service and who entered active duty as an E-1. Also, within each service, the analysis excluded service members in occupations with small sample sizes. Specifically, service members with three-digit DoD occupation codes that have 50 or fewer observations in any given cohort were dropped.

explained the most variation, compared with occupation and entry year, we replicated the results for that analysis here. In particular, for each service, the study estimated a Cox Proportional Hazards model and the *survival R-squared* (Royston, 2006), a measurement of the proportion of variation explained by observable factors similar to the standard R-squared for linear regression models. Table 2.3 draws from Tables 7.5 and 7.6 and shows the R-squared of the estimated survival models for time to E-4 and time to E-5 that include indicators of calendar year of promotion. To facilitate comparison, the table also shows the study's results by service.[7] The study found that the calendar year of promotion indicators explained between 13.1 percent and 47.5 percent of the variation in time to E-4 and between 3.7 percent and 25.1 percent of variation in time to E-5. For the Army, they explained 28.4 percent of the variation to E-4 and 14.1 percent of the variation in time to E-5.

The implication of this analysis is that promotion opportunities in the calendar year of promotion, driven by supply and demand factors, explain a sizable portion, but not most, of the variation in times to promotion to these grades. Consistent with the concerns of some of the managers we met, the study found evidence to indicate that some of the variation in promotion is attributable to factors such as demand and supply factors that are unrelated to merit. But, to the extent that the unexplained factors reflect merit, the analysis found that a substantial share of the variation in promotion speed is not explained by factors related to supply and demand, suggesting that internal factors, such as merit, still play an important role, especially in time to E-5 for the Army. Other unexplained factors that could also play a role include delays in promotion caused by a company preparing for deployment and differences across supervisors and leaders in how they assess performance of soldiers. Moreover, the methodology used to assess factors explaining variation in promotion speed assumes that promotions, in part, reflect performance, given that the Army and other services use promotion as a way to financially recognize better performance. However, there could be error in the way performance is measured, and this measurement error could exist even after adjusting for supply and demand factors. For example, when tasks are complex, team oriented, or involve discretion in decisionmaking, performance can be hard to judge. From a soldier's perspective, this can blur the link between true and perceived performance and raise uncertainty about future promotion speed. We note that the Army has traditionally used promotion speed to set the level of SRBs, at least implicitly, because SRBs were a function of basic pay and offered to specific zones up until 2010. Consequently, some of the COAs considered, particularly the ones that set SRBs based on basic pay, would introduce uncertainty similar to the uncertainty inherent in the bonuses offered in the past.

Another consideration worth noting is that putting greater emphasis on promotion speed could counteract goals related to equity and diversity. In fact, past research indicates that women and minorities are promoted at slower rates than white males in the military among both enlisted service members and officers (Asch, Miller, and Malchiodi, 2012; Hosek et al., 2001; U.S. Government Accountability Office [GAO], 2020).

TABLE 2.3

Survival R-Squared for Time to E-4 and to E-5, for Cox Proportional Hazard Models Including Indicators of Calendar Year of Promotion

Covariate	Army	Air Force	Marine Corps	Navy
Time to E-4	0.284	0.131	0.450	0.475
Time to E-5	0.141	0.037	0.251	0.145

SOURCE: Asch, Mattock, and Tong (2020), from Tables 7.4 and 7.5.

[7] The study found that occupation and entry year explained little of the variation—the R-squared values were small and substantially smaller than the R-squared values when calendar year indicators were used. Put differently, calendar year of promotion explained the largest share of variation in time to promotion to E-4 and to E-5, compared with occupation and entry year.

The extent to which the COAs considered would reduce equity and diversity depend on their structure. The COAs that have a similar structure to SRBs used in the past, i.e., the ones that depend on basic pay, would affect women and minorities similarly to historical SRBs. In contrast, the COAs that set SRBs based on time to promotion only may negatively affect women and minorities more than historical SRBs.

Summary

Pay-for-performance in the military could be challenging because of issues surrounding the accuracy, consistency, and transparency of performance measurement. That said, using SRBs to reward better performance could help the services directly target the retention of better performers, locking in their retention with an additional service obligation while reducing the incentive of poorer performers to stay. One way to embed performance incentives into SRBs is to base them on promotion speed. The use of zones to determine SRB eligibility indirectly bases SRB eligibility on promotion speed because zones target SRBs to specific experience levels, while the computation of SRB dollar amounts as multiples of basic pay embeds promotion speed and the skewed structure of pay across grades, features of the enlisted pay table that increase performance incentives. A potential concern of using faster promotion speed as an indicator of better individual performance is that promotion speed can reflect external factors such as supply and demand factors that can affect retention and the availability of positions into which personnel can be promoted. Available evidence indicates that these external factors have a role but are not the major factor in explaining variation in promotion speed to E-4 and to E-5. Put differently, individual factors, such as performance, play a more important role in the Army over the period of data considered.

CHAPTER THREE

Alternative Courses of Action

We used the insights from our discussions with personnel and compensation managers, and from the literature, to develop a set of COAs to increase the performance incentives embedded in the Army's SRB program. From our discussions and the literature, it is clear that the Army's current SRB structure has some advantages. By not specifying zones, the Army can offer multiple SRBs to a soldier in the same zone; by paying lump-sum amounts, the Army increases the retention effect of a given dollar amount and simplifies the budgeting process; by not using multipliers, the Army increases the transparency of the award.

Though these features may also have some drawbacks, the most important deficiency of the Army's current SRB program from the standpoint of performance incentives is that it provides the same SRB to soldiers regardless of whether they are promoted faster or slower than their peers in the same occupation who reenlist for the same additional obligation length. As discussed in the previous chapter, analysis in support of the 13th QRMC showed that a sizable share of enlisted personnel is promoted faster or slower than their peers within the same occupation and in the same calendar year (Asch, Mattock, and Tong, 2020). Table 3.1 illustrates this finding for soldiers in MOS 11B by showing the YOS distribution by paygrade in this MOS in the years 2017–2020. The table shows that E-5s typically have five or fewer YOS, with a sizable share of personnel—42 percent—with more than five YOS. These are soldiers who are promoted more slowly than their peers. Similarly, E-6s typically have between six and ten YOS, with a sizable share—43 percent—being soldiers who are promoted more slowly (i.e., with more than ten YOS). To the extent that those promoted more slowly are poorer performers, the Army's SRB program offers the same SRB to a substantial share of personnel who are poorer performers.

The COAs we developed address this issue by offering a higher SRB to those promoted faster and a lower SRB amount to those promoted more slowly. That is, we introduce a dimension to the eligibility criteria for a given MOS in addition to grade, location, SQI, and ASI—namely, YOS. At the end of 2019, the Army began to use total active federal service to define eligibility for SRBs, but its use has been limited to CMF 18, special forces personnel, and, so far, to those with between six and 12 YOS in the grades of either E-6 or E-7. The

TABLE 3.1
YOS Distribution, by Pay Grade, for MOS 11B, FY 2017–FY 2020 Average

	E-1 to E-3	E-4	E-5	E-6	E-7
YOS 0–3	99%	79%	13%	0%	0%
YOS 4–5	1%	16%	45%	4%	0%
YOS 6–10	0%	5%	38%	53%	4%
YOS 11–15	0%	0%	4%	29%	43%
YOS 16–20	0%	0%	0%	12%	41%
YOS 21+	0%	0%	0%	2%	5%
Total	100%	100%	100%	100%	100%

SOURCE: Author's tabulations using the Total Army Personnel Data Base for Regular Army enlisted personnel.

COAs build on the Army's approach for CMF 18, making the SRBs within a grade (and for a given MOS, Tier, and AOS) differ depending on YOS.

The COAs are assessed relative to a baseline case and a case that reflects the current Army approach to setting SRBs.[1] Under the baseline case, the Army offers no SRB, while under the current approach case, the Army offers all soldiers in a given grade the same SRB.[2] We chose the baseline to be the case of $0 SRBs because we sought to ensure that the COAs produced the same effect on force size as the Army's current approach. To show this common effect, we needed to compute the retention effect of the current approach relative to a baseline and then compare the retention effect of the COAs with this effect.

Table 3.2 shows the baseline case (column [1]) and the current approach case (column [2]) for MOS 11B, assuming an AOS of 48 months. Under the current approach case shown in column (2), all soldiers would get $8,300 regardless of grade and regardless of YOS within a given grade. As will be discussed in Chapter Five, this current approach case would increase the force size of 11Bs by 5.3 percent relative to the baseline case in column (1).

We then consider three COAs in which SRBs are higher within a grade for those with fewer YOS. While the COAs have different features, the intent of all three is to demonstrate the basic point that targeting SRBs

TABLE 3.2

COAs for MOS 11B, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)
E-3	≤ 1	$0	$8,300	$17,300	$15,000	$10,302
	> 1	$0	$8,300	$0	$3,000	$0
E-4	≤ 2	$0	$8,300	$17,300	$15,000	$11,411
	> 2	$0	$8,300	$0	$3,000	$0
E-5	≤ 4	$0	$8,300	$17,300	$15,000	$14,583
	> 4	$0	$8,300	$0	$3,000	$0
E-6	≤ 8	$0	$8,300	$17,300	$15,000	$18,425
	> 8	$0	$8,300	$0	$3,000	$0
E-7	≤ 14	$0	$8,300	$17,300	$15,000	$23,310
	>14	$0	$8,300	$0	$3,000	$0
E-8	≤ 18	$0	$8,300	$17,300	$15,000	$27,208
	>18	$0	$8,300	$0	$3,000	$0

NOTE: Assumes a 48-month AOS. As will be shown in Chapter Four, the COAs and the current approach case in this example are simulated to produce approximately the same 5.3 percent the same effect on 11B. The multiplier of monthly basic pay used for COA 3 is 5.20.

1 The SRBs are lump-sum amounts in all of the COAs, including the current approach and baseline cases, following the Army's current practice. While there are advantages to paying in installments, there are disadvantages as well.

2 The case labeled "current approach" is not necessarily the current dollar values offered by the Army. Rather, the case is considered the "current approach" because, as in the current Tiered SRB approach, the SRB for a given grade is the same regardless of YOS. For simplicity, we assume the same SRB is offered under the current approach case, regardless of grade. That is, we do not differentiate by grade under the current approach case. In reality, the Army can and does offer different SRBs for different grades, given the assigned tier.

by YOS within a grade would increase performance incentives relative to the Army's current approach. The three COAs show three different ways to achieve that objective.[3]

In the first COA, shown in column (3), those with more YOS within a grade—and, therefore, who are promoted more slowly—get no SRB, while those promoted more quickly get an SRB of $17,300. For each grade, we create a cutoff YOS. For example, for E-5s, the cutoff YOS is four YOS. Therefore, under COA 1, those with four or fewer YOS get a bonus, while those with more than four YOS would get no bonus. The table shows how the cutoff YOS would increase with grade. Importantly, COA 1 offers the same SRB to E-3s as to E-8s who meet the YOS cutoff criterion for that grade. This COA is the most similar to the Army's current approach because it offers the same amount regardless of grade, though the COA differs in that eligibility for the SRB depends on YOS. The dollar amount is higher under COA 1 than the current approach case ($17,300 versus $8,300) because a higher amount is required to achieve the same 5.3-percent retention effect as the current approach case. This first COA gives a stark contrast in the incentives to perform well versus to perform poorly, since those who are poorer performers receive no SRB.

In the second COA (column [4]), those with more YOS would get an SRB, similar to COA 1, but one that is lower than for those with fewer YOS. For example, those who meet the YOS cutoff would receive $15,000, while those who do not would receive $3,000—unlike COA 1, in which those who do not meet the cutoff receive $0, as seen in Table 3.2. The second COA gives a smaller differential for superior and poorer performers than does COA 1. But the Army might opt for the second COA in circumstances in which it wants to lessen the SRB differences. Again, to permit comparisons of the cost and performance effects of all the COAs, we chose dollar figures for the SRBs in COA 2 to produce the same overall change in the inventory of soldiers in a given MOS.

Though similar to the current approach, a drawback of COA 1 is that it gives the same SRB to those in all grades, contingent on YOS. But because E-8s earn higher monthly basic pay than E-3s in recognition of their greater experience and responsibility, a given SRB will be a smaller fraction of basic pay for an E-8 than for an E-3. For that reason, we consider COA 3, in which the Army would offer a higher SRB to those in higher grades than to those in lower grades, contingent on the YOS cutoff, as shown in Table 3.2. For example, an E-5 with, at most, four YOS would receive $14,583, while an E-6 with, at most, eight YOS would receive an SRB of $18,425. To take advantage of the incentives embedded in the pay table, as discussed in Chapter Two, COA 3 sets SRBs as a multiple of monthly basic pay. Thus, the SRB for the E-5 of $14,583 equals 5.20 × $3,543.3 (after rounding), while the SRB for the E-6 of $18,425 equals 5.20 × $3,543.3 (after rounding). The multiplier of 5.20 was chosen so that COA 3 provided the same 5.3-percent increase in force size as the current approach.

To further explore how changing the structure of the SRBs would affect retention, cost, and performance incentives, we analyzed two other SRB structures, using MOS 11B as an example. First, we considered COAs for 11B that target SRBs to a single grade, E-6s. By focusing on a single grade, we can compare the effects on retention, cost, and performance incentives of the YOS criteria for a single grade versus multiple grades shown in Table 3.2. That is, consideration of the single-grade case allows us to examine how adding other grades affects the results. The specific COAs for the single-grade case are discussed in more detail in Chap-

[3] Because supply and demand factors and other factors outside of the control of the individual can affect promotion speed for soldiers in a given MOS and entry cohort, as we discussed in the previous chapter, an alternative approach of introducing performance incentives–based promotion speed into the SRB eligibility criteria is to set the criteria for eligibility based on relative promotion speed rather than absolute promotion speed. Under this alternative, the Army would determine the distribution of promotion speed for a given entry cohort for a given MOS and offer SRBs to those who are promoted faster than some fraction of soldiers in the same MOS and entry cohort. This approach could be more accurate in terms of targeting performance incentives but could also add complexity in its implementation, thereby increasing implementation costs and reducing transparency to the member. For simplicity, the COAs we consider focus on absolute promotion speed, but the Army might consider an approach based on relative promotion speed.

ter Five. Second, the YOS criteria used in COAs 1–3 are based on average promotion times and the average YOS within each grade in the Army, using Army personnel data for recent years. To better understand how changing the YOS criteria affects the results, we consider COAs 1–3 using more restrictive YOS criteria. The specific YOS criteria and the dollar amounts under each COA are also discussed in more detail in Chapter Five.

In addition to MOS 11B, we also estimated retention models for 14E, 17E, 18B, 35F, and 68P and conducted analyses of alternative COAs for each of these MOSs. For brevity, we focus in the main text on MOS 11B and show results for other MOSs in Appendix D. To facilitate the comparison of results across MOSs, the SRB dollar amounts for each COA for each MOS were set to produce the same retention effect across MOSs. In particular, as we'll discuss more in Chapter Five, for each MOS, the SRBs are set to produce an approximately 5.3-percent increase, respectively, in force size for that MOS. The one exception is MOS 17E, in which the COAs were specified to yield a 3-percent increase in force size. For this MOS, achieving a 5.3-percent increase was not possible because of high retention within this MOS. As will be seen, because the DRM model estimates differ, reflecting differences in retention behavior across MOSs, the SRBs required to produce the same retention effect differ across MOSs.

Before we present our simulation results in Chapter Five, the next chapter discusses our data, methodology, estimates, and simulation capability.

CHAPTER FOUR

DRM, Data, and Simulation Methodology

This chapter covers how we extended the DRM so that we can simulate the effect of alternative SRB structures on retention, performance, and personnel cost. Performance is measured in terms of promotion speed relative to peers and depends on individual ability. By ability, we mean characteristics of individual members that increase or decrease their promotion speed relative to their peers and can include innate cognitive intelligence and other characteristics that lead to success, such as an ability to work well in teams and in a hierarchical organizational structure, or greater resilience to changes such as frequent moves and new assignments. In the simulations, we seek to provide estimates of the effect of alternative SRB pay structures on overall retention, retention of individuals with higher innate ability, and the average ability of the force.

We first give a general overview of the DRM, and then discuss how we extended the mathematical structure of the DRM to account for SRB pay by MOS, grade, YOS, length of obligation, and calendar year. We then discuss how we estimated the DRM parameters for enlisted personnel in each MOS of interest using DMDC data that track individual service members from entry in the 2000 through 2009 cohorts through their active and reserve military career until 2019. We can then use the parameter estimates to simulate the effect of untried policies, such as alternative structures for SRB pay. Next, we discuss how we conduct these simulations. After that, we discuss how we extended the DRM to simulate how different SRB policies might affect the retention of members of differing levels of ability, where we assume that higher-ability members are promoted faster than their peers. We conclude the chapter with a short summary.

A Brief Overview of the DRM

The DRM is a model of the service member's decision, made each year, to stay in or leave the active component, and for those who leave, to choose whether to participate in a reserve component, and, if participating, whether to continue as a reservist.[1] These decisions are structured as a dynamic program in which the individual seeks to choose the best career path, but the path is subject to uncertainty. The model is formulated in terms of parameters that are estimated with longitudinal data on retention in the active component and participation in the reserve component, and these data are then used to see how well the estimated model fits observed retention. We use the estimated parameters in policy simulations.

We have described the DRM in earlier documents in which we have estimated a DRM for officers and for enlisted personnel in each service and for selected communities, such as Air Force pilots and military mental health care providers (Asch et al., 2008; Mattock et al., 2016; Hosek et al., 2017). This chapter presents an overview of the DRM, describing the extension of the model to include SRB pay. The description presented in this chapter draws heavily on Asch et al. (2018) and Asch, Mattock, and Tong (2020).

1 Individuals who have left the active component and are currently not participating in the reserve component may choose to participate in the reserve component at a later time.

In the DRM, a set of parameters underlies the individual member's retention decisions, and a goal of our analysis is to use individual-level data on active retention and reserve participation to estimate the parameters for enlisted personnel in different MOSs of interest to the Army. We discuss the data we use in more detail later in this chapter, but, in short, we use DMDC's Work Experience File (WEX) and the monthly Active Duty Master Files and Reserve Master Files to track individual careers from 2000 to 2019.

Model Overview

In the behavioral model underlying the DRM, in each period, the individual can choose to continue on active duty, leave the military to hold a job as a civilian, or leave the military to join a reserve component and hold a job as a civilian. The individual bases his or her decision on which alternative has the maximum value. The model assumes that an individual begins his or her military career in an active component.

Individuals are assumed to differ in their preferences for serving in the military. Each individual is assumed to have fixed, unobserved preferences for active and reserve service, and these preferences do not change. The individual member has knowledge of military pay and retirement benefits, as well as civilian compensation. In each period there are random shocks associated with each of the alternatives, and the shocks affect the value of the alternative. The model explicitly accounts for individual preferences and military and civilian compensation, and, in this context, shocks represent current-period conditions that affect the value of being on active duty, being in the selected reserve while also being a civilian worker (or *reserve*, for short), or being a civilian worker and not in the reserve (*civilian*, for short). Examples of what may contribute to a shock are a good assignment; a dangerous mission; an excellent leader; inadequate training or equipment for the tasks at hand; a strong or weak civilian job market; an opportunity for on-the-job training or promotion; the choice of location; a change in marital status, dependency status, or health status; the prospect of deployment or deployment itself; or a change in school tuition rates. These factors may affect the relative payoff of being in an active component, being in a reserve component, or being a civilian. The individual is assumed to know the distributions that generate the shocks, as well as the shock realizations in the current period but not in future periods.

Depending on the alternative chosen, the individual receives the pay associated with serving in an active component, working as a civilian, or serving in a reserve component while also working as a civilian. In addition, the individual receives the intrinsic monetary equivalent of the preference for serving in an active component or serving in a reserve component. These values are assumed to be relative to that of working as a civilian, which is set at zero.

In considering each alternative, the individual takes into account his or her current state and type. *State* is defined by whether the member is active, reserve, or civilian and by the individual's active YOS, reserve YOS, total years since first joining the military, pay grade, and random shocks.

Type refers to the level of the individual's preferences for active and reserve service. The individual recognizes that today's choice affects military and civilian compensation in future periods. Although the individual does not know when future military promotions will occur, he or she does know the promotion policy and can form an expectation of military pay in future periods. Further, the individual does not know what the realizations of the random shocks will be in future periods. The expected value of the shock in each state is zero. Depending on the values of the shocks in a future period, any of the alternatives—active, reserve, or civilian—might be the best option at the time. Once a future period has been reached and the shocks are realized, the individual can reoptimize (i.e., choose the alternative with the maximum value at that time). The possibility of reoptimizing is a key feature of dynamic programming models that distinguishes them from other dynamic models. Reoptimization means that the individual can choose the best alternative in a period when its conditions have been realized, i.e., when the shocks are known. In the current period, with future realizations unknown, the best the individual can do is to estimate the expected value of the best choice in the next period—i.e., the expected value of the maximum. Logically, this will also be true in the next period, and the one after it, and so forth, so the model is forward-looking and rationally handles future uncertainty. Moreover, the model presumes that the individual can reoptimize in each future period, depending on the state and shocks in that period. Thus, today's decision takes into account the possibility of future career changes and assumes that future decisions will also be optimizing.

Our model includes promotion. The model assumes that the timing and probability of promotion at each grade is the same across all enlisted personnel. Variation in the timing and probability of promotion for an individual member is captured by the shock term. Promotion to a given grade occurs at a given number of YOS, but the probability of promotion differs by grade. As a simplifying assumption, the probability of promotion is assumed to be invariant to policy change. Not being promoted decreases the value of continuing in the military and operates to decrease retention. Enlisted members who are promoted can look ahead to future promotion gates, and their value of staying is higher than that of members who are not promoted. It is important to note that promotion timing and promotion probability are treated as a fixed process. There is no randomness in timing or in the draw of the promotion probability. Later, the timing of promotion will be modeled to depend in a fixed way on ability, with higher-ability soldiers being promoted faster at each grade for grades E-5 and up.

The model has two switching costs, which enter the relevant value function as additive terms. *Switching cost* refers to a de facto cost reflecting the presence of constraints or barriers affecting the movement from particular states and periods to other states, relative to the movement that would otherwise have been expected for the values of staying and of leaving. Switching costs are not actually paid by the individual but, as estimated in the model, are a monetary representation of the constraints or barriers affecting the transition from one state to another at a given time. Further, a switching cost can be either negative or positive. A negative value implies a loss to the individual when changing from the current status to an alternative status, while a positive value implies a gain, or incentive, for the change. The first switching cost is a cost of leaving the active component before an enlisted member's initial term of service is completed and enters the value function for the reserve and the civilian status. The estimates, shown later, indicate that the switching cost has a negative value in all the models we estimate, reflecting the perceived cost of breaching the service contract. The second switching cost is a cost of switching into the reserve from the civilian state and enters the value function for the reserve status. This cost could represent difficulty in finding a reserve position in a desired geographic location or an adverse impact on one's civilian job, e.g., from not being available to work on certain weekends or for two weeks in the summer or being subject to reserve call-up. Its estimated value is also negative across all the models we estimate.

Our model also includes SRBs as an element of military compensation. SRBs are modeled as a payment the individual receives for reenlisting in the active component. To cover all historical SRB payment policies, the SRB is potentially a function of grade, YOS, and zone,[2] as well as MOS and obligation length.[3] This gives the flexibility to model historical SRB policies, such as the multiplier system in which the SRB value was the product of a MOS- and zone-specific multiplier, monthly basic pay (itself a function of grade and YOS), and the obligation length in years, as well as to model the current Tiered SRB Program, in which SRBs depend on MOS, grade, and obligation length, but not on zone or YOS. In the DRM, the SRB payment is in addition to

2 *Zone* corresponds to a range of time in service, as discussed in Chapter Two. A member is in Zone A if they have completed at least 21 months but not more than six YOS, Zone B if they have completed at least six YOS but not more than ten YOS, and Zone C if they have completed ten YOS but not more than 14 YOS. Under SRB policies that take zones into account, members may not receive an SRB for a particular zone if they have already received an SRB for that zone.

3 SRBs may also be a function of location, SQI, ASI, and, beginning in mid-2019, YOS—though only for CMF 18—but we do not model the effect of these additional eligibility requirements.

the pay that members receive for serving in the active component (based on their grade and YOS), their preference for active military service, and the shock term for a given period. An individual who leaves the active component before completing their SRB service obligation would have to pay back the unearned portion of the SRB. This is implemented as a penalty incurred during the first period an individual spends either as a civilian or as a member of the reserve component.

Estimation Methodology

To estimate the DRM, we use the mathematical structure of the model together with assumptions on the distributions of tastes across members and the shock distributions. This allows us to derive expressions for the transition probabilities (the probability in a given period of choosing a particular alternative, i.e., active, reserve, or civilian, given one's state), which are then used to compose an expression for the likelihood of each individual's years of active retention and reserve participation. Importantly, each transition probability is itself a function of the underlying parameters of the DRM. These are the parameters of the taste distribution, the shock distributions, the switching costs, and the discount factor (which we will describe in more detail below). The estimation routine finds parameter values that maximize the likelihood.

We assume that the model is first-order Markov[4] and that the shocks have extreme value distributions,[5] and that the shocks are uncorrelated from year to year. As a result, we can derive closed form expressions for each transition probability. We can also obtain expressions for the probability of leaving the active component and, for those who have left, the probabilities of entering, or staying in, the reserve component in each subsequent year. To relate the DRM to one-period discrete choice models, we note that in a given period and for a given state and individual taste, the individual's value functions for staying and leaving have the same form as those of a random utility model (RUM). Similarly, for those who have left active duty, the choices of whether to enter the reserves or to remain in the reserves are also based on a RUM. More broadly, the reserve choice is nested in the choice to leave active duty, and the model has a nested logit form. (See Train, 2009, for further discussion.) Of course, the DRM differs from a traditional RUM because the explanatory variables are value functions, not simple variables, such as age and education, and the value functions are recursive.

The transition probabilities in different periods are independent and can be multiplied together to obtain the probability of any given individual's career profile of active, reserve, and civilian states that we observe in the data. Multiplying the career profile probabilities together gives an expression for the sample likelihood that we use to estimate the model parameters for using maximum likelihood methods. Optimization is done using the Broyden-Fletcher-Goldfarb-Shanno algorithm, a standard hill-climbing method. We compute standard errors of the estimates using numerical differentiation of the likelihood function and taking the square root of the absolute value of the diagonal of the inverse of the Hessian matrix.

To judge goodness of fit, we use parameter estimates to simulate retention profiles for synthetic individuals (characterized by tastes drawn from the taste distribution) who are subject to shocks (drawn from the shock distributions), then aggregate the individual profiles to obtain a force-level retention curve and compare it with the retention curve computed from actual data.

We estimate the following model parameters:

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4 A first-order Markov assumption is that the probability of an event at time $t + 1$ depends only on the state at time t.

5 This and the following paragraph give some technical details of the model that may not be of interest to all readers. Less technically inclined readers may wish to skip down two paragraphs, to the paragraph beginning, "To judge goodness of fit . . .".

- the mean and standard deviation of tastes for active and reserve service relative to civilian opportunities, (e.g., μ_a, μ_r, σ_a, and σ_r)
- a common scale parameter λ of the distributions of ω_t^R and ω_t^C, the shocks to the reserve and civilian alternatives, and a scale parameter τ of the distribution of ε_t^L, the shock for the active versus civilian/reserve alternative
- a switching cost incurred if the individual leaves active duty before completing the active-duty service obligation or first term
- a switching cost incurred if the individual moves from *civilian* to *reserve*.

In past DRM analyses, we also estimate a personal discount factor (see Asch, Hosek, and Mattock, 2014). We fixed the personal discount factor in this project because we found the model fits were better and parameter estimates were more reasonable relative to our expectations based on past research.[6] We set the personal discount factor for enlisted to 0.88, which is the value we have typically estimated for Army enlisted in earlier work.

Once we have parameter estimates for a well-fitting model, we can use the logic of the model and the estimated parameters to simulate the active-component cumulative probability of retention to each YOS in the steady state for a given policy environment, such as a change to SRB policy. By steady state, we mean when all members have spent their entire careers under the policy environment being considered. The simulation output includes a graph of the active-component retention profile for enlisted personnel by YOS. We can also produce graphs of reserve component participation and provide computations of costs, though we do not do so here. We show model fit by simulating the steady-state retention profile in the current policy environment and comparing it with the retention profile observed in the data.

Data

DMDC's WEX data contain person-specific longitudinal records of active and reserve service. WEX data begin with service members in the active or reserve component on or after September 30, 1990. Our analysis files include active component entrants in 2000 through 2009, who are followed through 2019, providing up to 20 years of data for the 2000 cohort and up to 11 years of data for the 2009 cohort. Although the WEX file concluded in 2016, we extended the individual career data out to 2019 using the monthly Active Duty Master Files and Reserve Master Files.

Another key source of data is information on civilian and military pay. We used the 2007 median wage for full-time male workers with associate degrees to represent the civilian pay opportunities for enlisted personnel. The data are from the Census Bureau. Civilian work experience is defined as the sum of active years, reserve years, and civilian years since age 20, but here, pay does not vary by other factors, such as years since leaving active duty. We used 2007 military pay tables. Military pay increases are typically across-the-board, with the structure of pay by grade and YOS remaining the same.[7] Therefore, we did not expect our results to be sensitive to the choice of year. Annual military pay for active members is represented by regular military compensation (RMC) for FY 2007, equal to the sum of basic pay, basic allowance for subsistence, BAH, and

[6] The personal discount factor equals 1/(1+r), where r is the personal discount rate. For example, a personal discount factor of 0.88 corresponds to a discount rate r of 13.6 percent.

[7] An exception was the structural adjustment to the basic pay table in FY 2000 that gave larger increases to midcareer personnel who had reached their pay grades relatively quickly (after fewer YOS). A second exception was the expansion of the basic allowance for housing (BAH), which increased in real value from FY 2000 to FY 2005. It should be noted that the costing analysis is in 2019 dollars.

the federal tax saved because the allowances are not taxed. Data on RMC and basic pay by grade and YOS from the *Selected Military Compensation Tables*, also known as the Green Book (Office of the Under Secretary of Defense for Personnel and Readiness, Directorate of Compensation, 2007), indicated that reserve component members are paid differently from active component members, although the same pay tables are used. The method for computing reserve component annual pay is described in Asch, Mattock, and Hosek (2017). Military retirement benefits are related to the basic pay table, and we use the basic pay tables for 2007 for this computation.

We also required data on enlisted promotion rates and promotion timing for each grade. Promotion rates for enlisted were based on computations of average time in service at promotion, by grade, from DMDC.

Model Estimates and Model Fits for 11B

Table 4.1 shows the estimated parameters and standard errors for the enlisted DRM for MOS 11B. (Results for the other MOSs are in Appendix D. We note that model results for enlisted service members in MOSs 17E and 18B are viewed as exploratory because some of the key parameter estimates are statistically insignificant.) To make the numerical optimization easier, we did not estimate most of the parameters directly but instead estimated the logarithm of the absolute value of each parameter, except for the taste correlation, for which we estimated the inverse hyperbolic tangent of the parameter. All parameters but the between-nest scale parameters τ are statistically significant in the models. To recover the parameter estimates, we transformed them. Table 4.2 shows the transformed parameter estimates, which are denominated in thousands of 2007 dollars, except for the assumed discount rate and the taste correlation. These parameters lend

TABLE 4.1
Parameter Estimates and Standard Errors: Enlisted MOS 11B

	11B	
	Estimate	Standard Error
Log(Scale Parameter, Nest = τ)	3.54	1.34
Log(Scale Parameter, Alternatives within Nest = λ)	5.6	0.35
Log(–1*Mean Active Taste = μ_a)	4.39	0.31
Log(–1*Mean Reserve Taste = μ_r)	6.39	0.35
Log(SD Active Taste = σ_a)	4.72	0.36
Log(SD Reserve Taste = σ_r)	6.06	0.35
Atanh(Taste Correlation = ρ)	0.67	0.01
Log(-1*Switch Cost: Leave Active < ADSO)	5.81	0.35
Log(-1*Switch Cost: Switch from Civilian to Reserve)	6.95	0.35
Personal Discount Factor β (Assumed)	0.88	N/A
–1*Log Likelihood	136,277.3	
N	34,538	

SOURCE: Parameter estimates from cohorts of enlisted personnel entering active duty in 2000–2004.

NOTES: The scale parameter κ governs the shocks to the value functions for staying and for the reserve-versus-civilian nest and equals $\sqrt{\lambda^2+\tau^2}$. The means and standard deviations of tastes for active and reserve service relative to civilian opportunities are estimated, as are the costs associated with leaving active duty before completing the active-duty service obligation (ADSO) and switching from civilian status to participating in the reserves. The personal discount factor was assumed to be 0.88 in these models.

TABLE 4.2
Transformed Parameter Estimates: Enlisted MOS 11B

	11B
Scale Parameter, Nest = τ	34.62
Scale Parameter, Alternatives within Nest = λ	269.81
Mean Active Taste = μ_a	–80.88
Mean Reserve Taste = μ_r	–594.24
SD Active Taste = σ_a	112.43
SD Reserve Taste = σ_r	427.1
Taste Correlation = ρ	0.58
Switch Cost: Leave Active < ADSO	–334.47
Switch Cost: Switch from Civilian to Reserve	–1,043.36
Personal Discount Factor β (Assumed)	0.88

NOTE: Transformed parameters are denominated in thousands of 2007 dollars, with the exception of the taste correlation and personal discount factor. Definitions of variables are provided in Table 4.1.

themselves to interpretation. For example, the parameter estimate for mean active taste is –$80,880, which is consistent with the need to pay enlisted members a wage premium to attract and retain the quantity and quality required by the Army. In addition, the standard deviation of active taste is $112,430, which indicates that there is a large variance in taste for active service from member to member.

Model Fit for 11B

To assess model fit, we used the parameter estimates to simulate the behavior of synthetic personnel represented by tastes drawn from the active/reserve taste distribution and subject to shocks drawn from a shock distribution with a scale parameter equal to the estimated value. Figure 4.1 shows the model fit graphs for Army enlisted members in MOS 11B. (The model fits for the other MOSs are similar to the fits for this MOS and are shown in Appendix C.) The red lines are simulated cumulative retention, and the black lines are retention observed in the data. The figures show the Kaplan-Meier survival curves, and the dotted lines show the 95-percent confidence intervals for the Kaplan-Meier estimates for the observed data.

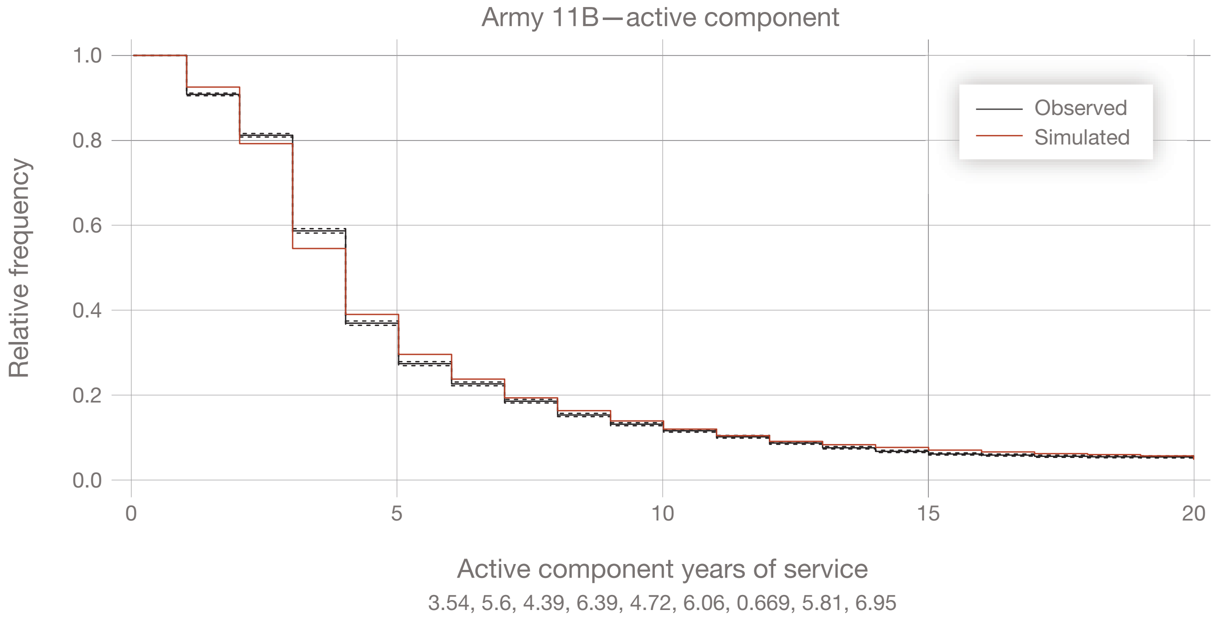
The horizontal axis counts years since the individual was observed beginning active service. The vertical axis shows the cumulative probability of retention on active duty until that year. The solid black line shows the actual retention of individuals in our cohorts, and the red line shows the predicted retention.

Visual inspection shows that the model fit for the active component is good. In all cases, including the MOSs shown in Appendix C, the simulated retention line lies close to the observed retention line and reflects the pattern of retention seen in the data, with attrition first being high, then slowing after mid-career as vesting in the defined-benefit retirement approaches, and then falling quickly once the vesting point is reached.

Incorporating Performance into the DRM Simulation Capability

SRBs, in addition to increasing overall retention, also have an effect on the ability of the individuals who are retained. The bonuses can perform a twofold purpose, acting both to increase retention and to induce

FIGURE 4.1
Model Fit Results: Enlisted MOS 11B



SOURCE: Authors' computations, DMDC WEX files.

higher-ability personnel to stay and seek advancement to more senior grades, where it is likely that ability has a bigger impact than in the lower ranks.[8]

Asch and Warner were the first to incorporate ability into a dynamic retention model, and they used the model to assess the retention, performance, and cost effects of alternative retirement reform proposals, as well as policies to restructure the military pay table (Asch and Warner, 1994, 2001). In particular, in their model, higher-ability personnel are promoted faster and have higher promotion probabilities, but higher-ability personnel also have better external opportunities. Compensation policy can affect the financial benefits to staying for higher-ability personnel. Asch and Warner used their DRM to provide simulations of how compensation reforms affected overall retention, the retention of higher-ability personnel, ability sorting into higher grades, and personnel cost.

The Asch-Warner simulations were based on a calibrated model whose key parameters, such as the mean and standard deviation of taste for service, were assumed so as to replicate the observed retention profile. In contrast, the parameters of the DRM used in this project are estimated, not calibrated. We build on the Asch and Warner modeling of ability and incorporate their approach into our DRM simulation capability to evaluate alternative SRB policies.

8 The objectives of military compensation are listed in Office of the Under Secretary of Defense for Personnel and Readiness (2018) and have been articulated by past QRMCs.

Ability

We can use the structure of the DRM, along with the estimated parameters and assumptions about how innate ability affects the speed of promotion, to examine how selective alternative SRB structures are on ability. To incorporate ability into the DRM, we make three assumptions:[9]

1. The extent to which ability differs among military entrants[10]
2. The extent to which ability affects promotion speed[11]
3. The effect of ability on external civilian opportunities.

We discuss each of these in turn.

First, we assumed that any given individual has a fixed level of ability at entry, drawn from a normal distribution and rounded to the nearest integer. The standard deviation of the distribution indicates the extent to which ability differs among military entrants. Regarding rounding, individuals with ability drawn from a normal distribution with mean zero and standard deviation 0.5 (and then rounded) would typically have values of ability of –1, 0, or 1. The values of the mean and standard deviation for the distribution we use in our simulations are calibrated to replicate the steady-state retention profiles of enlisted in each MOS, given the other two assumptions we make.[12]

Second, we assumed that higher-ability personnel are promoted faster. We implement this concept by subtracting the (rounded) draw from the normal distribution for a given individual from the time-in-service between promotions. This increase in promotion speed is modeled to start happening between E-5 and E-6 for enlisted members. Thus, an enlisted member with an innate ability of 1 would be one year faster than average to E-6, two years faster to E-7, and so on. Consequently, the effect of ability on promotion speed to the more senior grades is larger than for the more junior grades because the effects on promotion timing are cumulative. Note that we are limited to integer values for the increase or decrease in promotion time due to the time resolution of our model being one year, thus we cannot model promotion being 0.5 years faster, or 1.5 years slower (for example).[13] Figure 4.2 shows how years to promotion to E-6 and E-9 vary with ability for Army enlisted personnel. As mentioned in the previous paragraph, the assumed parameters are calibrated so as to best fit the retention profile for that MOS.[14]

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9 In Chapter Four of Asch, Mattock, and Tong (2020), sensitivity analysis was conducted to determine how varying the assumptions about how ability enters the model affected the simulations considered. The study found that varying the assumptions did not affect the qualitative results.

10 We assume the distribution of ability at entry is fixed and the same under alternative SRB structures.

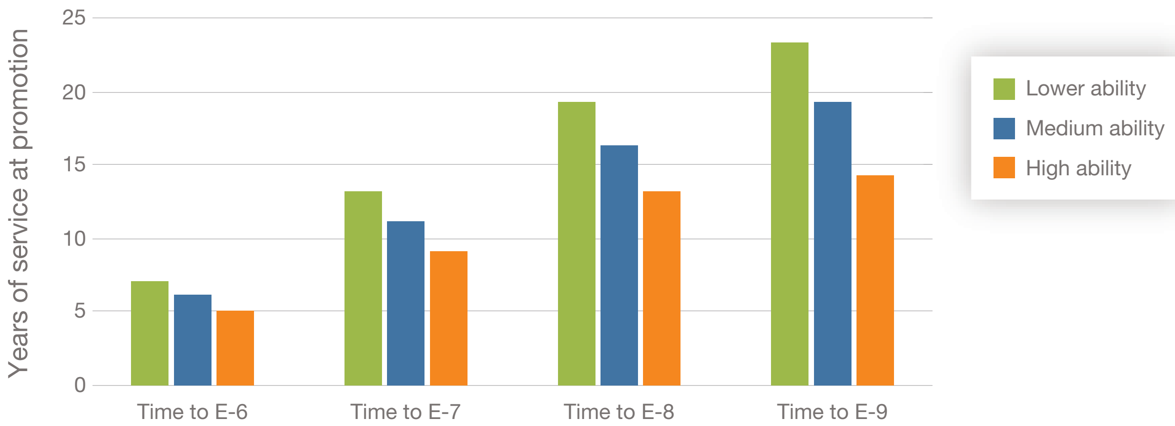
11 The model only considers individual attributes in promotion timing/probability, so it does not allow for the possibility of the ability distribution skewing higher under some SRB structures, which might result in slowing down the promotion of individuals who might otherwise have been promoted early under the current SRB structure.

12 We also explored using a lognormal distribution for ability for selected MOSs. These results are reported in Appendix D.

13 This limits the sensitivity analysis we can do, as we cannot vary the speed of promotion by increments smaller than a year. In related work, we examined the effect of reducing the sensitivity of promotion time to ability in a recent paper for the 13th QRMC on a time-in-grade pay table (Asch, Mattock, and Tong, 2020) by having ability affect time to promotion to E-7 and above (rather than E-6 and above) and found that the results remained qualitatively the same in our comparison of average ability percentiles by grade across the time-in-grade and time-in-service pay tables.

14 In effect, this assumption creates different paths for enlisted members with lower ability, medium ability, and high ability. A member promoted one year slower to one grade is also promoted slower to the following grades (if they are promoted), and, conversely, a member promoted one year faster to one grade is also promoted faster to the following grades (if they are promoted). Never would a member be promoted faster to one grade and slower to the next. The member knows which path they are on with certainty, be it slow, medium, or fast; the time to the next potential promotion is nonstochastic, with the only residual uncertainty regarding whether they will be promoted or not. This strong assumption makes the model tractable, but

FIGURE 4.2
Years to Promotion, by Ability Level, Army Enlisted Personnel



Third, we assume that higher-ability members also have better external opportunities. We model this by multiplying the civilian opportunity wage by one plus 0.1 times the ability distribution standard deviation times the individual's ability draw, or $(1 + 0.1 \times \sigma_a \times a)$, where σ_a is the standard deviation of the draw, and a is the individual's ability draw. This has the effect of increasing the civilian opportunity wage for high-ability individuals and decreasing the civilian opportunity wage for low-ability individuals. For example, an individual with innate ability of 1 drawn from a normal distribution with mean zero and standard deviation 0.5 would have an opportunity wage that is 5 percent greater than that of the average individual, while an individual with innate ability of –1 would face a civilian opportunity wage that is 5 percent less.[15]

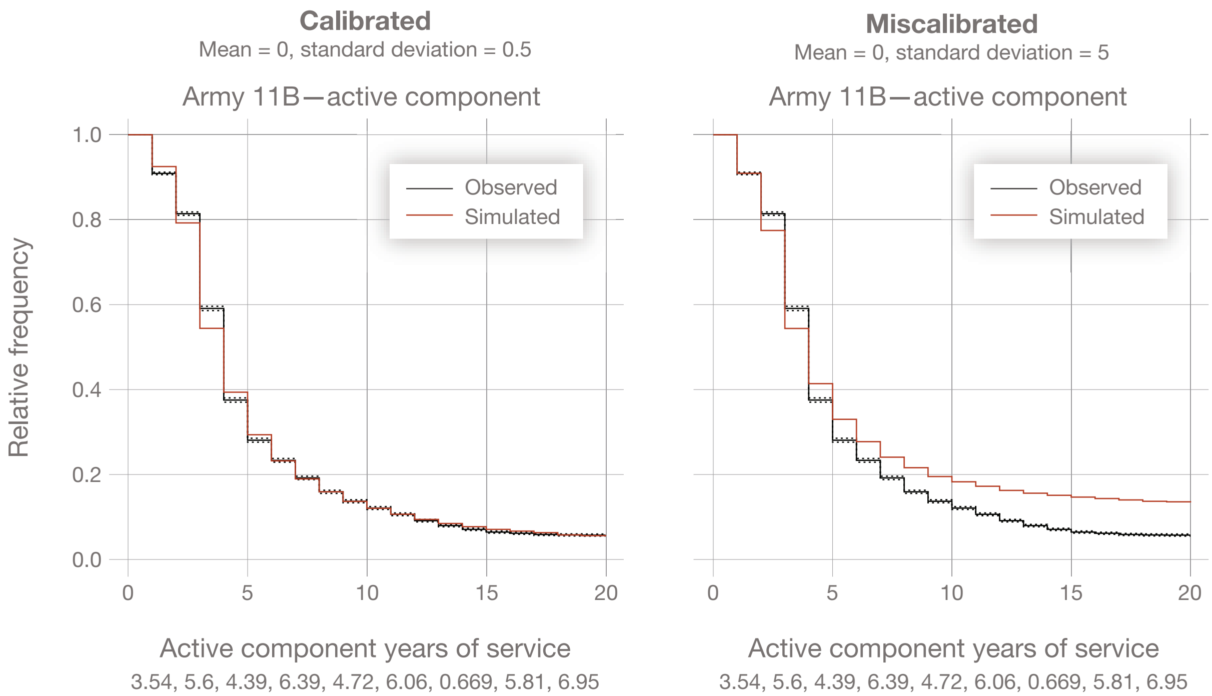
We illustrate how we calibrate the mean and standard deviation of the normal distribution to fit the observed retention profile in Figure 4.3 for Army enlisted personnel in MOS 11B. In the process of calibration, we systematically varied the mean and standard deviation within the DRM and chose the mean and standard deviation that most closely replicated the historically observed retention, as indicated by the Kaplan-Meier curve. The right panel shows the observed retention profile versus the simulated retention profile when we miscalibrate the mean and standard deviation to equal 0 and 5, respectively. The simulated retention profile is too high relative to the observed profile. We chose a standard deviation of 0.5 instead, resulting in a good fit, as shown in the left panel. When ability is drawn from a normal distribution with mean zero and standard deviation 0.5, 16 percent of simulated individuals (0.1587) are assigned high ability, and 16 percent low ability, leaving about two-thirds as average ability.

it may assume away some uncertainty that is important. We hope to have the opportunity to relax this assumption in future work.

[15] Similar to the impact of ability on speed of promotion, impact of ability on the civilian opportunity wage is nonstochastic, though it does depend on the standard deviation of the ability distribution. This strong assumption makes the model tractable but potentially assumes away some important uncertainty. We hope to relax this assumption in future work.

While we did not explore sensitivity of this model to the civilian wage assumption, we did explore this for a closely related model in our 13th QRMC report on a time-in-grade pay table (Asch, Mattock, and Tong, 2020) and found that the results remained qualitatively the same in our comparison of average ability percentiles by grade across the time-in-grade and time-in-service pay tables.

FIGURE 4.3
Calibrating the Parameters of the Ability Distribution, 11B



Summary

The DRM is a model with a relatively simple structure, but despite the simple structure it can support a rich variety of analyses. In this chapter, we extended it to include SRBs and presented new estimates and model fits for Army enlisted personnel in MOS of interest to the Army. We also extended the simulation capability to permit analysis of alternative SRB structures and incorporated individual ability.

CHAPTER FIVE

Results

This chapter shows the simulated effects on retention, cost, and performance of the Army's current SRB approach and alternative courses of action for restructuring SRBs. As discussed in the previous chapter, performance is measured in terms of promotion speed relative to peers, and we consider a key factor that can affect performance—namely, ability. By *ability*, we mean characteristics of individual members that increase or decrease their promotion speed relative to their peers and can include innate cognitive intelligence, as well as other characteristics that lead to success, such as ability to work well in teams and in a hierarchical organizational structure and resilience to changes, such as frequent moves and new assignments.

The chapter shows results for MOS 11B and summarizes the results for MOSs 14E, 17E, 18B, 35F, and 68P, with more-detailed results presented in Appendix D. We begin the chapter with results for COAs 1–3, shown in Table 3.2, for MOS 11B. Unlike the current approach used by the Army, the COAs would offer SRBs to soldiers conditional on their YOS. The chapter then further explores how changing the structure of SRBs would affect the simulation results. First, we consider COAs that change the YOS cutoff criteria so we can assess how changing the YOS cutoff criteria affects the results. Second, we consider COAs that target SRBs to a single grade, specifically E-6s, using MOS 11B as an example. Focusing on a single grade rather than multiple grades allows us to specifically consider how targeting SRBs by YOS affects performance incentives without the additional complication of how SRBs are structured by YOS at other grades. Furthermore, the Army at times targets SRBs to only a single grade under the Tiered SRB program. As we show in Appendix D, we find performance incentives improved, even when only considering a single grade. This chapter then summarizes the results of the alternative COAs for the other MOSs that we show in Appendix D. We wrap up with a summary of the findings.

COAs 1–3 for MOS 11B

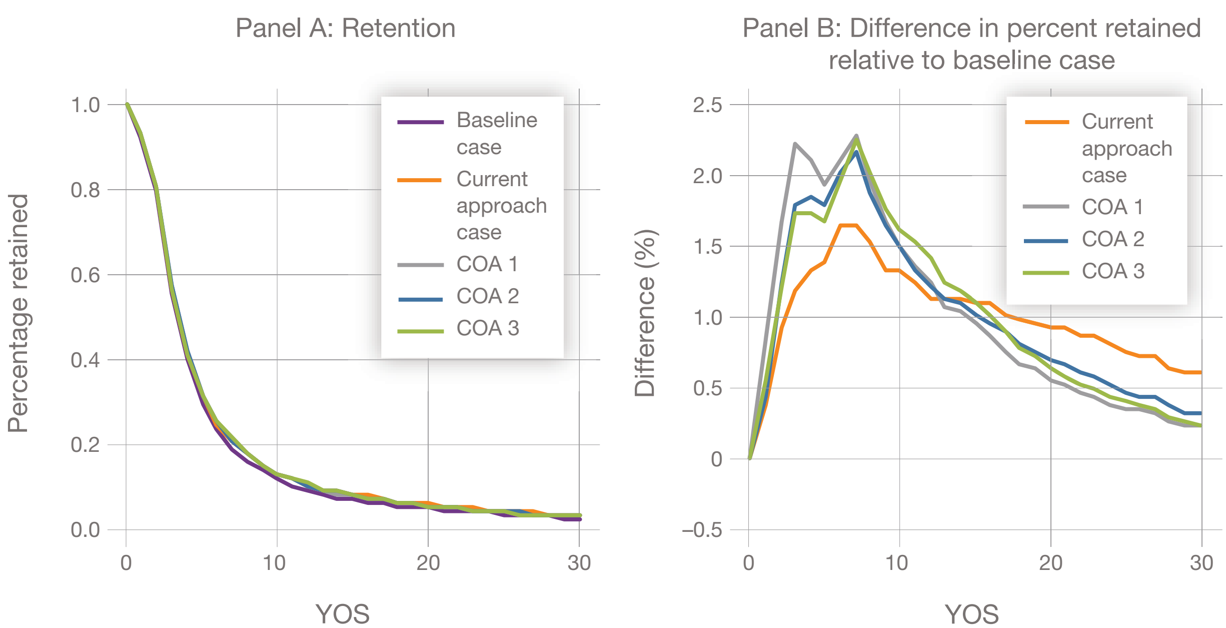
As discussed in Chapter Three, we compare the current approach case and COAs 1–3 to a baseline case in which no SRB is offered. The SRBs in each case were chosen so that retention increased and the steady-state size of the 11B inventory rose by 5.3 percent. Under the current approach case, an $8,300 SRB is offered to all 11B soldiers who reenlist for 48 months, regardless of grade or YOS. COA 1 also offers the same SRB to all 11B soldiers, an amount equal to $17,300, but eligibility is limited to those who have fewer YOS than the grade-specific YOS cutoff. Those with more YOS than the cutoff would not receive an SRB. Because fewer 11B soldiers receive SRBs under COA 1, the SRB is set to a higher amount than in the current approach case ($17,300 versus $8,300) to achieve the 5.3-percent increase in force size. COA 2 would give $15,000 to those who meet the YOS cutoff but $3,000 to those with more YOS than the grade-specific cutoff points. Finally, COA 3 is similar to COA 1 except that the SRB amounts increase with grade, reflecting the structure of the pay table. In particular, the SRB for each grade equals 5.20 times basic pay for that grade and YOS cutoff point.

Retention

Figure 5.1 shows the simulated steady-state retention effects. The left panel (Panel A) shows the cumulative fraction of an entry cohort that would be retained to each YOS under the baseline case, the current approach, and the COA alternatives for 11B. The black line is the baseline case, and the current approach and the COAs all increase force size relative to the baseline case by the same overall amount, 5.3 percent. Though the current approach case and the COAs have the same overall retention effect, the right panel (Panel B) shows that the retention effects differ by YOS. The right panel shows the difference in the cumulative fraction retained relative to the baseline case. In all cases, retention increases across YOS. Retention increases after each reenlistment point because soldiers who reenlist have a three- or four-year service obligation. (For MOS 11B, the assumed reenlistment points occur at three, six, ten, and 14 YOS.) Since the bulk of reenlistments occur at the first and second reenlistment points at YOS three and six, respectively, the SRB effects are largest at YOS five. Retention increases before each reenlistment point as well, because soldiers anticipate future SRBs. Further, retention increases after YOS 14, the last reenlistment point, and even after YOS 18, when their service obligation is completed, because they induce not only more soldiers to stay beyond YOS 14 to complete their obligation, but these soldiers anticipate retirement eligibility at YOS 20.

While the current approach case and the COAs show a similar pattern of change in retention across YOS, the COAs differ from the current approach case, as seen in the right panel of Figure 5.1. Because the current approach case does not set SRBs based on YOS, the increase in retention is smaller under the current approach case (the orange line) than COAs 1–3 between YOS two and 13, but larger after YOS 15. An implication of the different effects on the 11B inventory by YOS—and therefore the eligibility for SRBs under the alternative COAs—is that the number of soldiers receiving an SRB, and the cost of the SRB program for 11B, will differ across COAs. We discuss the effects on cost below.

FIGURE 5.1
MOS11B Simulated Retention (Panel A) and Difference in Retention (Panel B)

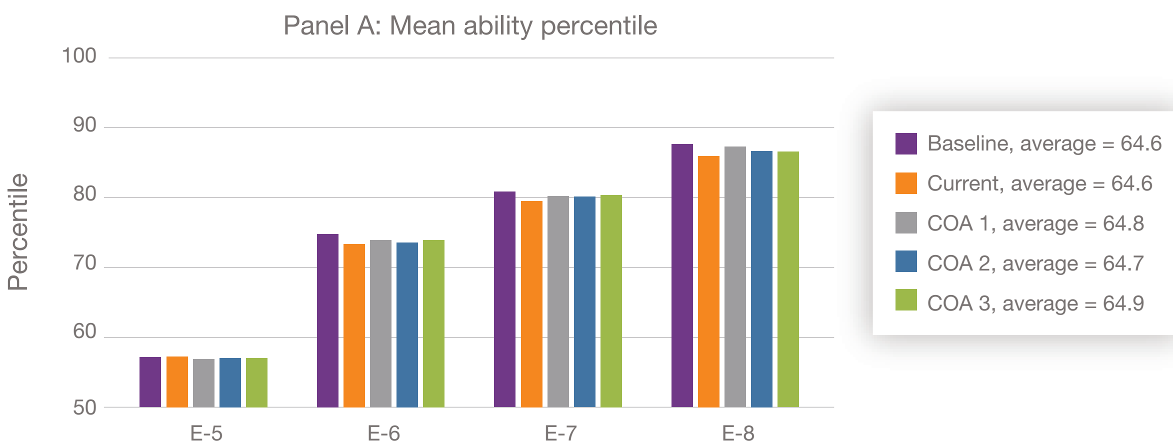


NOTES: Panel A shows the simulated cumulative percentage of an entry cohort retained for MOS 11B for each case. Panel B shows the difference in the cumulative percentage of an entry cohort retained relative to the baseline. The current approach case and COAs 1–3 each increase MOS 11B force size by 5.3 percent.

Performance

By design, the SRBs were set to produce the same overall retention effect. Of particular interest for our project is how the different SRB structures would affect performance and cost. As discussed in Chapter Four, we assume a normal distribution of ability at entry with mean 0. In percentile terms, the mean would be the 50th percentile of the distribution. We simulate retention and compute the average ability percentile across the force and the average ability percentile at each grade. Figure 5.2 shows the simulated effects on performance, as measured by the ability percentiles, by grade. Because SRBs target the retention of personnel with fewer than 20 YOS and few E-9s have fewer than 20 YOS, we show average ability up to the grade of E-8. Further, although the Army targets SRBs to personnel in grades as low as E-3, personnel who reenlist at the first reenlistment point are usually in grades E-4 or E-5, so we show average ability down to the grade of E-5. The legend in Figure 5.2 shows the average ability percentile across the 11B inventory for the baseline case, the current approach case, and COAs 1–3. The bar chart (Panel A) shows the average ability of 11B soldiers in E-5 and E-8. Comparisons of average ability by grade provides information on the extent of ability sorting or the retention and promotion of higher-ability personnel to the upper grades. Because differences across COAs can be difficult to discern in the bar chart, the table below the chart (Panel B) shows the difference in average

FIGURE 5.2
MOS 11B Simulated Mean Ability Percentile (Panel A) and Difference Relative to Current Approach Case (Panel B), by Grade



Panel B: Change in mean ability percentile relative to current approach case

	Average	E-5	E-6	E-7	E-8
Baseline case	64.6	57.1	74.8	80.8	87.7
Current case	64.6	57.2	73.4	79.6	86
Current – Baseline	0.0	0.1	–1.4	–1.2	–1.7
COA 1 – Current	0.2	–0.3	0.5	0.7	1.3
COA 2 – Current	0.1	–0.2	0.2	0.5	0.7
COA 3 – Current	0.3	–0.2	0.5	0.8	0.6

NOTES: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. We compute the percentile of the ability distribution for each member in the force. The graph shows the mean of the percentile, by grade.

ability between the COAs and the current approach, by grade. Thus, the table shows the extent to which the COAs improve or worsen ability sorting relative to the Army's current SRB approach.

A key result of our analysis of SRBs for 11B is that restructuring SRBs to provide higher dollar amounts to better performers, as indicated by their faster promotion speed, would increase performance as measured by the average ability percentile. In particular, the average percentile increases under COAs 1–3 relative to the average of 64.6 found for the baseline case and the Army's current approach case. The average would increase the most under COAs 1 and 3 (to 64.8 and 64.9, respectively) but would still increase even under COA 2 (to 64.7). By paying a lower SRB to those promoted slower, COA 2 embeds stronger performance incentives than the current approach, but these incentives are not as strong as those of either COA 1 or COA 3; the latter cases pay no SRB to those promoted more slowly.

Another result pertains to the simulated average ability percentiles for E-5s. Relative to the baseline case, the Army's current approach case increases average ability slightly among E-5s, from 57.1 to 57.2, or by 0.1 percentile. In contrast, all of the COAs reduce E-5 average ability relative to the current approach case. That is, average performance worsens among E-5s relative to the Army's current SRB approach case, and the drop in average performance is the greatest under COA 1: by 0.3 relative to the current approach case.

The effect of the current approach and the COAs on ability sorting for 11Bs is another key result of the analysis. Although the Army's current approach provides the best E-5 performance among the COAs we considered and the baseline case, the current approach hurts *ability sorting*, or the retention of higher-ability soldiers in the grades of E-6 to E-8. Specifically, mean ability is 1.4 percentiles lower among E-6s relative to the baseline case (73.4 versus 74.8), 1.2 percentiles lower among E-7s (79.6 versus 80.8), and 1.7 percentiles lower among E-8s (86.0 versus 87.7). By offering SRBs to both better- and poorer-performing soldiers, the simulations indicate that the current approach case would increase the retention of poorer-performing 11B soldiers in the senior grades relative to the case of offering no SRBs.

In contrast, COAs 1–3 would improve ability sorting relative to the baseline case and the current approach case. A key result is that restructuring SRBs so that only better-performing soldiers are eligible for SRBs in MOS 11B improves ability sorting relative to the current approach case in the senior grades. All three COAs would increase the average ability percentile in grades E-6 to E-8. The COAs have slightly different results by grade. For example, the average ability percentile increases the most among E-7s for COA 3, by 0.8 percentile, and increases the most among E-8s for COA 1, by 1.3 percentiles. COA 3 has a stronger ability sorting effect than the current approach case because it reflects the positive ability sorting incentives embedded in the pay table in addition to including the YOS cutoff criterion that pays SRBs only to those promoted faster. COA 2 has a stronger ability sorting effect than the current approach, but not as large as either COA 1 or 3. The YOS cutoff criterion under COA 2 improves ability sorting because COA 2 still offers SRBs, albeit lower dollar amounts, to poorer performers as measured by slower promotion speeds, so the ability sorting effect is not as large. The ability sorting results for COA 1 are at least as good or better than for COA 2 because it includes the YOS cutoff criteria with no SRB for those promoted more slowly but provides the same SRB to soldiers in all grades who meet the YOS criteria.

Cost

Because SRBs would affect retention across YOS, not just retention at the reenlistment point, as shown in Figure 5.1, we measure costs in terms of SRB costs per member, computed as total SRB costs divided by the size of the 11B inventory. SRB costs per member will be affected by the change in the dollar values of the SRBs by YOS and the change in the number of soldiers receiving an SRB of a given amount. For example, COA 1 would offer a higher SRB amount relative to the current approach case, thereby increasing costs. But the change in the number of soldiers receiving an SRB would be influenced by two factors potentially working in opposite directions. On the one hand, the number of soldiers receiving an SRB would decrease relative to the current approach case because of the YOS cutoff criteria. On the other hand, the number of soldiers receiving an SRB could increase or decrease, depending on how the COA affected retention by YOS. For example, COA 1 increased retention among those in YOS two to 13 but reduced retention among those with more than 15 YOS, relative to the current approach case. On net, the effects of the COAs on SRB costs per member for MOS 11B are ambiguous, a priori.

Table 5.1 shows simulated SRB cost per 11B soldier in 2019 dollars. Under the current approach case, cost per soldier is $10,200. Cost per member is $900 per soldier higher under COA 2, $4,100 per soldier higher under COA 1, and about $1,400 higher under COA 3.

The table also shows the simulated differences in personnel costs per soldier where personnel costs include not only SRB costs but also basic pay, allowances, and the retirement accrual charge that the Army contributes to the military retirement fund. We consider how personnel costs change because the mix of experience between junior and senior personnel in the 11B population changes under each COA, as shown in Figure 5.1. Furthermore, when a COA induces higher retention among those who are promoted faster to a given grade, we can expect that the average grade at a given year of service would be higher. Consequently, the pay bill that the Army faces, and the accrual charge that is a multiple of the pay bill, will change as the years of service and grade mix of personnel change.

While the magnitude of the changes in personnel costs differs from the magnitudes of the changes in SRB costs, the relative ranking of the changes across COAs is the same; COA 2 shows the smallest increase in both SRB costs and personnel costs per soldier. The implication is that for MOS 11B, COAs 1–3 increase cost per soldier, in terms of both SRB costs and personnel costs, but also improve ability sorting.

Changing the YOS Criteria

The YOS cutoff criteria we selected for our analysis reflect the typical YOS of soldiers, by grade. However, the Army has latitude in selecting the YOS cutoff criteria for each grade. In this subsection, we show that the choice of the cutoff criteria has important implications for simulated performance and cost per soldier.

Table 5.2 shows two new COAs—namely, COAs 4 and 5. These new COAs have a similar structure to COA 1; they offer the same SRB amount regardless of grade as long as soldiers meet the YOS cutoff criteria for a given grade. COA 4 would make the YOS cutoff criteria more restrictive than the cases of the baseline, current approach, and COAs 1–3, while COA 5 would make the criteria less restrictive. For example, to be eligible for an SRB as an E-5, an 11B soldier would require three or fewer YOS under COA 4 instead of four or fewer YOS in the other cases. Under COA 5, the E-5s would require five or fewer YOS. Notice that the SRB

TABLE 5.1

Differences in SRB and Total Personnel Costs per Soldier in MOS 11B in 2019 Dollars

	SRB Cost per Member	Total Personnel Costs per Member
Baseline case	$0	$62,600
Current approach case	$10,200	$74,000
COA 1 – current	$4,100	$3,900
COA 2 – current	$900	$800
COA 3 – current	$1,400	$1,400

NOTE: Assumes a 48-month additional obligation of service. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 11B inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

TABLE 5.2

COAs for MOS 11B Under More- and Less-Restrictive YOS Cutoffs, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 4 (3)	COA 5 (4)
E-3	≤ 1	$0	$8,300		
	> 1	$0	$8,300		
	= 0			$28,500	
	> 0			$0	
	≤ 2				$14,630
	> 2				$0
E-4	≤ 2	$0	$8,300		
	> 2	$0	$8,300		
	≤ 1			$28,500	
	> 1			$0	
	≤ 3				$14,630
	> 3				$0
E-5	≤ 4	$0	$8,300		
	> 4	$0	$8,300		
	≤ 3			$28,500	
	> 3			$0	
	≤ 5				$14,630
	> 5				$0
E-6	≤ 8	$0	$8,300		
	> 8	$0	$8,300		
	≤ 7			$28,500	
	> 7			$0	
	≤ 9				$14,630
	> 9				$0
E-7	≤ 14	$0	$8,300		
	>14	$0	$8,300		
	≤ 13			$28,500	
	> 13			$0	
	≤ 15				$14,630
	> 15				$0

Table 5.2—Continued

	YOS	Baseline (1)	Current Approach (2)	COA 4 (3)	COA 5 (4)
E-8	≤ 18	$0	$8,300		
	>18	$0	$8,300		
	≤ 17			$28,500	
	> 17			$0	
	≤ 19				$14,630
	> 19				$0

NOTE: Assumes a 48-month additional obligation of service. The COAs and the current approach are simulated to produce approximately the same 5.3 percent the same effect on 11B.

amount under COA 4 is $28,500, an amount larger than the $17,300 SRB under COA 1; the amount is larger because the more restrictive YOS criteria and the smaller fraction of soldiers qualifying for the SRB means that a higher SRB is needed to achieve the same 5.3-percent increase in 11B force size under COA 4 as under COA 1. Similarly, the SRB amount under COA 5 is lower—$14,630—than the SRB for COA 1.

Table 5.3 shows the fraction of the 11B inventory in FYs 2017–2020 that would meet the YOS cutoff criteria. For each grade, the table shows three sets of numbers; the first is the most restrictive criteria (COA 4) and is color-coded in green, the second is the criteria for COAs 1 and 3 cases from Table 3.2 (in orange), and the third is the least restrictive criteria we considered (COA 5), shown in blue.[1] Since the baseline case offers no SRB, the percentage would be zero in the baseline, while the current approach case and COA 2 both offer SRBs to all soldiers in grades E-3 to E-8, although under COA 2, the SRB amount would be smaller for those with more YOS. Thus, under the current approach case and COA 2, the overall percentage in grades E-3 to E-8 receiving an SRB would be 100 percent.

The percentages in the table show that the YOS cutoff criteria would substantially affect the share of 11B soldiers who would qualify for SRBs under the cases we consider and, as we will show later in this subsection, cost per soldier. Though not shown, it would also affect the overall percentage of soldiers receiving an SRB. As mentioned, under the current approach and COA 2, 100 percent of soldiers in grades E-3 to E-8 would receive an SRB. Under COAs 1 and 3, 51 percent of soldiers would receive an SRB, while under COA 4, it would be 14 percent. Finally, under COA 5, 70 percent of soldiers would receive an SRB.

Like the other COAs, COAs 4 and 5 have a different effect on retention by YOS than does the current approach case. COA 5, the less-restrictive YOS cutoff criteria case, has a larger effect on retention before YOS six than does either the current case or COA 4. On the other hand, COA 4, the more restrictive YOS cutoff criteria case, has a larger effect than either the current case or COA 5 between YOS seven and 15.

Earlier in this section, we found that COAs 1–3 would increase simulated average performance, measured in terms of average ability percentile across the force for MOS 11B, relative to the current case. Table 5.4 replicates Table 5.1 but also includes results for COAs 4 and 5. We find that a more-restrictive YOS cutoff criterion, in COA 4, produces an even larger increase in average performance than COAs 1–3, while COA 5, with the least restrictive criteria, has no impact on average performance. Like the other COAs, the new COAs reduce average ability among E-5s relative to the Army's current approach case but also improve ability sorting in grades E-6 to E-8—with the exception of E-6 for COA 5, in which there is no change relative to the current approach case. COA 4 produces the largest improvement in ability sorting. For example, the mean ability percentile among E-8s increases by 2.1 percentiles under COA 4 relative to the current approach case,

1 Table 5.3 does not show the grade of E-8 because of restrictions in data use associated with privacy protection.

TABLE 5.3

Fraction of Soldiers in MOS 11B Who Would Be Eligible for an SRB Under Alternative YOS Cutoff Criteria, by Grade

YOS	E-3	E-4	E-5	E-6	E-7
0	18%				
1	93%	18%			
2	98%	54%			
3		78%	19%		
4			40%		
5			61%		
7				32%	
8				46%	
9				58%	
13					35%
14					43%
15					51%

SOURCE: Author's tabulations using the Total Army Personnel Data Base for Regular Army enlisted personnel.
NOTE: The cells in green show the fraction of the 11B inventory in FYs 2017–2020 that would meet the YOS cutoff criteria for COA 4. The orange cells show the fraction that would meet the criteria for COAs 1 and 3, while the blue cells show the fraction for COA 5. For privacy protection, the table does not present tabulations for grades above E-7.

TABLE 5.4

MOS 11B Simulated Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade, COAs 1–5

	Average	E-5	E-6	E-7	E-8
Baseline case	64.6	57.1	74.8	80.8	87.7
Current case	64.6	57.2	73.4	79.6	86
Current – baseline	0.0	0.1	–1.4	–1.2	–1.7
COA 1 – current	0.2	–0.3	0.5	0.7	1.3
COA 2 – current	0.1	–0.2	0.2	0.5	0.7
COA 3 – current	0.3	–0.2	0.5	0.8	0.6
COA 4 – current	0.7	–0.3	1.3	1.7	2.1
COA 5 – current	0.0	–0.3	0.0	0.2	0.6

NOTES: Ability is a unitless measure in the model, with an assumed mean and standard deviation for the accession cohort. We compute the percentile of the ability distribution for each member in the force. The graph shows the mean of the percentile, by grade.

compared with 1.3 under COA 1. In contrast, in the less-restrictive criteria case, COA 5, the mean ability percentile among E-7s increases by 0.2 relative to the current approach case, compared with 0.5 under COA 2. These results suggest that the Army could improve performance among soldiers in 11B by focusing SRBs on soldiers with faster promotion times and can achieve the largest improvement in average performance and ability sorting by setting restrictive YOS cutoff criteria.

Finally, we consider how COAs 4 and 5 would affect 11B cost per soldier relative to the current approach case in Table 5.5. COA 4 has more restrictive criteria, but the SRB dollar amount is higher, while COA 5 is less restrictive and would qualify more soldiers but has a lower dollar amount. Furthermore, Figure 5.3 shows that both would also change retention by years of service, although the overall retention effect is 5.3 percent, similar to the current approach case. Consequently, the effect on SRB cost and personnel cost is ambiguous, a priori. Relative to the Army's current approach case, we find that COA 5 would increase SRB cost per soldier

TABLE 5.5

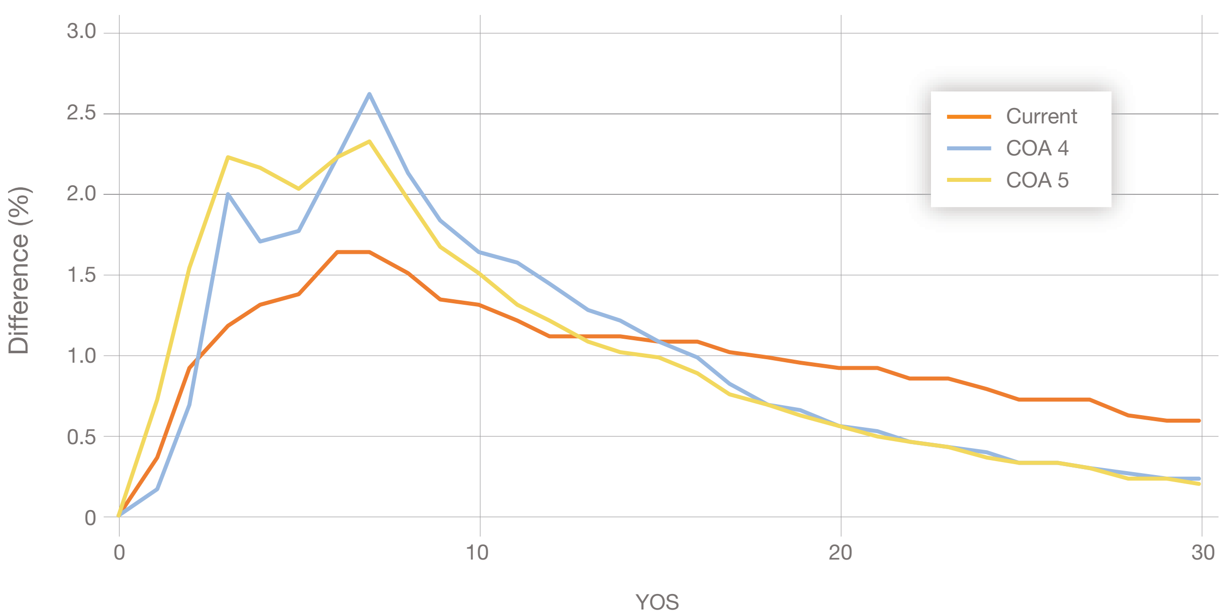
Differences in SRB and Total Personnel Costs per Soldier in MOS 11B for COAs 1–5, in 2019 Dollars

	SRB Cost per Member	Total Personnel Costs per Member
Baseline case	$0	$62,600
Current approach case	$10,200	$74,000
COA 1 – current	$4,100	$3,900
COA 2 – current	$900	$800
COA 3 – current	$1,400	$1,400
COA 4 – current	–$1,900	–$1,900
COA 5 – current	$3,400	$3,200

NOTE: Assumes a 48-month additional obligation of service. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 11B inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

FIGURE 5.3

MOS 11B Simulated Difference in Retention Relative to the Baseline Case When YOS Criteria Are More or Less Restrictive



NOTES: The chart shows the difference in the cumulative percentage of an entry cohort retained. Each case increases MOS 11B force size by 5.3 percent.

by $3,400 per soldier and increase personnel costs per soldier by $3,200, though not as much as COA 1. In contrast, COA 4 would reduce both SRB and personnel costs per solder, by $1,900 per soldier.

In sum, we find that COA 4 is the most efficient SRB structure for 11B among the COAs we considered. It increases average ability and ability sorting the most relative to the current approach case, while reducing both SRB and personnel costs per soldier by $1,900 per soldier. The implication of the analysis is that unlike the Army's current approach of paying the same SRB to all soldiers in a given grade, regardless of YOS, paying SRBs to better performers by targeting the bonuses to soldiers with fewer YOS within a grade improves performance incentives and ability sorting relative to the current approach. While all of the COAs we considered achieved better performance with the exception of COA 5, not all of them reduced cost per soldier for MOS 11B. We found that it is more efficient to set restrictive YOS cutoff criteria so that only the fastest-promoted soldiers receive an SRB.

Targeting SRBs to a Single Grade

The COAs that we considered assume that the Army offers SRBs to soldiers across all grades between E-3 and E-8. However, the Army often offers SRBs to only a subset of grades for a given MOS, tier, and obligation length; a single grade; or no SRB at all. We examined how our results might differ if the Army offered SRBs only to soldiers in 11B who are in the grade of E-6. In particular, we consider a current approach case in which the Army offers an SRB of $24,750 to any E-6 in MOS 11B, regardless of YOS. We then consider two single-grade COAs.[2] Under the first COA, the Army offers an SRB of $51,000 to any E-6 in MOS 11B as long as they have eight or fewer YOS. Under the second COA, a lower SRB of $3,750 is offered to E-6s in 11B who have more than eight and a higher SRB of $48,000 is offered to those with eight or fewer YOS. These COAs, as well as the current approach case in this single-grade example, are shown in Table 5.6. The dollar values for all of the SRBs are set so as to increase the size of the 11B force by 5.3 percent, as before.

As with the other COAs, we simulated the effects on retention by YOS, performance, and cost per soldier under these single-grade alternatives. For brevity, we summarize the main findings and show the detailed results in Appendix D. The key finding is that the single-grade approach produces qualitatively similar retention and performance effects as the multiple-grade approaches shown above. Retention increases more under these single-grade COAs until YOS 12 relative to the current approach case but increases less thereafter. Furthermore, both single-grade COAs improve average performance across the 11B inventory and improve the retention of higher-ability soldiers in mid- and senior grades, i.e., both improve ability sorting. Relative to the single-grade current approach case, SRB cost per soldier increases relative to the current approach case by about $1,000 for both COAs 1 and 2, while personnel cost per soldier falls by $3,000 for COA 1 and $3,100 for COA 2, reflecting the savings associated with a more junior force under each COA. That said, costs per soldier are uniformly lower across the single-grade cases compared with costs per solder across the multiple-grade cases shown in Table 5.5. In short, similar improvements in performance incentives can be achieved when SRBs are targeted to a single grade versus multiple grades, but only if the SRBs are contingent only on YOS, meaning they are paid only to those who are promoted faster.

2 Because our focus is on a single grade, COA 3—in which SRB values vary by grade—is not relevant and, thus, is not considered here.

TABLE 5.6
COAs That Target SRBs to E-6 for MOS 11B, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)
E-3	≤ 1	$0	$0	$0	$0
	> 1	$0	$0	$0	$0
E-4	≤ 2	$0	$0	$0	$0
	> 2	$0	$0	$0	$0
E-5	≤ 4	$0	$0	$0	$0
	> 4	$0	$0	$0	$0
E-6	≤ 8	$0	$24,750	$51,000	$48,000
	> 8	$0	$24,750	$0	$3,750
E-7	≤ 14	$0	$0	$0	$0
	>14	$0	$0	$0	$0
E-8	≤ 18	$0	$0	$0	$0
	>18	$0	$0	$0	$0

NOTE: Assumes a 48-month additional obligation of service. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 11B inventory size relative to the baseline case.

Summary of COA Results for Other MOSs

We also considered alternative COAs for MOSs 14E, 17E, 18B, 35F, and 68P. The results for these MOSs are shown in Appendix D. The simulations for MOSs 17E and 18B are viewed as exploratory, since some of the key parameter estimates in their respective models are statistically insignificant. We omit COA 5, in which we use less-restrictive YOS cutoff criteria for these other MOSs, because we found this COA to be inferior in terms of ability sorting and cost per soldier—not only for 11B but for the other MOSs as well. Because model estimates differ across the MOSs, it is not surprising that, quantitatively, the simulations produced different results. But, qualitatively, in terms of the broad direction of the effects, we found both similarities and differences in the results across the MOSs and with the results of MOS 11B, as we discuss in this subsection.

Performance

The results pertaining to performance are similar across the MOSs. Relative to the baseline case, the current approach case reduces average performance as measured by the average ability percentile. That is, regardless of MOS we considered, the Army's current approach reduces performance incentives. Similarly, restructuring SRBs so that they are higher for those who are promoted faster to a given grade would increase average performance across soldiers in the MOS for all of the MOSs we considered. Furthermore, a commonality across the MOSs is that COA 4, the COA with the most-restrictive YOS cutoff criteria, produced the largest improvement in average performance. We also find that ability sorting, meaning the selective retention and promotion of higher-ability soldiers to the grades of E-6 to E-8, would improve in all of the alternative COAs in each of the MOSs we examined. In sum, regardless of MOS we considered, restructuring SRBs to reward those who are promoted faster would increase performance incentives relative to the current approach used by the Army.

Retention

The results are also similar with respect to how they change retention. By design, the SRB amounts for all of the COAs for each MOS were selected to produce the same overall increase of 5.3 percent in force size for that MOS (with the exception of MOS 17E, in which the amounts were selected to result in an overall increase of 3.0 percent, as a 5.3-percent increase was infeasible due to the high retention within this MOS). But the changes by YOS under the COAs versus the current approach case are also similar qualitatively. In particular, both the current approach case and the COAs result in increased retention over the entire career for each MOS, relative to the baseline case, but the COAs increased retention by more than the current approach in the junior years and, especially, in the mid-career, and by less than the current approach in the more senior years. Because the retention profiles differ across MOSs, the magnitude of these effects and the specific YOS differ where the larger effects appear, but the results are broadly similar across the MOSs.

SRB Amounts

One area in which the results differ is the size of the SRBs required under the current approach case and under the alternative COAs to produce the same 5.3-percent retention effect. For example, for the current approach case, we found previously that for MOS 11B, an SRB of $8,300 was required to produce the 5.3-percent effect. The required SRB is lower for the current approach case for MOSs 14E, 18B, and 35F, indicating that soldiers in these MOSs are more responsive to an SRB under the current approach than those in MOS 11B. But the required SRB is much larger, $22,500 for MOS 68P, indicating less responsiveness. The required SRBs under the alternative COAs also differ across the MOSs we considered. The key point is that the responsiveness to SRBs of soldiers in different MOSs differs, reflecting differences in promotion speed, retention, and civilian pay opportunities in their MOSs.

The differences across MOSs in SRB amounts required to produce a given retention effect translate into differences in cost per soldier. For example, estimated SRB costs per soldier are higher in the current approach case for MOS 68P (equal to $26,846) compared with $14,289 for MOS 11B.

Cost per Soldier

An important difference in the results across MOSs pertains to the effects of the COAs on cost per soldier relative to the current approach case. In particular, as was the case with 11B, SRB and personnel costs per soldier are lower under COA 4 for MOSs 35F and 14E. The implication is that COA 4 is an unambiguously more efficient SRB structure for these MOSs; it produces the same overall retention effect but higher average performance, higher average performance in upper grades, and lower cost per soldier. In the case of the other COAs (i.e., COAs 1–3) SRB and personnel costs per soldier are either a bit lower, about the same, or higher than the current approach case, depending on the COA and the MOS.

For the other three MOSs we consider, namely 17E, 18B, and 68P, all of the COAs, including COA 4, would produce higher SRB and personnel costs per soldier than the current approach case. Costs per soldier are higher in these MOSs because a very large SRB is required to induce a sufficient quantity of fast promoters to stay, and this can cause overall cost to increase even though slower promoters may receive a low or no SRB. Higher compensation is needed to induce higher retention among fast promoters to compensate for the lower retention of slow promoters receiving no SRB. Large SRBs are needed to get a large proportion of fast promoters—including those with lower taste for active service, who are less responsive to a given dollar increase in the SRB.

For MOSs 17E and 18B, COA 2 would produce the lowest cost per soldier, albeit a higher one than the current approach case. Under COA 2, the Army would offer a lower, but not zero, SRB to soldiers who are promoted more slowly. For MOS 68P, COA 4 would produce the lowest cost per soldier among the four COAs considered, albeit a higher one than the current approach case.

The implication of these results is that for MOSs 17E, 18B, and 68P, restructuring SRBs would improve performance but at a higher cost per soldier. MOSs 17E (electronic warfare specialist) and 18B (special forces weapons sergeant) are rather unusual because they require highly specialized skills and are highly selective. Soldiers are recruited into these occupations from other MOSs. Only the most-qualified soldiers are selected into these occupations, and they undergo advanced and rigorous training. Soldiers in 17E are trained as cyber warriors, while those in 18B are part of the special operations community. Soldiers in these communities are likely to be very high performers already.[3] Our analysis suggests that restructuring SRBs to further increase performance incentives in these occupations can be accomplished only by increasing SRB and personnel costs per soldier.

In the case of MOS 68P (radiology specialist), training is particularly long, with advanced individual training lasting 24 weeks. Furthermore, while aspects of the duties of a radiology specialist are military-specific, this occupation has a direct and competitive civilian counterpart, implying that SRBs must be higher, and consequently more costly, to counter those opportunities. Ultimately, the Army must weigh whether the improvement in performance incentives for all three occupations is worth the higher cost per soldier.

Extent of Eligibility

As mentioned in the context of changing the YOS cutoff criteria for MOS 11B, we showed that COA 4 reduces the share of soldiers in grades E-3 to E-7 who would receive an SRB. We find a similar result for the other MOSs we considered, as shown in Table 5.7. In the case of 11B, 14 percent of soldiers would receive an SRB. Less than a quarter of soldiers in these grades would receive an SRB under COA 4 for the other MOSs, except for 18B, in which nearly half would receive an SRB. The smaller share of soldiers receiving an SRB might be concerning to the Army if soldiers who are promoted more slowly complain about inequitable treatment, especially if they perceive their slower promotion as caused by factors outside their control. Thus, while COA 4 improves performance incentives the most and is more efficient than the current approach for several of

TABLE 5.7

Fraction of Soldiers in an MOS Who Would Be Eligible for an SRB Under Alternative COAs, by MOS

	11B (%)	14E (%)	17E (%)	18B (%)	35F (%)	68P (%)
Baseline case	0	0	0	0	0	0
Current approach case and COA 2	100	100	100	100	100	100
COA 1 and COA 3	51	51	36	61	54	36
COA 4	14	17	22	48	23	12

SOURCE: Author's tabulations using the Total Army Personnel Data Base for RA enlisted personnel for 2017–2020.

NOTE: The fraction is computed as the fraction of the inventory in grades E-3 to E-7 in each MOS. We excluded COA 5 because the analysis for 11B showed that this COA reduced performance.

[3] The SRB simulations in the main text assume ability is normally distributed. For enlisted service members in the 17E and 18B MOSs, the occupations with highly specialized skills, we reestimated the different COAs assuming that ability is log-normally distributed to see whether the results are sensitive to the distributional assumptions of ability. The main results hold with one exception. For service members in the 18B MOS, the COAs improved ability sorting for those in the E-7 and E-8 paygrades only, as opposed to the main results, which showed improved ability sorting for those in the E-6 through E-8 paygrades.

the MOSs we consider, it may be important to consider that it would also result in a smaller share of soldiers receiving an SRB overall and within a grade.

Summary

Using DRM model estimates, we simulated the retention, performance, and cost effects of the COAs relative to the baseline case of no SRB and compared the results we found under the Army's current approach. All of the COAs were predicted to produce the same overall increase in force size as the current approach, by design, but the COAs tended to concentrate the retention effect around more junior and mid-career personnel than the current approach case. Restructuring SRBs so that higher amounts are paid to soldiers who are promoted faster is predicted to increase the average performance of soldiers in each MOS we considered. Restructuring also improves the retention of higher-ability personnel because we found that average ability in grades E-6 to E-8 increased relative to the current approach case. The largest performance effects were predicted when the criteria for defining faster promotion in each grade were more stringent, though more-stringent criteria mean that fewer soldiers within an MOS would receive an SRB. For several of the MOSs we considered, the COA with the most-stringent criteria also reduced SRB and personnel costs per soldier, indicating that it not only increased performance but achieved improved performance and the same overall retention at lower cost. However, for other MOSs, notably, MOSs 17E, 18B, and 68P, cost per soldier was higher for all of the COAs relative to the current approach case.

CHAPTER SIX

Conclusions

The Army requested that RAND Arroyo Center provide analyses to improve the setting of S&I pays to increase efficiency and incentives for higher performance, focusing particularly on the Army's SRB program. This report presents our analysis, and we summarize our conclusions in this chapter.

The Army's Current SRB Structure Reduces Performance Incentives

Under the Army's current Tiered SRB program, soldiers who are promoted slower receive the same SRB as faster-promoted soldiers in the same MOS and tier (given additional obligation length). This occurs because eligibility for a given SRB does not depend on YOS for each grade. Given that faster promotion is one of the ways, if not the most important way, that the Army and the other services financially reward superior performance, an implication of the current SRB structure is that it does not incorporate the performance incentives provided by the promotion process.

The Army has changed the structure of its SRB program over time and, specifically, the eligibility criteria and the formula for determining dollar amounts. Under the Tiered SRB program, soldiers who reenlist receive a lump-sum dollar amount, with higher amounts for those in occupations deemed more critical (higher-tiered) and for those who choose longer additional service obligations. Eligibility depends on occupation and grade and, in some cases, on location and additional skill qualifications. Since mid-2019, YOS is also an eligibility criterion but has been used only occasionally for those in CMF 18, and the YOS criterion is not grade-specific. Prior to the Tiered SRB program, the Army used zones or a range of YOS to define SRB eligibility. The Army told us that a disadvantage of using zones to define eligibility is that a service member who reenlisted in a given zone cannot receive another SRB while in the same zone. But, in the absence of zones, the Army no longer targets SRBs to specific experience levels for different grades.

Using estimated DRM models for a selected set of Army occupations, we simulated how SRBs, as currently structured, would affect performance relative to a baseline case of no SRBs. Our DRM simulations assume that promotion speed depends on performance, which, in turn, depends on innate ability. We do not observe ability. Instead, we treat ability as a unitless index, and then we make assumptions about how ability affects promotion speed. We also make assumptions about the distribution of ability among entrants and how ability affects external civilian wage opportunities. These assumed parameters are calibrated or chosen so that we can replicate the observed retention profile of Army soldiers in each occupation. To report results on ability, we first compute each member's simulated percentile in the ability distribution (e.g., the 50th percentile would represent the mean) and then report the overall ability of the force in terms of the mean ability percentile. To assess the extent to which the structure of SRBs affects the selective retention of higher-ability personnel in higher grades, i.e., ability sorting, we also report the average ability percentile by grade.

The MOSs we considered were drawn from a list of CMFs that Army managers considered the most critical at the time of our analysis in terms of setting SRBs. They included the following:

- 11B (infantry)

- 14E (Patriot fire control enhanced operator/maintainer)
- 17E (electronic warfare specialist)
- 18B (special forces weapons sergeant)
- 35F (intelligence analyst)
- 68P (radiology specialist).

It is important to recognize that the simulated percentiles are not comparable across MOSs because the percentiles are measured relative to the 50th percentile for a given MOS, and the 50th percentile is not the same across MOSs.

We find that the Army's current approach is less successful at retaining higher-ability personnel into the senior grades than offering no SRB at all. Relative to the baseline case of no SRBs, we find that SRBs, as currently structured, would slightly reduce the mean ability percentile in the upper grades for all of the MOSs we considered. These results suggest that retention of poorer performers is more responsive to SRBs—and they have a stronger incentive to stay and be promoted to the upper ranks, given their poorer civilian opportunities—than is the retention of better performers who have better external opportunities. Note that the comparison does not hold retention constant; retention is higher overall when SRBs are offered than when they are not. Thus, our comparisons do not hold overall staffing constant.

We also find that the average ability percentile across the force for each MOS generally falls, albeit only slightly, implying that the higher retention of poorer performers in the upper grades is offset to some extent by higher retention of better performers in the lower grades. (The exceptions are MOS 11B, where there is no overall change, and MOS 68P, where there is a larger change.) The implication of these results is that the current structure of the Tiered SRB program does not measurably improve performance incentives relative to offering no SRBs at all, overall, but does reduce performance incentives in the upper grades.

Restructuring SRBs Would Improve Performance Incentives Relative to the Current Army Approach

Our simulations show that performance would improve if the Army restructured SRBs to depend on YOS for each grade. The restructuring would provide higher SRBs to those promoted faster to the grade and either no SRB or a lower SRB to those promoted more slowly to the grade. We considered four alternative COAs for each MOS that we analyzed, and in every case, average performance was improved by restructuring SRBs relative to the Army's current SRB approach.

The COAs differed in terms of the degree of improvement in the average performance of soldiers in a given MOS, with the largest improvement occurring under COA 4. This alternative would give no SRB to those who are promoted more slowly, similar to COAs 1 and 3, but with more-restrictive criteria for defining slow versus fast promotion for each grade. For example, rather than defining slow promotion as having more than four YOS among E-5s, COA 4 defined slower promotion as having more than three YOS in that grade. We find that the average ability percentile across the inventory in each MOS increases by more under COA 4 than in the other COAs. For example, average ability increases by 1.7 percentiles in MOS 14E, compared with 0.7 under COA 1, 0.6 under COA 3, and 0.5 under COA 2.

We also find that ability sorting, meaning the selective retention and promotion of higher-ability soldiers to higher grades, would also improve in COA 4 for each of the MOSs we examined relative to the Army's current approach. The improved ability sorting is important because the productivity of soldiers in senior grades could affect the productivity of more-junior soldiers. The other COAs would also improve ability sorting in each of the MOSs we considered. For example, among soldiers in MOS 17E, our simulations showed that the average ability percentile would increase among E-7s by 0.7 percentiles and by 0.8 among E-8s. For those in MOS 18B, the increase among E-7s would be 2.2 percentiles and 2.3 among E-8s.

While the COAs with the less-restrictive YOS cutoff criteria produce smaller improvements in average ability and retention of higher-ability personnel in the upper grades, they are still an improvement over the current approach case. Furthermore, among these COAs (specifically, COAs 1–3), the least improvement is predicted generally for COA 2, where even slower-promoted soldiers would receive an SRB. The implication is that offering an SRB to those who are promoted slower, even a smaller amount, could produce the same retention effect but would generally improve performance the least. On the other hand, we find that setting the SRB amounts as a multiple of basic pay, but only for faster-promoted soldiers (e.g., COA 3), would have a larger effect than both COA 2 and COA 1 for four of the MOSs we considered (11B, 14E, 17E, and 18B). For the other two MOSs (35F and 68P), we found that COA 3 would produce either about the same or slightly less performance improvement as COA 1. The implication is that setting SRB dollar amounts as a multiple of basic pay would enable the Army to take advantage of the performance incentives embedded in the basic pay table.[1]

In sum, regardless of MOS we considered, restructuring SRBs to reward those who are promoted faster would increase performance incentives relative to the current approach used by the Army, given our assumptions about how performance affects promotion speed and civilian wage opportunities.[2]

Restructuring SRBs to Increase Performance Could Reduce SRB and Personnel Costs per Soldier, But Not Always

We also simulated how the COAs would affect SRB and personnel costs per soldier relative to the current approach case. SRB costs per member will be affected by the change in the dollar values of the SRBs by YOS and the change in the number of soldiers receiving an SRB of a given amount. Personnel costs might also change because the mix of YOS and grade may change under alternative COAs relative to the current approach, though all COAs produce the same overall retention effect, relative to the baseline case, as the current approach case. Personnel costs include not only SRB costs but also pay, allowances, and retirement accrual costs. We find that SRB and personnel costs per soldier would be lower than in the current approach for the COA with the most stringent criteria for YOS within a grade for MOSs 11B, 14E, and 35F. Consequently, restructuring SRBs would be unambiguously more efficient than the current case for these MOSs because the same overall force size would be achieved at a lower cost and with increased performance. For the other three MOSs we consider—namely, 17E, 18B, and 68P—all of the COAs, including the COA with the most stringent YOS cutoff criteria, would produce higher SRB and personnel costs per soldier than the current approach case. For MOSs 17E and 18B, COA 2, whereby even slow-promoted soldiers would receive an SRB, would produce the lowest cost per soldier, albeit a higher cost than the current approach case. For MOS

[1] While we do not consider a COA that sets the SRB as a multiple of basic pay and that uses more-restrictive YOS cutoff criteria—e.g., a hybrid of COAs 3 and 4—such a COA could produce an even larger estimated effect on performance than COA 4 alone.

[2] We note that, in contrast to the Army's current SRB structure, continuation pay is appropriately structured to increase performance incentives for those who are promoted faster. *Continuation pay* is an element of the reformed military retirement system known as the *blended retirement system* that covers new entrants to any service, not just the Army, beginning in 2017. Continuation pay is set as a multiple of basic pay and is offered to service members with between eight and 12 YOS. Consequently, it is well structured from a performance standpoint because personnel who are promoted faster and are at higher grades within the YOS range will receive higher continuation pay.

68P, COA 4 would produce the lowest cost per soldier among the four COAs considered, albeit a higher cost than the current approach case.

The implication of these results is that for MOSs 17E, 18B, and 68P, restructuring SRBs would improve performance but would do so at a higher cost per soldier. While restructuring SRBs would be more effective in terms of increasing performance, whether doing so is more efficient depends on whether the improvement in performance incentives for all three occupations is worth the higher cost per soldier.

In this project, we did not consider an SRB reform that would determine SRB dollar amounts in an auction. Our review of past reform ideas suggests that an auction approach could increase the cost-effectiveness of SRBs, though it might inject uncertainty into the bonus system. Furthermore, such an auction approach could be implemented in conjunction with the restructuring considered in this project, whereby only soldiers who are promoted faster would be eligible to receive an SRB. Under an auction approach, soldiers within an MOS who are eligible for reenlistment (and who have been promoted faster) could bid the lowest SRB they would be willing to accept to reenlist. An auction approach could have two potential advantages for the Army. First, it could lower the cost of the SRB program, potentially even for the MOSs in which we found cost per soldier increased under a restructured SRB format. Second, it could potentially enhance the Army's current talent management efforts. The Army's *Talent Alignment Process* is a relatively new and decentralized market-style hiring system that matches Army personnel to jobs based on preferences. But, while it is "market-style," it does not rely on an actual market mechanism, such as an auction.

Does Faster Promotion Speed Indicate Factors Other Than Supply and Demand?

A fundamental assumption underlying our analysis is that faster promotion speed is an indicator of performance. But if faster promotion speed is due to factors beyond the control of individual members, such as supply and demand factors that cause promotion opportunities to vary across personnel, and not due to differences in performance, then restructuring SRBs according to promotion speed could be viewed as unfair.

In a recent analysis for the 13th QRMC (Asch, Mattock, and Tong, 2020), RAND researchers considered empirical evidence regarding the role of supply and demand factors in enlisted promotion speed for the four services, including the Army. The analysis estimated the extent to which variation in time to promotion is attributable to factors outside an individual's control, such as supply and demand factors. The analysis found that the calendar year of promotion, an indicator of supply and demand factors relevant at the time of promotion, explained 28 percent of the variation to E-4 and 14 percent of the variation in time to E-5. The implication is that promotion opportunities in the calendar year of promotion, driven by supply and demand factors, explain a sizable portion, but not most, of the variation in times to promotion to these grades in the Army. Put differently, the analysis found that a substantial share of the variation in promotion speed is not explained by factors related to supply and demand, suggesting that merit and performance still play an important role, especially for time to E-5 for the Army.

Wrap-Up

The analysis in this report shows that the Army could improve the setting of SRBs to increase incentives for higher performance and to increase efficiency for some MOSs. The results suggest that restructuring SRBs would, therefore, help modernize the Army's S&I pay program and help support its talent management strategy. Before a full-scale implementation of the new approach to SRBs, the Army might take several steps to gather additional information about the approach, especially for MOSs we do not consider in this project. For example, the Army might survey soldiers to gauge their reaction to the new bonus approach, in which only fast promoters would get a bonus, and to ask them about the fairness and accuracy of promotion evaluations to grades E-5 and up. The Army might also survey enlisted leaders with responsibility for performance evaluations and promotion decisions, to see whether they support a system where bonuses would go to perhaps one-third of soldiers reaching a promotion. Finally, it might consider whether and how soldiers might request a *reclama*, i.e., a reevaluation of their performance and possible adjustment of the time of their promotion, if there were factors that led to undue delay. The objective would be to provide assessments of the SRB cost per soldier under the new approach versus the current approach—and in MOSs where the new approach costs more—and gather additional information on whether the higher average ability of retained soldiers is worth the cost.

Finally, the analysis focused on SRBs, but it could also be extended to consider other compensation policies relevant to the MOSs we considered. For example, soldiers in MOS 18 are eligible for the Written Bonus Agreement (also known as the Critical Skills Retention Bonus) targeted to soldiers who are retirement-eligible, and the analysis could be extended to simulate how changes in this bonus program would affect retention in this occupation. Another example is an assessment of how the new blended retirement system would affect active retention, reserve participation, and personnel costs in these occupations. While our analysis focused on a select set of MOSs in this project, the approach we take could be expanded to other Army MOSs.

APPENDIX A

A History of Army Reenlistment Bonuses, Evidence on Effectiveness, and Past Reform Proposals

This Appendix summarizes the history of reenlistment bonuses in the Army, focusing on key aspects of various reenlistment bonus programs and how they may affect the various roles SRBs perform, which are sometimes at odds with one another. We then briefly discuss some of the conceptual limitations and shortcomings of the SRB program over time. Following this, we review the existing literature on the effectiveness of SRBs in their primary role, increasing reenlistments, and conclude with a discussion of a more-limited literature focusing on specific reforms to SRBs and both existing and proposed changes aimed at increasing the effectiveness of SRBs across the services.

History

The Early History of Reenlistment Bonuses and Skill-Based Pays

Reenlistment bonuses intended to ensure that adequate numbers of qualified enlisted personnel are retained in the service have been employed as far back as the aftermath of the Revolutionary War.[1] In 1795, Congress authorized the payment of a "bounty for reenlistment" equal to $16 for each reenlisting soldier. Through the mid-1800s, reenlistment bonuses took the form of, variously, two or three months' pay and, later, increases in regular pay (e.g., $2 per month during the reenlistment term). By the 1920s, the services used a multiplier-type formula that paid $50 for each year of completed service in the prior term of enlistment for present-day E-5 to E-7 and $25 per year for E-1 through E-4 (Office of the Under Secretary of Defense for Personnel and Readiness, 2018).

The Career Compensation Act of 1949 established the "regular reenlistment bonus," which offered payments of fixed dollar amounts for each of the first four reenlistments up to a maximum of $1,440 ($15,500 in 2020 dollars) over the career.[2] This act, following recommendations of the Advisory Commission on Service Pay (the "Hook Commission") significantly reformed the formula for awarding reenlistment bonuses by making the amounts awarded a function of the length of the reenlistment term, rather than the prior term of service (Office of the Under Secretary of Defense for Personnel and Readiness, 2018). This program was modified in 1954 to vary the amount of a bonus payment for reenlisting according to the years of AOS incurred by the reenlisting soldier. The base payment amount was also tied to a soldier's monthly basic pay. The formula was one month's basic pay for each year of a first reenlistment, two-thirds of a month's basic pay for a second reenlistment, one-third for a third reenlistment, and one-sixth for a fourth reenlistment. The

[1] This section draws primarily on GAO (1974) and Office of the Under Secretary of Defense for Personnel and Readiness (2018).

[2] Conversions calculated using the U.S. Bureau of Labor Statistics Consumer Price Index Inflation Calculator (U.S. Bureau of Labor Statistics, undated-a).

cumulative maximum amount over the career was also increased to $2,000, an amount that was typically reached by the third reenlistment.

In 1958, DoD requested an additional financial incentive. Congress responded with 37 U.S.C. 307, introducing monthly proficiency pay (Special Duty Assignment and Superior Performance Pay [SSPP]). SSPP was not a bonus given at the time of reenlistment but was, rather, an additional monthly pay for enlisted members possessing certain skills designated as being in short supply. Payments of $50, $100, or $150 per month were authorized, payable in addition to any other pays, allowances, or special and incentive pays that the member was entitled to.

During the rapid buildup of U.S. ground forces in Vietnam in 1965, DoD reported to Congress that additional reenlistments were required in a relatively large set of skills—accounting for approximately 40 percent of the total enlisted force—to achieve staffing goals, according to the GAO (1974). One motivation offered in requesting additional reenlistment incentives was to preserve costly investments in training certain personnel; financial losses from retraining associated with early career separations in certain skills were estimated to be as high as $10,000 per first-term enlisted member who failed to reenlist ($83,000 in 2020 dollars) (GAO, 1974). Congress responded with 37 U.S.C. 308g, which created the Variable Reenlistment Bonus (VRB) program. The VRB was an additional bonus available only at the first reenlistment point that was calculated by multiplying the regular reenlistment bonus at the time by a multiplier value (between one and four) set by the services based on the estimated training investment and manning shortfall in a given skill. The bonus was limited to four times the regular bonus, or $8,000 ($66,000 in 2020 dollars) at the time of enactment and was paid in annual installments over the period of AOS incurred.

In the early 1970s, DoD studied these existing programs and concluded that around one-quarter of all the funds used for regular reenlistment bonuses was paid to members serving in skills that would have had adequate retention without regular retention bonuses (GAO, 1974). The study also concluded that the SSPP was highly cost-ineffective, as most funds were paid to career service members who were past the critical retention points, and that the VRB was the most cost-effective existing retention incentive; it significantly increased initial reenlistments throughout the heaviest years of involvement in Vietnam. DoD recommended the creation of a single SRB to replace the regular reenlistment bonus and VRB programs. It further recommended that, if this program was found to be effective, the SSPP should be phased out.

The first SRB program became law on June 1, 1974, and established an SRB that was

- payable only to individuals in designated critical skills
- payable at the first and subsequent reenlistments for those with a minimum of 24 months of service and with total years of service not exceeding ten (the limit was eventually extended to 14 years of service)
- computed as the product of one month's basic pay times the number of years of AOS (from a minimum of three years up to six years) times a multiplier value between 1 and 6
- not to exceed a maximum amount of $15,000 ($83,000 in 2020 dollars), with this maximum intended to apply only to personnel in nuclear fields
- payable as either a lump sum or in installments, according to the discretion of each service.

The SRB program also ended the payment of a bonus for service that was already obligated. Under the VRB program, bonuses were paid to cover the full period starting with the reenlistment decision and ending with the new expiration of term of service (ETS) date. This resulted in an estimated 15 to 25 percent of VRB payments being paid for already obligated service (GAO, 1974).

Over most of the period from 1974 to 2010, the Army also conditioned SRB eligibility on a soldier's tenure, with three reenlistment *zones* keyed to YOS: Zone A (two to six years), Zone B (seven to ten years), and Zone C (11–14 years). A soldier was eligible for only one SRB in each zone.

The Targeted SRB and Location SRB Programs

In 1999,[3] the Army began the Targeted Selective Reenlistment Bonus (TSRB) program, which added *location-specific bonuses*—multipliers based on a specific occupation-location combination (and potentially additional skill[s]).[4] The TSRB program was intended to increase the effectiveness of reenlistment bonuses in inducing soldiers to reenlist specifically into undermanned or less desirable locations. The *locations* targeted ranged from specific U.S. bases (e.g., Ft. Drum, Ft. Bragg) to specific units (e.g., 75th Ranger Regiment) to broader overseas locations (e.g., Korea).[5]

In 2004, the Location SRB (LSRB) program was introduced, with the primary distinction that higher multipliers were focused on critical staffing needs related to the wars in Iraq and Afghanistan. Soldiers offered higher bonuses were typically members of units bearing the brunt of combat activity. Despite the name change, these two programs were more similar than different in practice.[6]

The Enhanced SRB Program

In mid-2007, the roughly 30-year span of multiplier-based SRB programs in the Army was ended with the introduction of the Enhanced SRB (ESRB) program. The ESRB program represented a significant departure from the LSRB program in a number of ways. Among the key features of the program are the following:

- It eliminated the use of multipliers to calculate bonuses, instead introducing flat SRB amounts by rank, zone, and years of AOS for eligible personnel.
- It used three tiers of SRB eligibility, each with its own table of corresponding SRB amounts:
  - Tier 1 was only MOS-specific
  - Tier 2 included combinations of MOS and critical skills (with higher SRB amounts)
  - Tier 3 focused on location-specific staffing needs (e.g., Tier 3 SRBs might include a location-specific MOS-skill combination not otherwise offered a bonus).
- It determined eligibility with respect to MOS as a "yes-no" decision (i.e., either eligible or not) and related this eligibility to a table of bonus amounts that varied only by zone, rank, and choice of AOS (not, notably, by MOS).
- An SRB was offered for as little as one year of AOS, rather than the minimum of three years that had prevailed since the introduction of the SRB program.
- It generally expanded SRB eligibility for Zone B and, especially, Zone C personnel, who were often offered zero multipliers even when there was a positive SRB multiplier for Zone A.

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3 This section draws primarily from Asch et al. (2010) and Carrell and West (2007).

4 In discussion around earlier reenlistment incentives (the VRB and the SSPP), *skill* was used as a shorthand for military occupation. In discussions of the TSRB program and subsequent SRB programs, the term *skill* refers to skill measures beyond military occupation, including such SQIs as parachutist and such ASIs as Master Fitness Trainer, as well as language skills.

5 A parallel SRB program was the Bonus Extension and Retraining (BEAR) program, which incentivized soldiers in overstrength MOSs at the time of reenlistment to move into occupations with critical staffing shortfalls. Details on the introduction and termination of this program are unclear, but BEAR SRBs appeared in MILPER messages from at least 1997 and ceased to be included in May 2004 (the final MILPER with BEAR SRB listings was MILPER 04-150). We do not include further discussion of the BEAR program here.

6 Almost simultaneously with the introduction of the LSRB program, the Army introduced the Deployed SRB (DSRB) program, over the period from September 2003 to June 2007. This program initially offered a lump-sum $5,000 bonus and, later, zone-specific multipliers to all personnel deployed to Afghanistan, Iraq, or Kuwait who were not otherwise eligible for an SRB. The DSRB program continued through the transition from the LSRB program to the Enhanced SRB program in 2007. For more on the DSRB program and its effect on overall bonus eligibility over this period, see Asch et al. (2010).

- It expanded SRB eligibility for E-3s and E-7s.[7]
- For Tier 1, the program conditioned bonus amounts on the length of time until an individual's ETS, offering larger bonuses for those closer to their ETS date.[8]

Table A.1 provides examples of how the ESRB program was structured. Each MOS had a tier-specific eligibility that may apply to the entire MOS (Tier 1), to a MOS and skill combination (Tier 2), or to a MOS, skill, and location combination (*location* may also refer to unit, not just geography). Panel A details eligibility by these tiers for 11B (infantry) and 68W (health care specialist). For MOS 11B, all ranks are eligible for an SRB across all tiers, with E-7s eligible for a Tier 2 SRB. Tier 1 is offered to all 11Bs regardless of additional skills or location. Tier 2 is offered to 11Bs with a special qualification identifier "V" (Ranger Parachutist). Tier 3 is offered to all 11Bs in Airborne units (who are parachute qualified, i.e., with SQI "P").

For 68W, only E-5s and E-6s are eligible for a Tier 1 SRB, only E-3 and E-4 are eligible for a Tier 2 SRB, and Special Operations 68Ws in paygrades E-3 through E-6 are eligible for a Tier 3 SRB (ASI "W1" is Special Operations Combat Medic). Notably, for 68W, Tier 2 does not have a skill qualifier associated with it, so it is offered to all 68Ws. In this case, offering a "skill-based" SRB without any specific criterion to E-3s and E-4s while making them ineligible for a Tier 1 SRB appears to be a workaround to offer a higher SRB to these grades than would be offered under Tier 1.

Panel B shows the associated SRB amounts for each paygrade and choice of AOS. For simplicity, we restrict the amounts shown here to Zone A (six YOS or less) and omit paygrades above E-5. Note that the SRB amount difference between 12–23 months of AOS and 24–35 months of AOS is typically relatively small, while the differences between longer periods of AOS typically grows substantially. For example, for a Tier 3 PFC, the 12–23-month SRB amount is $2,000, and the 24–35-month SRB is $3,000 (a $1,000, or 100-percent difference), while the SRB for a 36–47-month AOS is $6,000 (a $4,000, or 300-percent difference).

Initially, the ESRB program significantly increased the amounts paid out to eligible personnel relative to the amounts paid out at the end of the LSRB program. For example, a Zone A 11B Infantryman in the rank of E-4 who reenlisted for four years would receive an SRB of about $8,000 under the LSRB program but $14,500 for a 36- to 48-month reenlistment under the December 2007 ESRB program. However, the generosity of the program was reduced, in terms of both SRB amounts and eligibility, by early 2008 (Asch et al., 2010).[9]

The Tiered SRB Program

In October 2010, the ESRB program was replaced by the Tiered SRB program, a program that is still in use at the time of writing. For this project, we were unable to locate any materials that explicitly discussed the Army's motivation behind the transition from the ESRB program to the Tiered SRB program. However, issues of concern with features of prior SRB programs that were discussed in Chapters Two and Three, including addressing the limitations of zone-based SRB eligibility in allowing flexibility to planners to meet staffing needs and using simpler bonus amount structures to provide transparency to service members and

7 E-3s were previously eligible for an SRB only in specific cases of having a short initial enlistment term and meeting all other requirements for eligibility for an E-4 SRB.

8 The cutoff for this ETS-based distinction ranged from around six to 12 months over the course of the ESRB program. The difference in amounts was small (or sometimes zero) for shorter terms of AOS but was sometimes as large as 30 percent or more for terms of AOS of four or five years. Additionally, the DSRB program continued over this period for deployed personnel not otherwise eligible for an SRB.

9 SRB amounts were reduced by an average of around 25 percent, E-7 eligibility was reduced, and Tier 1 eligibility was, again, made specific to combinations of rank and MOS. Overall, these changes reduced the percentage of personnel eligible for an SRB with at least one year of AOS from around 80 percent to approximately 60 percent.

TABLE A.1
Examples of the Structure of the ESRB Program for MOSs 11B and 68W

Panel A: ESRB Eligibility, by Tier				Eligibility				
TIER	MOS	Skill	Location	PFC (E-3)	SPC (E-4)	SGT (E-5)	SSG (E-6)	SFC (E-7)
1	11B	N/A	N/A	Y	Y	Y	Y	N/A
2	11B	SQI “V”	N/A	Y	Y	Y	Y	Y
3	11B	SQI “P”	ALL AIRBORNE	Y	Y	Y	Y	N/A
1	68W	N/A	N/A	N	N	Y	Y	N/A
2	68W	-	N/A	Y	Y	N	N	N
3	68W	ASI “W1”	SP OPNS CMD	Y	Y	Y	Y	N/A

Panel B: SRB Amounts by Tier (Zone A)			AOS in Months				
TIER	ETS	Rank	12–23	24–35	36–47	48–59	60+
1	Prior to 10/1/2009	PFC	$2,000	$3,000	$6,000	$9,000	$11,500
1	Prior to 10/1/2009	SPC	$3,000	$4,000	$7,500	$9,500	$13,000
1	Prior to 10/1/2009	SGT	$4,000	$5,000	$8,000	$10,000	$15,000
1	Prior to 10/1/2009	SSG/SFC	$5,000	$6,000	$10,000	$15,000	$17,000
1	After 10/1/2009	PFC	$2,000	$3,000	$4,500	$6,000	$7,500
1	After 10/1/2009	SPC	$3,000	$4,000	$5,000	$6,500	$8,500
1	After 10/1/2009	SGT	$4,000	$5,000	$6,000	$8,000	$10,500
2	N/A	PFC	$3,000	$5,000	$8,000	$10,000	$12,500
2	N/A	SPC	$6,000	$8,000	$10,000	$12,500	$16,000
2	N/A	SGT	$8,000	$9,500	$11,000	$13,500	$18,000
3	N/A	PFC	$2,000	$3,000	$6,000	$9,000	$11,500
3	N/A	SPC	$3,000	$4,000	$7,500	$9,500	$13,000
3	N/A	SGT	$4,000	$5,000	$8,000	$10,000	$15,000

SOURCE: Army MILPER Message 08-318 (2008). This message had an effective date of December 31, 2008. Thus, the ETS distinction above was for those with an ETS within ten months or beyond ten months. This cutoff varied over the course of the ESRB program. For simplicity, only Zone A is shown, and SSG/SFC rank is omitted.

reduce detailer errors, are addressed in the characteristics of the Tiered SRB program, suggesting that the redesign appears to have been sensitive to the concerns of Army service managers. The principal changes made were as follows:

- The use of zone-based eligibility was ended, with SRB eligibility based only on combinations of MOS, skill, location, and rank.[10]

[10] Eligibility and differing SRB amounts by experience level have occasionally been used since the advent of the tiered program in special cases, and recently a new criterion, TAFS, has been added to allow planners to distinguish eligibility for a given SRB by years of service. However, the use of this distinction appears to have been fairly rare over the past decade (appearing primarily in a small number of SRBs offered to personnel in CMF 18).

- Rather than binary SRB eligibility, a tier number was assigned to each combination of MOS, skill, location, and rank that ranged between 0 (ineligible) and 10 (or occasionally 11) that indicated the level of priority for the given occupation, skill, location and combinations of these factors.
- Each tier level corresponded to a set of flat SRB amounts according to rank and years of AOS.

One notable aspect of the Tiered SRB program is that ending zone-based eligibility allowed soldiers in Zone C to be eligible for any offered SRB. Prior to the Tiered SRB program, Zone C personnel were generally offered fewer SRBs than earlier-career individuals (see Figure A.2 for evidence of this in multiple MOSs in our CMFs of interest), presumably because reenlistment rates among Zone C soldiers tend to be very high overall, and these personnel were likely to be increasingly incentivized to reenlist by approaching retirement benefits (Hattiangadi et al., 2004). In past studies on the reenlistment effects of SRBs, Zone C estimates have tended to be much smaller than those for Zones A and B and are sometimes not statistically distinguishable from zero (Hattiangadi et al., 2004; Moore et al., 2007; Tsui et al., 2006). We explore this difference with past programs in more detail below.

In 2019, the Army changed the Tiered SRB program to increase the incentive to reenlist for longer AOSs by setting SRB amounts so that they increased nonlinearly with AOS length. For example, under a linear structure, each additional year of obligation adds a fixed dollar amount—e.g., $2,500 per year—regardless of whether the soldier obligates for three additional years versus two years or six years versus five. Under a nonlinear structure, each additional year of obligation adds an increasing dollar amount as years of obligation rise. For example, increasing the years of obligation from two to three might increase the SRB by $1,500, but increasing years from five to six might increase it $6,000, a higher amount.

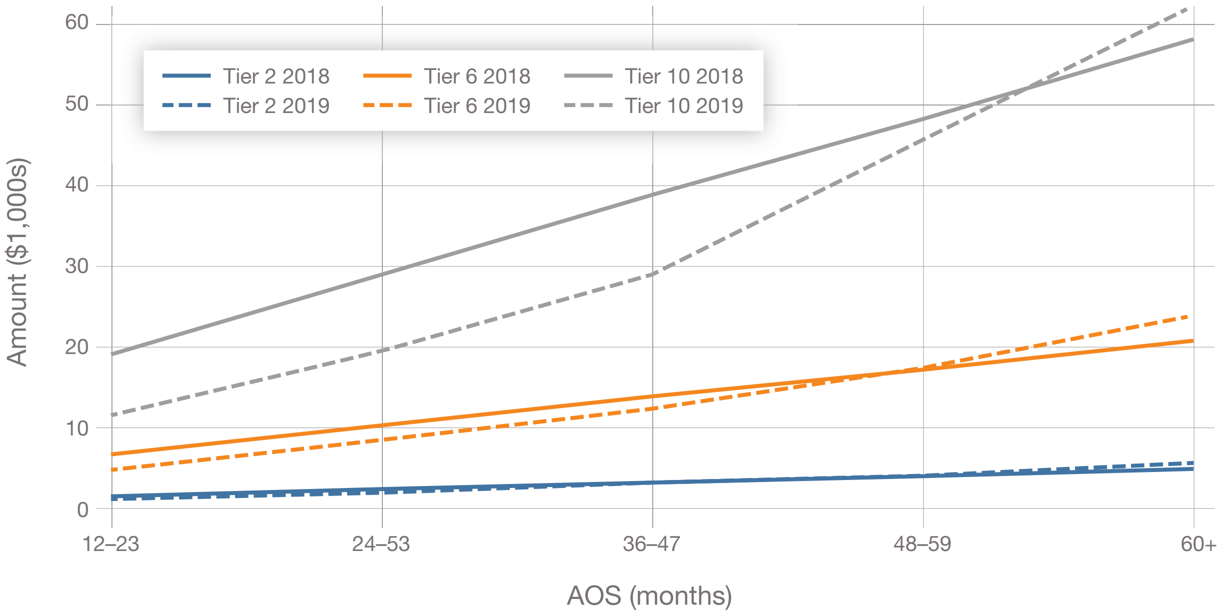
Figure A.1 provides examples of this change by showing average SRB amounts by AOS for Tier 2, Tier 6, and Tier 10 for each of calendar years 2018 and 2019.[11] In 2018, the SRB amounts for all three tiers show a linear relationship between AOS length and SRB amount. However, for 2019, the slope of the SRB amounts across years for Tier 2 is steeper, providing a smaller SRB for a shorter term of AOS and a slightly larger SRB for a longer term. For Tier 6, these differences are more pronounced, and the relationship in 2019 is slightly nonlinear, offering uniformly lower SRBs for one or two years of AOS (about $1,900 less), a slightly lower amount for three years, the same amount for four years, and about $3,000 more for a five-year reenlistment term. This pattern is most pronounced for Tier 10, with a distinct kink in the curve showing the relationship between SRB amount and years of AOS. In this case, the SRB for reenlistment terms of less than four years was reduced by around 25 percent, while the amount for a four-to-five-year term was nearly identical to the old amount, and the amount for a five-year reenlistment was nearly 10 percent higher, providing a stronger financial incentive to increase the length of a reenlistment term for soldiers on the margin of choosing a longer term over a shorter one.

Comparing the Tiered SRB Program with Its Predecessors

Prior to 2010, when the Army introduced the Tiered SRB Program, SRB amounts varied by YOS for a soldier in a given grade. This is because prior to 2010, the Army used zones or experience level to define SRB eligibility. Consequently, only soldiers with specific levels of experience could be eligible for an SRB. When the Army introduced the Tiered SRB Program and dropped the use of zones, soldiers in a junior grade but with considerable experience could receive the same SRB as solders with less experience. Given that better-performing soldiers tend to get promoted faster, these more-experienced soldiers were likely to be poorer

[11] These amounts are generated for each year as a weighted average, in which the weights are the proportion of the calendar year for which the message was in effect. So, for example, the SRB amounts given in a MILPER message that was in force from January 1 to March 31 would be given a weight equal to 0.25.

FIGURE A.1
Changes in Relative Generosity of SRB Payments from 2018 to 2019 for Different AOS Terms



SOURCE: Author calculations using SRB data from MILPER messages issued in 2018 and 2019. Amounts reflect a weighted average over the calendar year in which the weights are the proportions of the year that a given set of SRB bonus amounts were in effect.

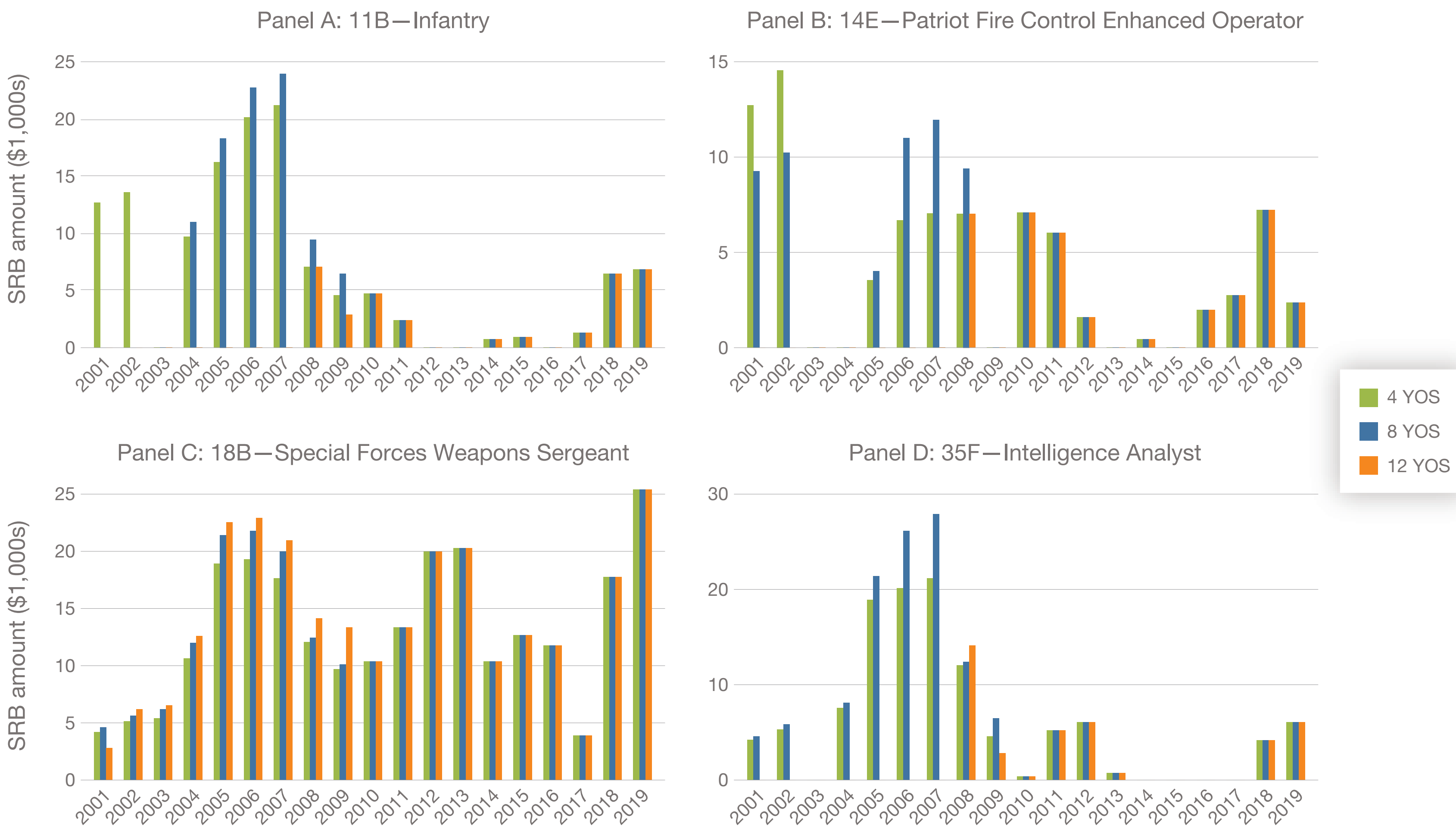
performers. In this subsection, we show how SRB amounts tended to vary by YOS for an E-5 prior to 2010 but then varied little in 2010 and thereafter.

Figure A.2 shows SRB amounts by year for an E-5 with, respectively, four, eight, and 12 YOS (corresponding to Zones A, B, and C) reenlisting for four years of AOS in MOS 11B, 14E, 18B, and 35F. Not surprisingly, SRBs for a given MOS varied over time, regardless of YOS, reflecting changes in supply and demand factors over time, such as the Great Recession and operations in Iraq and Afghanistan. Of interest for our purposes is the variation across YOS for a given MOS and how that variation changed over time. Across the period 2001–2009, SRB amounts differed by zone across occupations and years. For 11Bs (panel A), in the early 2000s, an SRB was offered only for Zone A, but then for both Zones A and B beginning in 2004. In 11B, 14E, and 35F, there were no SRBs for a Zone C E-5 prior to the introduction of the ESRB program in 2008. In MOS 14E, the SRB in 2001–2002 was around 20 to 25 percent higher for those in Zone A relative to Zone B. But by 2006–2007, this relationship was reversed. In MOS 18B, personnel in all zones were offered SRBs in all years, but the SRB amounts varied across zones in the years between 2001 and 2009. In summary, prior to 2010, SRB amounts varied by zone for a given MOS.

From 2010 onward, this dimension of variation in SRB amounts disappeared, as zone-specificity was eliminated with the Tiered SRB program. For example, prior to 2010, and specifically between 2001 and 2007, an E-5 in MOS 14E with 11 or more YOS received no SRB in five of the seven years that any SRB was offered for this MOS. By contrast, from 2010 to 2019, the average SRB amount (for eight of the ten years any SRB was offered for this MOS) increased to around $3,000. While the Army reported to us that eliminating zones provided the Army with greater flexibility to offer SRBs regardless of experience, as mentioned in Chapter Two, doing so also eliminated the implicit performance incentive associated with faster promotion.

FIGURE A.2

SRB Amounts for E-5 Reenlisting for Four-Year AOS, by MOS and YOS, from 2001 to 2019



SOURCE: Author calculations from MILPER messages spanning 2001 through 2019. The SRB amounts from these messages were collapsed down to annual amounts using a weighting process that took as weights the proportion of each calendar year a given MILPER message was effective. The SRB offerings here are restricted to SRBs offered in the specified MOS that do not have any further eligibility restrictions (e.g., location, SQI, ASI). In the ESRB period, SRBs corresponding with a shorter amount of time until a soldier's ETS were used. In the 2001 to 2007 period, basic pay table amounts were used for each year in the formula (monthly basic pay x multiplier x 4) to generate SRB amounts. All amounts are deflated to 2019 constant dollars using the CPI "Urban wage earners and clerical workers" index (U.S. Bureau of Labor Statistics, undated-b).

Past Estimates of the Effects of Reenlistment Bonuses on Reenlistment

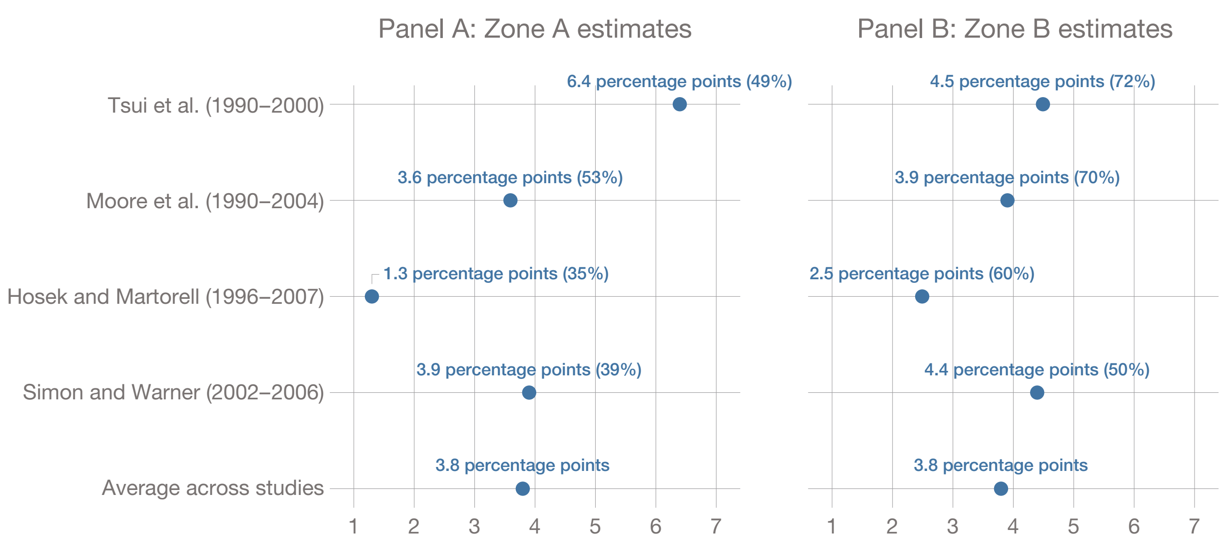
Researchers have estimated the effects of reenlistment bonuses on reenlistment dating back to the original VRB program. In this section, we summarize several of these studies, focusing first on more-recent studies that estimate effects for Army personnel, and then discussing a number of older studies across the services.

One of the most recent studies of Army personnel that we are aware of used the first half of the 2000s as its sample period, during Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF), when both extensive deployments and stop loss policies likely had a significant effect on retention (Simon and Warner, 2010). The authors estimated that a one-unit increase in the SRB multiplier was associated with an average increase in Zone A reenlistment of 5.9 percentage points when those eligible for a deployment-related SRB were included, and 3.9 percentage points excluding these soldiers. In Zone B, the analogous effect sizes were 7 and 4.4 percentage points. Another study focused on this period estimated the effect of a one-unit multiplier increase on reenlistment across the services while controlling for both nonhostile and hostile deployment and estimated remarkably different associations between bonuses and reenlistment across services. Estimates for the Army and Air Force were around 1 percentage point, while the estimate for the Navy was 6.5 percentage points, and for the Marines the estimate was 7.8 percentage points (Hosek and Martorell, 2009).[12] This estimated effect for the Air Force is nearly identical to results from another study using a similar regression-based modeling approach and focusing on the same period of time but not controlling for deployment (Jofrion and Wozny, 2015).

Figure A.3 summarizes four of these more-recent studies of Army SRBs. Each study is labeled on the y-axis, and the estimated change in first-term reenlistments is shown on the x-axis. The average effect estimated across these studies for both Zones A and B is 3.8 percentage points. The average reenlistment rate for the samples used in these studies was 44 percent for Zone A, suggesting around a 10-percent increase in reenlistment for a one-multiplier SRB increase. The average rate for Zone B was around 64 percent, suggesting a 6-percent SRB effect among Zone B personnel.

FIGURE A.3

Point Estimates from Select Studies of SRBs and Reenlistment Among Army Personnel



SOURCE: Author calculations from referenced studies.

[12] The estimates are from their model using MOS fixed effects, so that the estimates are the average effect within-occupation.

A trio of older studies that focused specifically on Army enlisted personnel in the 1990s found changes in first-term reenlistment rates associated with a one-unit multiplier increase that ranged from approximately 4 to 6 percentage points and second-term effects that ranged from around 1 to 4 percentage points (Hogan et al., 2005; Tsui et al., 2006; Moore et al., 2007). Hogan et al. (2005) estimated an association between Zone A reenlistment and a one-multiplier increase of around 4.4 percentage points, and a much smaller 1–percentage point increase in Zone B. This same group of researchers later revised their approach by including controls for the national unemployment rate and, more importantly, for the large force drawdown from 1992 to 1996—when many soldiers were offered strong incentives to exit active-duty service. Using the same data as in Hogan et al. (2005), they estimated a relationship that was significantly larger in magnitude (6.4 percentage points for Zone A and 4.4 percentage points for Zone B) after controlling for these factors.[13]

More broadly, the effects of retention bonuses across various services have been estimated repeatedly over the period of the all-volunteer force (AVF). Estimates of the effects of reenlistment bonuses on reenlistment in the early 1970s suggested that a 1-percent increase in the bonus amount increased reenlistment by around 2 percent (Enns, 1975, 1977). Early studies of the reenlistment effects of the SRB program (1974–1980) used a multiplier increase of one as the unit of reference for estimating reenlistment effects. Estimates from studies focused on these initial years tended to cluster around a 3-to-4–percentage point, or approximately 6-to-9-percent, increase in reenlistment for an increase in the multiplier of one unit (Goldberg and Warner, 1982; Cylke et al., 1982). But, across studies, these estimates often varied meaningfully by service, occupational group within a service, and reenlistment term length.

For example, Goldberg and Warner (1982) estimated the effect of reenlistment bonuses on Marines who enlisted during the first four years of the SRB program. They generated separate estimates for six occupational clusters and for first- and second-term reenlistments. For first-term reenlistments, their estimates of the effect of an increase of one in the multiplier (which corresponded to an average of $1,060 using the FY 1982 pay table, or $2,900 in 2020 dollars) ranged from 8.3 percentage points for those in administration/logistics occupations to 6 percentage points for those in combat occupations to 1.5 percentage points for those in technical occupations. Estimates for second-term reenlistment were generally 50 to 100 percent higher. Goldberg and Warner also assessed whether reenlistment substituted for extensions by estimating the net retention after accounting for decreases in extensions. For first term reenlistments, these estimates were generally around half the size of the gross reenlistment change. A number of other studies estimated average reenlistment effects for Marines of around 6 percentage points, which is around twice the magnitude of average estimates for other services (Quester and Adedeji, 1992; North, 1994; Hattiangadi et al., 2004).

SRB Program Reforms—Existing Evidence and Alternative Reform Proposals

In addition to studies of the effects of SRBs on reenlistments, several studies have considered alternative SRB reform proposals. One example is studies that have considered the SRB payout method. Over the history of the SRB program, the services have shifted between an installment-based payment system—typically whereby one-half of the SRB is paid at the time of reenlistment and the remaining balance is distributed across subsequent anniversary dates over the length of the reenlistment term—and a system that pays SRBs

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[13] In the original Hogan et al. (2005) study, the estimate for Zone B was statistically significant only if the other individual controls (gender, race, educational attainment, Armed Forces Qualification Test score, and marital status) were omitted. In Tsui et al. (2006), these Zone B estimates also remained highly statistically significant with the inclusion of all the additional controls used in the Zone A estimates.

as a single lump sum at the time of reenlistment. This feature of the program can be considered a reform related to efficiency, since it interacts with the amount of personal discounting soldiers apply to future versus present payments and can, thus, achieve a given level of reenlistment for less money than would be required in an installment-based system. Additionally, it relates to fiscal flexibility from the service's perspective since, under a lump sum payment approach, SRB program expenditures in a given year do not incur future fiscal commitments.

A study of DoD-wide bonus effects using data from the 1970s estimated the effect of a $1,000 increase in the bonus amount (roughly $4,000 in today's terms). Analysts found that a $1,000 bonus increase was associated with a 0.9–percentage point increase in the reenlistment rate under an installment system, but a 1.25–percentage point increase under a lump-sum payment system (Hosek and Peterson, 1986).[14] Another study focusing on marines, who were switched to a lump-sum payment system in the second half of the 1990s, estimated that the average effect of any SRB offer increased by around 20 percent if the offer was for a lump sum rather than installment payment (Barry, 2001).

A number of reforms that would incorporate performance incentives into SRBs have been proposed or discussed in past research. For example, in a discussion of potential mechanisms to increase performance incentives in the military pay structure, Hogan (2004) suggests that incentives to achieve faster promotion could be strengthened by making anniversary payments associated with an SRB a function of a soldier's paygrade at the time of the anniversary, rather than at the time of the reenlistment decision. Koopman (2007) suggests the same approach as a way to embed performance into SRBs. She also discusses, in the Navy context, an approach similar to the focus of this research, which is to pay SRBs based on promotion speed relative to some index of initial sailor quality. This approach uses a relative measure of promotion speed that incorporates a measure of expected performance at the beginning of the career, rather than a uniform measure of time to promotion. Hosek and Asch (2002) suggested, in the context of the Air Force, that performance incentives could be embedded into SRBs by relating the size of SRB anniversary payments (under a non–lump sum system) to some prespecified framework of skill acquisition, such that payments would increase for the originally offered SRB amount if an airman acquired additional skills during the reenlistment period.

Other studies have focused on alternative ways to improve the efficiency of SRBs. Early in the program's history, Haber, Lamas, and Eargle (1984) attempted to address the effect on retention of a pay table that pays the same amount of basic pay regardless of the valuation of a military skill in the civilian labor market.[15] The proposed mechanism attempted to rationalize the key motivations for an SRB (to compensate for training costs and retain those with critical skills) using an algorithm that estimates the wage premium for a skill in the civilian labor market and assigns SRB amounts according to the probability of losing a soldier with such skills.

Another approach to increase efficiency is an auction mechanism whereby eligible soldiers would bid on the lowest SRB they would be willing to accept to reenlist. The auction approach induces soldiers to share information about the SRB required to induce reenlistment. The Navy has piloted an auction-based approach to setting Assignment Incentive Pay. In the pilot, qualified sailors bid on the lowest Assignment Incentive Pay they would be willing to accept to take an assignment. Golfin, Lien, and Gregory (2004) found that the auction system enabled the Navy to match sailors to less-desirable assignments with virtually no involuntary assignments to undesirable locations and at lower cost relative to the traditional (involuntary) assignment

[14] A $1,000 change in the bonus amount is approximately equal to a half-multiplier increase, suggesting that a one-multiplier increase would be associated with around a 2–percentage point increase in retention under installment payments and 2.5 percentage points under lump-sum payments. This is roughly equivalent to estimates for the Navy found in similar studies from this period but smaller than some of the other estimates from this time reported above.

[15] This conceptual aspect of military compensation and its effect on retention is discussed in Hogan (2004).

system of sailors to locations. Costs were lower because the Navy paid fewer rents. The traditional (nonauction) approach generates greater rents because it pays sailors an Assignment Incentive Pay to go to an undesirable location that is higher than what they would have accepted in an auction. Auction-based SRBs have not been implemented in any service, but such an approach has the potential to save SRB costs.

A recent study considered an auction mechanism for the Navy to allocate not only monetary SRBs, but also a range of nonmonetary incentives of potential value to eligible sailors, such as geographic stability, selection of home port, and choice of billet (Coughlan, Gates, and Zimmerman, 2011).[16] The relative effectiveness of three auction-based approaches to providing a reenlistment incentive are considered: a purely monetary auction, a "Universal Incentive Package" auction that includes a standard package of nonmonetary incentives to which a sailor can attach a value and then bid any additional monetary incentive required to retain him or her, and a *Combinatorial Retention Auction Mechanism* (CRAM) that allows a sailor to select a package of nonmonetary incentives and then attach a bid to this package, along with an additional monetary amount required for him or her to reenlist.[17] Their simulations suggested that a CRAM outperformed the other two approaches and represented a potential cost savings to the Navy of 25 to 80 percent, relative to a purely monetary incentive.

A notable alternative approach to shaping the force according to performance criteria that has been tested is the Navy's "Perform to Serve" program. Introduced in the early 2000s, the program required interested sailors to reapply to remain in the Navy (with the recommendation of their commanding officer) in one of three ways: (1) remaining in their current billets, (2) remaining in their current billets but being willing to switch assignments if required, and (3) being reassigned to new billets. Performance reviews and other criteria were then used to assign each member a status with respect to his or her ability to reenlist. However, the centralized nature of this top-down program suggests an information inefficiency relative to auction-based approaches. Limitations of this program and potential ways to improve it were discussed in Koopman (2007).

16 Examples of such inefficiencies include offering a common SRB amount to all in a given occupation, even though many might have reenlisted without it and offering dependent-based BAH amounts that may be of little importance to many service members (and may lead directly to selection into military careers based on factors not associated with job performance). See Hogan (2004) for a lengthier discussion of these issues.

17 Two student theses from the Naval Postgraduate School—Bock (2007) and Dedrick (2010), which were supervised by two of the three authors of Coughlan, Gates, and Zimmerman (2011)—proposed purely monetary auction systems for SRBs in the Marine Corps and the Air Force that were similar to the first option in Coughlan, Gates, and Zimmerman (2011).

APPENDIX B

How Selected MOSs Are Identified in the Data

This appendix describes how we identify service members in the MOS of interest in the data and provide tables containing crosswalks used to handle MOS conversions. There are four ways that service members were identified with an MOS of interest:

1. Direct accessions: These are service members whose first MOS is a MOS of interest.
2. Direct conversion: These are service members whose first MOS is converted to a MOS of interest.
3. Occupational switch: These service members have a different MOS before switching to a MOS of interest and are identified using the data, which are longitudinal and allow us to track occupational switches over the course of a military career.
4. Occupation switch and conversion: These service members have a different MOS and switch to a MOS that is subsequently converted to a MOS of interest.

MOS conversions, i.e., when one MOS is changed to a different MOS, were primarily identified using the U.S. Department of the Army Pamphlet 611-21 (Smartbook) Military Occupational Classification and Structure, Appendix B (2019a). This document provides a list of conversions at the four-digit MOS level. However, for simplicity, we assumed that the skill level remains the same when the conversion occurs. There were several issues encountered while creating a crosswalk to account for MOS conversions. First, we found the existing U.S. Department of the Army list to be incomplete in certain cases. For example, while the list reports that service members with a four-digit MOS of 91K5 were converted to the three-digit MOS of 68K effective October 1, 2006, the data show that this conversion applied to other 91K skill levels. As a result, we supplement the existing list of MOS conversions from the U.S. Department of the Army with MOS conversions shown in the data. Second, some three-digit MOSs are recycled over time. For instance, 35F was used for special electronic device repairers prior to being used for intelligence analysts. To ensure that we account for the relevant conversions for the MOS of interest, we checked historical and current MOS occupation descriptions. Third, certain MOSs were split into multiple MOSs (e.g., 14R1 through 14R4 were split into 14E, 14J, 14S, and 14T on October 1, 2009). To assign the correct MOS in this case, we used the longitudinal feature of the data to look forward into a service member's career to see which conversion occurred and then assigned the appropriate MOS. This approach, however, works only for service members who do not separate before the conversion occurs. For those who separate prior to the MOS conversion, we are unable to assign a new MOS because we do not observe their new MOS. In Table B.1, we document MOS conversion rules that apply to Army enlisted service members who entered active duty on or after January 1, 2000. The table includes the original MOS, the conversion date, and the new MOS. The new MOS is assigned to those who have the original MOS between January 1, 2000, and the conversion date.

TABLE B.1
MOS Conversion Crosswalk

Original MOS	Effective Date	New MOS	Original MOS	Effective Date	New MOS
11H1	2002-09-01	11B1	14J4	2011-10-01	14G4, 14H4
11M1	2002-09-01	11B1	14D4	2001-10-01	14G4, 14H4, 14T4
11H2	2002-09-01	11B2	23R5	2001-10-01	14Z5
11M2	2002-09-01	11B2	14E6	2001-10-01	14Z6
11H3	2002-09-01	11B3	68B1	2004-09-01	15B1
11M3	2002-09-01	11B3	68B2	2004-09-01	15B2
11H4	2002-09-01	11B4	68B3	2004-09-01	15B3
11M4	2002-09-01	11B4	68D1	2004-09-01	15D1
11B5	2001-10-01	11Z5	68D2	2004-09-01	15D2
11C5	2001-10-01	11Z5	68D3	2004-09-01	15D3
11H5	2002-09-01	11Z5	68F1	2004-09-01	15F1
11M5	2002-09-01	11Z5	68F2	2004-09-01	15F2
23R1	2001-10-01	14E1	68F3	2004-09-01	15F3
14R1	2009-10-01	14E1, 14G1, 14H1, 14S1, 14T1	68G1	2004-09-01	15G1
23R2	2001-10-01	14E2	68G2	2004-09-01	15G2
14R2	2009-10-01	14E2, 14G2, 14H2, 14S2, 14T2	68G3	2004-09-01	15G3
23R3	2001-10-01	14E3	68H1	2004-09-01	15H1
14R3	2009-10-01	14E3, 14G3, 14H3, 14S3, 14T3	68H2	2004-09-01	15H2
23R4	2001-10-01	14E4	68H3	2004-09-01	15H3
14R4	2009-10-01	14E4, 14G4, 14H4, 14S4, 14T4	68S1	2004-09-01	15J1
14J1	2011-10-01	14G1, 14H1	68J1	2004-10-01	15J1
14D1	2001-10-01	14G1, 14H1, 14T1	68S2	2004-09-01	15J2
14J2	2011-10-01	14G2, 14H2	68J2	2004-10-01	15J2
14D2	2001-10-01	14G2, 14H2, 14T2	68S3	2004-09-01	15J3
14D3	2001-10-01	14G3, 14H3	68J3	2004-10-01	15J3
14J3	2011-10-01	14G3, 14H3	68K4	2004-09-01	15K4
68S4	2004-09-01	15L4	35H1	2010-10-01	35G1
68J4	2004-10-01	15L4	96D2	2007-10-01	35G2
68N1	2004-09-01	15N1	96H2	2007-10-01	35G2
68N2	2004-09-01	15N2	35H2	2010-10-01	35G2
68N3	2004-09-01	15N3	96D3	2007-10-01	35G3
35K1	2008-10-01	15W1	96H3	2007-10-01	35G3
35K2	2008-10-01	15W2	35H3	2010-10-01	35G3

Table B.1—Continued

Original MOS	Effective Date	New MOS	Original MOS	Effective Date	New MOS
35K3	2008-10-01	15W3	96D4	2007-10-01	35G4
35K4	2008-10-01	15W4	96H4	2007-10-01	35G4
35K5	2008-10-01	15W5	35H4	2010-10-01	35G4
68Y1	2004-09-01	15Y1	97B2	2007-10-01	35L2
68Y2	2004-09-01	15Y2	97B3	2007-10-01	35L3
68Y3	2004-09-01	15Y3	97B4	2007-10-01	35L4
68Y4	2004-09-01	15Y4	97B1	2006-10-01	35M1
29E1	2018-10-01	17E1	97E1	2007-10-01	35M1
29E2	2018-10-01	17E2	35L1	2009-10-01	35M1
29E3	2018-10-01	17E3	97E2	2007-10-01	35M2
29E4	2018-10-01	17E4	97E3	2007-10-01	35M3
29E5	2018-10-01	17E5	97E4	2007-10-01	35M4
29E6	2018-10-01	17E6	98C1	2007-10-01	35N1
96B1	2007-10-01	35F1	98J1	2005-10-01	35N1, 35S1
96B2	2007-10-01	35F2	98C2	2007-10-01	35N2
96B3	2007-10-01	35F3	98J2	2005-10-01	35N2, 35S2
96B4	2007-10-01	35F4	98C3	2007-10-01	35N3
96D1	2007-10-01	35G1	98J3	2005-10-01	35N3, 35S3
96H1	2007-10-01	35G1	98C4	2007-10-01	35N4
98J4	2005-10-01	35N4, 35S4	98P1	2007-10-01	35U1
35U1	2007-10-01	35P1	98P2	2007-10-01	35U2
98G1	2007-10-01	35P1	98P3	2007-10-01	35U3
98H1	2005-10-01	35P1, 35U1	98P4	2007-10-01	35U4
35U2	2007-10-01	35P2	98C5	2001-10-01	35V5
98G2	2007-10-01	35P2	98G5	2001-10-01	35V5
98H2	2005-10-01	35P2, 35U2	98H5	2001-10-01	35V5
35U3	2007-10-01	35P3	98J5	2001-10-01	35V5
98G3	2007-10-01	35P3	98K5	2001-10-01	35V5
98H3	2005-10-01	35P3, 35U3	98Z5	2007-10-01	35V5
35U4	2007-10-01	35P4	35Z5	2014-10-01	35V5
98G4	2007-10-01	35P4	98X1	2007-10-01	35W1
98H4	2005-10-01	35P4, 35U4	96B5	2007-10-01	35X5
98K1	2005-10-01	35S1	96D5	2007-10-01	35X5

Table B.1—Continued

Original MOS	Effective Date	New MOS	Original MOS	Effective Date	New MOS
98Y1	2007-10-01	35S1	96H5	2007-10-01	35X5
98K2	2005-10-01	35S2	96Z5	2007-10-01	35X5
98Y2	2007-10-01	35S2	35F5	2008-10-01	35X5
98K3	2005-10-01	35S3	35G5	2008-10-01	35X5
98Y3	2007-10-01	35S3	35H5	2008-10-01	35X5
98K4	2005-10-01	35S4	97E5	2007-10-01	35Y5
98Y4	2007-10-01	35S4	97B5	2007-10-01	35Y5
33W1	2007-10-01	35T1	97Z5	2007-10-01	35Y5
33W2	2007-10-01	35T2	35L5	2008-10-01	35Y5
33W3	2007-10-01	35T3	35M5	2008-10-01	35Y5
33W4	2007-10-01	35T4	35T6	2014-10-01	35Z6
33W5	2007-10-01	35T5	35X6	2014-10-01	35Z6
35Y6	2014-10-01	35Z6	91H3	2006-10-01	68H3
91A1	2006-10-01	68A1	42E4	2001-10-01	68H4
91A2	2006-10-01	68A2	91H4	2006-10-01	68H4
91A3	2006-10-01	68A3	76J1	2001-10-01	68J1
91A4	2006-10-01	68A4	91J1	2006-10-01	68J1
91A5	2006-10-01	68A5	76J2	2001-10-01	68J2
91D1	2006-10-01	68D1	91J2	2006-10-01	68J2
91D2	2006-10-01	68D2	76J3	2001-10-01	68J3
91D3	2006-10-01	68D3	91J3	2006-10-01	68J3
91D4	2006-10-01	68D4	76J4	2001-10-01	68J4
91E1	2006-10-01	68E1	91J4	2006-10-01	68J4
91E2	2006-10-01	68E2	76J5	2001-10-01	68J5
91E3	2006-10-01	68E3	91J5	2006-10-01	68J5
91E4	2006-10-01	68E4	91K1	2006-10-01	68K1
91E5	2006-10-01	68E5	91K2	2006-10-01	68K2
71G3	2001-10-01	68G3	91K3	2006-10-01	68K3
91G3	2006-10-01	68G3	91K4	2006-10-01	68K4
71G4	2001-10-01	68G4	91K5	2006-10-01	68K5
91G4	2006-10-01	68G4	91M1	2006-10-01	68M1
71G5	2001-10-01	68G5	91M2	2006-10-01	68M2
91G5	2006-10-01	68G5	91M3	2006-10-01	68M3

Table B.1—Continued

Original MOS	Effective Date	New MOS	Original MOS	Effective Date	New MOS
42E1	2001-10-01	68H1	91M4	2006-10-01	68M4
91H1	2006-10-01	68H1	91M5	2006-10-01	68M5
42E2	2001-10-01	68H2	91P1	2006-10-01	68P1
91H2	2006-10-01	68H2	91P2	2006-10-01	68P2
42E3	2001-10-01	68H3	91P3	2006-10-01	68P3
91P4	2006-10-01	68P4	91C3	2001-10-01	68W3
91P5	2006-10-01	68P5	91W3	2006-10-01	68W3
91Q1	2006-10-01	68Q1	91B4	2001-10-01	68W4
91Q2	2006-10-01	68Q2	91C4	2001-10-01	68W4
91Q3	2006-10-01	68Q3	91W4	2006-10-01	68W4
91Q4	2006-10-01	68Q4	91W5	2006-10-01	68W5
91Q5	2006-10-01	68Q5	91B5	2001-10-01	68W5, 68Z5
91R1	2006-10-01	68R1	91C5	2001-10-01	68W5, 68Z5
91R2	2006-10-01	68R2	91X1	2006-10-01	68X1
91R3	2006-10-01	68R3	91X2	2006-10-01	68X2
91R4	2006-10-01	68R4	91X3	2006-10-01	68X3
91R5	2006-10-01	68R5	91X4	2006-10-01	68X4
91S1	2006-10-01	68S1	91Z5	2006-10-01	68Z5
91S2	2006-10-01	68S2	68Z5	2011-10-01	68Z5
91S3	2006-10-01	68S3	68A6	2013-10-01	68Z6
91S4	2006-10-01	68S4	68K6	2013-10-01	68Z6
91S5	2006-10-01	68S5	68R6	2013-10-01	68Z6
91T1	2006-10-01	68T1	68S6	2013-10-01	68Z6
91T2	2006-10-01	68T2	35A1	2005-10-01	94A1
91T3	2006-10-01	68T3	35A2	2005-10-01	94A2
91T4	2006-10-01	68T4	35A3	2005-10-01	94A3
91V1	2006-10-01	68V1	35D1	2005-10-01	94D1
91V2	2006-10-01	68V2	35D2	2005-10-01	94D2
91V3	2006-10-01	68V3	35D3	2005-10-01	94D3
91V4	2006-10-01	68V4	35D4	2005-10-01	94D4
91B3	2001-10-01	68W3	35E2	2005-10-01	94E2
35L2	2005-10-01	94E2	35S2	2005-10-01	94S2
35E3	2005-10-01	94E3	35S3	2005-10-01	94S3

Table B.1—Continued

Original MOS	Effective Date	New MOS	Original MOS	Effective Date	New MOS
35L3	2005-10-01	94E3	35Y1	2005-10-01	94Y1
35E4	2005-10-01	94E4	35B2	2002-10-01	94Y2
35J1	2005-01-01	94F1	35Y2	2005-10-01	94Y2
35N1	2005-04-01	94F1	35B3	2002-10-01	94Y3
35F1	2005-10-01	94F1	35Y3	2005-10-01	94Y3
35J2	2005-01-01	94F2	35Y5	2005-04-01	94Z5
35N2	2005-04-01	94F2	35D5	2005-10-01	94Z5
35F2	2005-10-01	94F2	35S5	2005-10-01	94Z5
35J3	2005-01-01	94F3	35V5	2005-10-01	94Z5
35N3	2005-04-01	94F3	14L1	2001-10-01	N/A
35F3	2005-10-01	94F3	68X1	2004-09-01	N/A
35C1	2000-04-01	94M1	14M1	2010-10-01	N/A
35M1	2005-10-01	94M1	14L2	2001-10-01	N/A
35C2	2000-04-01	94M2	68X2	2004-09-01	N/A
35M2	2005-10-01	94M2	14M2	2010-10-01	N/A
35C3	2000-04-01	94M3	14L3	2001-10-01	N/A
35M3	2005-10-01	94M3	68X3	2004-09-01	N/A
35P1	2005-10-01	94P1	14M3	2010-10-01	N/A
35P2	2005-10-01	94P2	14L4	2001-10-01	N/A
35P3	2005-10-01	94P3	68X4	2004-09-01	N/A
35R1	2005-10-01	94R1	14M4	2010-10-01	N/A
35R2	2005-10-01	94R2			
35R3	2005-10-01	94R3			
35S1	2005-10-01	94S1			
35S4	2005-10-01	94S4			
35T1	2005-10-01	94T1			
35T2	2005-10-01	94T2			
35T3	2005-10-01	94T3			
35A4	2005-10-01	94W4			
35P4	2005-10-01	94W4			
35T4	2005-10-01	94W4			
35Y4	2005-10-01	94W4			
35B1	2002-10-01	94Y1			

SOURCE: Author's calculation and Department of the Army (2019a).

APPENDIX C

Model Estimates and Model Fits for the Other MOSs

In this appendix, we describe the DRM model estimates and model fits for other MOSs, including 14E (Patriot fire control enhanced operator), 17E (electronic warfare specialist), 18B (Special Forces weapons sergeant), 35F (intelligence analyst), and 68P (radiology specialist). Models are tailored to each MOS.

Each model either includes five (2000–2004) or ten cohorts (2000–2009), as shown in Table D.1, in which the number of cohorts was chosen based on which set fit the data better and/or provided statistically significant estimates of reasonable magnitude. Moreover, each model incorporates the first-term length of the MOS as observed in the data, as well as its historical SRB. Across the MOS, the first term of length ranges from three to six years, with the exception of 17E and 18B. For these two MOSs, the observed retention profiles of enlisted service members show atypically high retention in the first few years of service, indicating that these occupations require a number of years of active-duty service before they become a 17E or 18B. Specifically, there is 100-percent retention until YOS nine for 17E, and for 18B, there is 100-percent retention until YOS five. For 17E, we assume that the first-term length is 13 years, which is when the first substantial drop in retention occurs in the observed retention profile. For 18B, the first-term length is assumed to be ten years. Additionally, for 17E, we manually restrict the model to setting the probability of being on active duty to one for nine or fewer YOS to assist with model fit. Although the models for 17E and 18B visually fit the data well, some of the key parameter estimates are statistically insignificant. As a consequence, model results and simulations for enlisted service members in MOSs 17E and 18B are viewed as exploratory.

Model Estimates

With the exception of the models for 17E and 18B, Table C.1 shows that the parameter estimates are generally statistically significant for each MOS model, with the exception of the between-nest scale parameters τ. For the 17E model, the within-nest scale parameter λ, mean active and reserve tastes, the standard deviation of reserve taste, and the switch cost from leaving active duty before the first term are statistically insignificant. For the 18B model, mean active taste and the standard deviation of active taste are statistically insignificant. Table C.2 reports the transformed parameter estimates. The coefficients are the expected signs with negative mean active and reserve tastes, indicating a distaste for active and reserve service relative to working in the civilian sector, and negative switching costs, indicating costs associated with leaving before the first term and moving from the civilian sector to the reserves.

Model Fits

Figures C.1 through C.5 show that the model-predicted retention (red lines) generally falls with the 95-percent confidence interval of the Kaplan-Meier estimates for the observed data, indicating that the models fit the data well.

TABLE C.1

Parameter Estimates and Standard Errors, by MOS

	14E		17E		18B		35F		68P	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Log(scale parameter, nest = τ)	0.15	22.16	3.87	0.25	4.23	0.15	1.6	4.98	5.69	0.10
Log(scale parameter, alternatives within nest = λ)	4.65	0.43	1.01	1.13	2.49	0.59	5.01	0.38	1.51	0.00
Log(–1 x mean active taste = μ_a)	3.75	0.34	–2.68	16.28	–2.95	23.94	4.21	0.33	6.34	0.04
Log(–1 x mean reserve taste = μ_r)	6.05	0.43	4.75	4.69	4.49	0.46	5.85	0.37	3.04	0.05
Log(SD active taste = σ_a)	3.85	0.48	3.35	0.45	–8.44	256.64	4.35	0.4	6.18	0.03
Log(SD reserve taste = σ_r)	5.63	0.44	4.33	4.82	4.26	0.47	5.48	0.38	2.29	0.06
Atanh(taste correlation = ρ)	0.54	0.03	0.45	0.12	1.07	0.2	0.61	0.02	0.37	0.07
Log(–1 x switch cost: leave active < ADSO)	4.44	0.45	3.66	0.39	3.54	0.27	5.22	0.38	6.61	0.00
Log(–1 x switch cost: switch from civilian to reserve)	6.00	0.43	0.75	2.45	3.35	0.86	6.41	0.38	3.01	0.06
personal discount factor β (assumed)	0.88	N/A	0.88	N/A	0.88	N/A	0.88	N/A	0.88	N/A
–1 x log likelihood	6,969		198		221		22,636		1,868	
N	2,099		139		90		6,399		598	
Cohorts included	2000–2009		2000–2004		2000–2004		2000–2009		2000–2004	

SOURCE: Parameter estimates from cohorts of enlisted personnel entering active duty in years listed in the table.

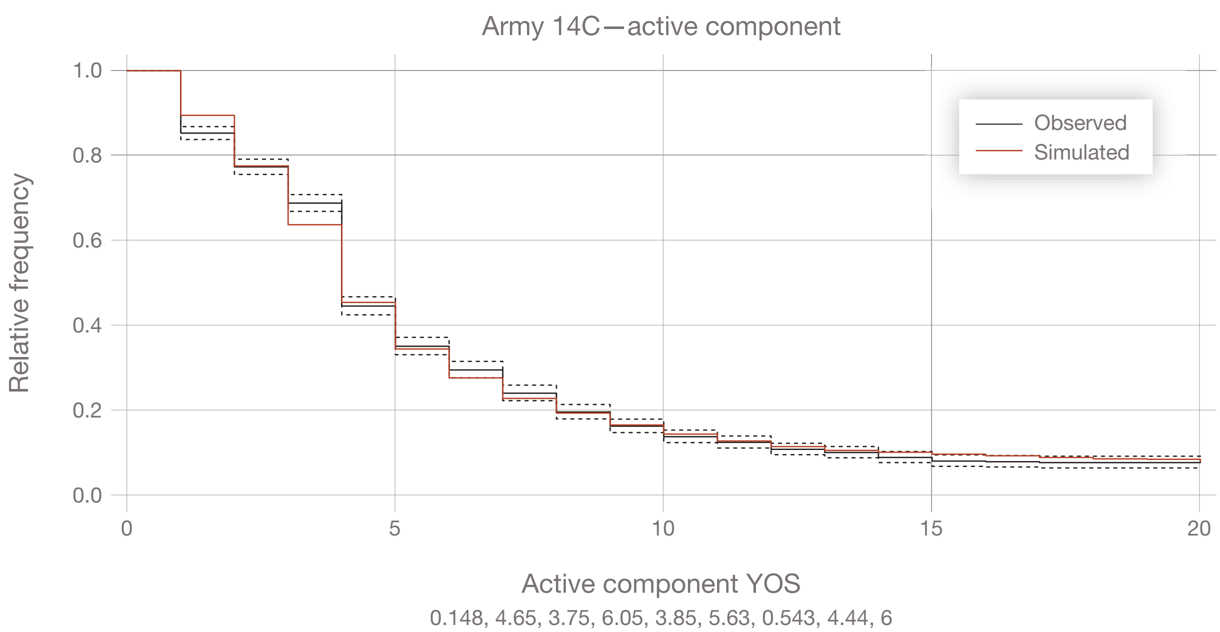
NOTES: The scale parameter κ governs the shocks to the value functions for staying and for the reserve-versus-civilian nest and equals $\sqrt{\lambda^2+\tau^2}$. The means and standard deviations of tastes for active and reserve service relative to civilian opportunities are estimated, as are the costs associated with leaving active duty before completing the ADSO and switching from civilian status to participating in the reserves. The personal discount factor was assumed to be 0.88 in these models. Grayed-out estimates are not statistically significant.

TABLE C.2
Transformed Parameter Estimates, by MOS

	14E	17E	18B	35F	68P
Scale parameter, nest = τ	1.16	48.12	68.4	4.96	295.64
Scale parameter, alternatives within nest = λ	104.69	2.75	12.02	149.32	4.53
Mean active taste = μ_a	–42.41	–0.07	–0.05	–67.67	–566.49
Mean reserve taste = μ_r	–424.65	–115.4	–89.28	–348.36	–20.91
SD active taste = σ_a	46.77	28.58	0	77.81	483.2
SD reserve taste = σ_r	279.28	76.3	70.59	239.33	9.89
Taste correlation = ρ	0.5	0.42	0.79	0.55	0.35
Switch cost: leave active < ADSO	–84.89	–38.92	–34.4	–184.42	–739.38
Switch cost: switch from civilian to reserve	–404.18	–2.12	–28.59	–609.61	–20.38
Personal discount factor β (assumed)	0.88	0.88	0.88	0.88	0.88

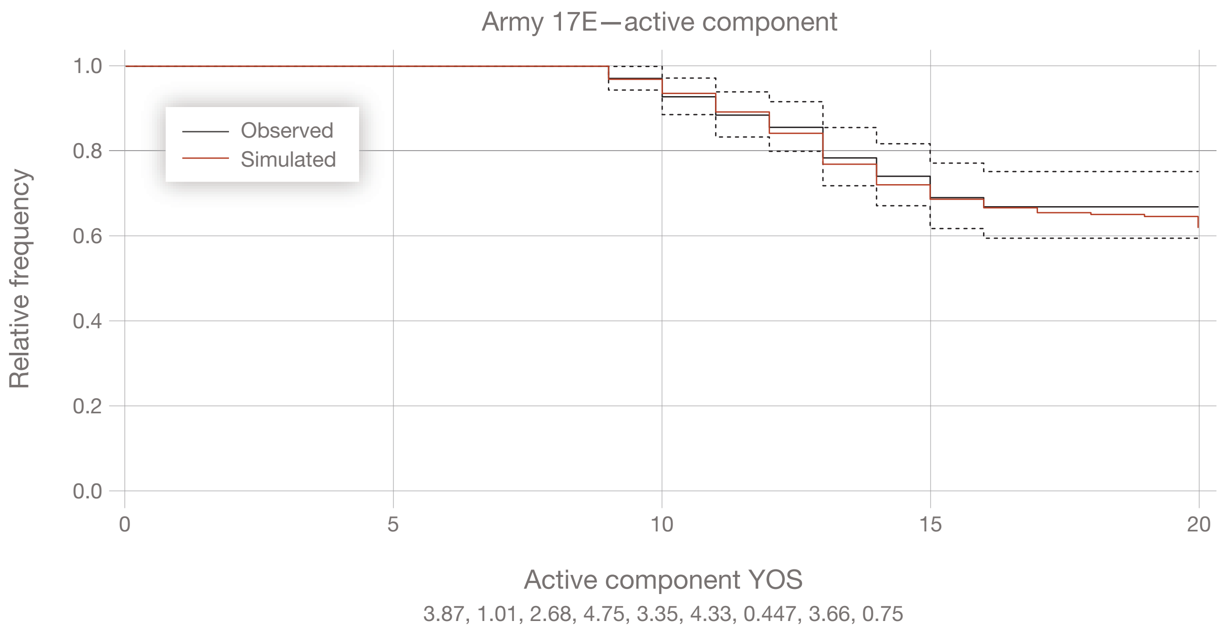
NOTE: Transformed parameters are denominated in thousands of 2007 dollars, with the exception of the taste correlation and personal discount factor. Grayed-out estimates are not statistically significant. Definitions of variables are provided in Table D.1.

FIGURE C.1
Model Fit Results: Enlisted MOS 14E



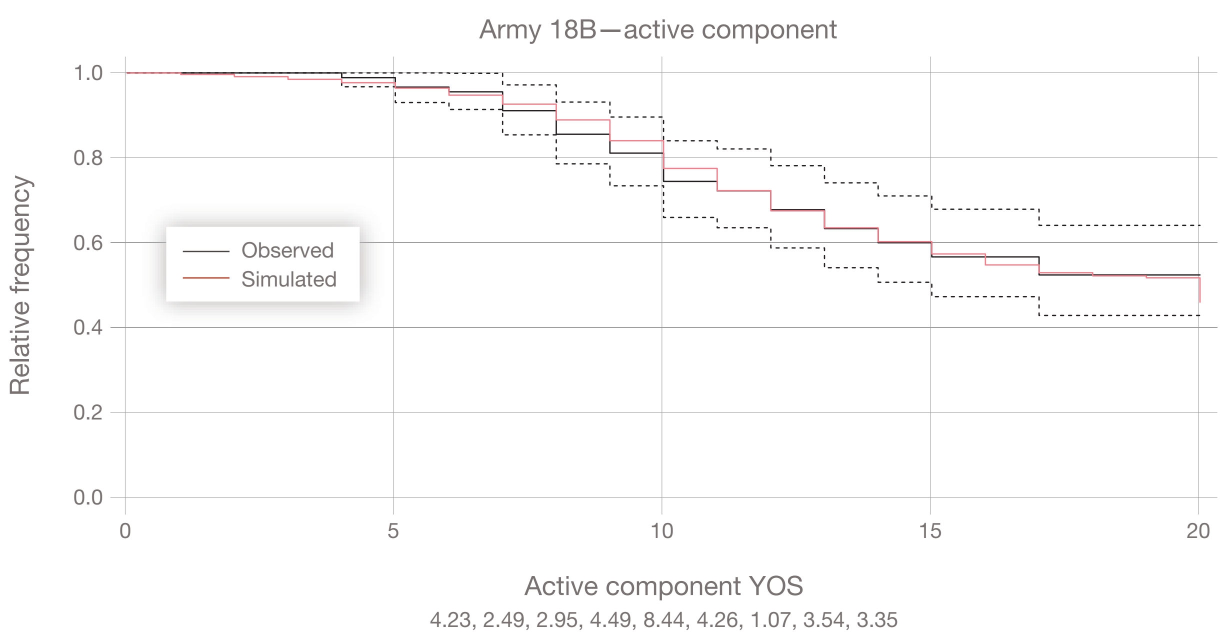
SOURCE: Authors' computations, DMDC WEX files.

FIGURE C.2
Model Fit Results: Enlisted MOS 17E



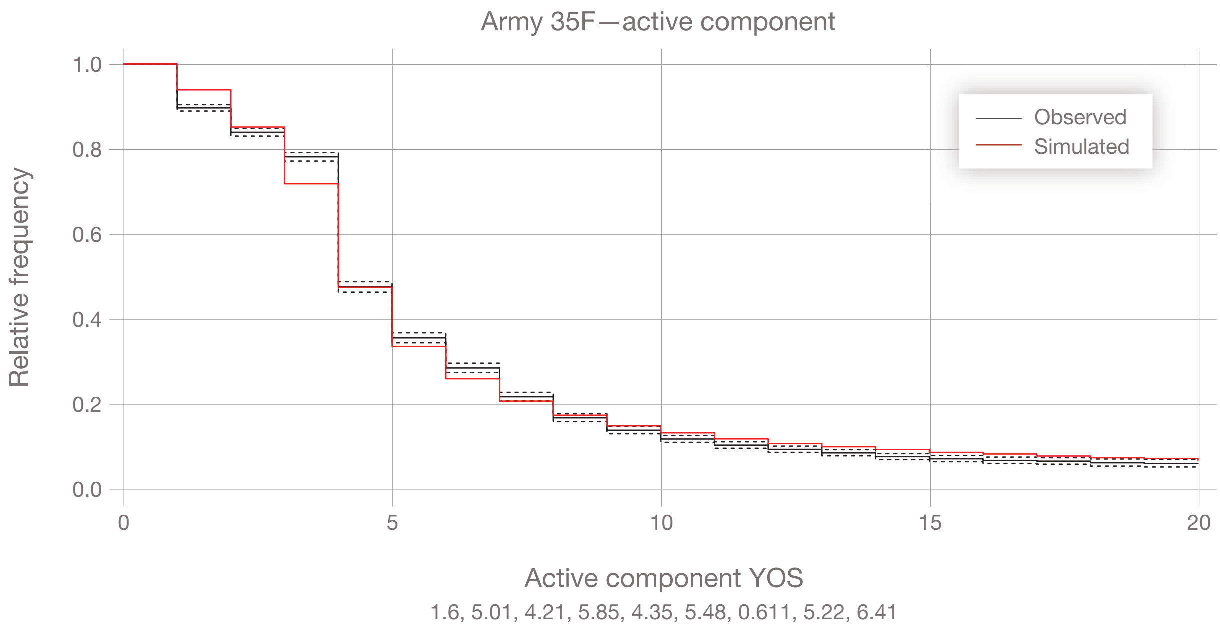
SOURCE: Authors' computations, DMDC WEX files.

FIGURE C.3
Model Fit Results: Enlisted MOS 18B



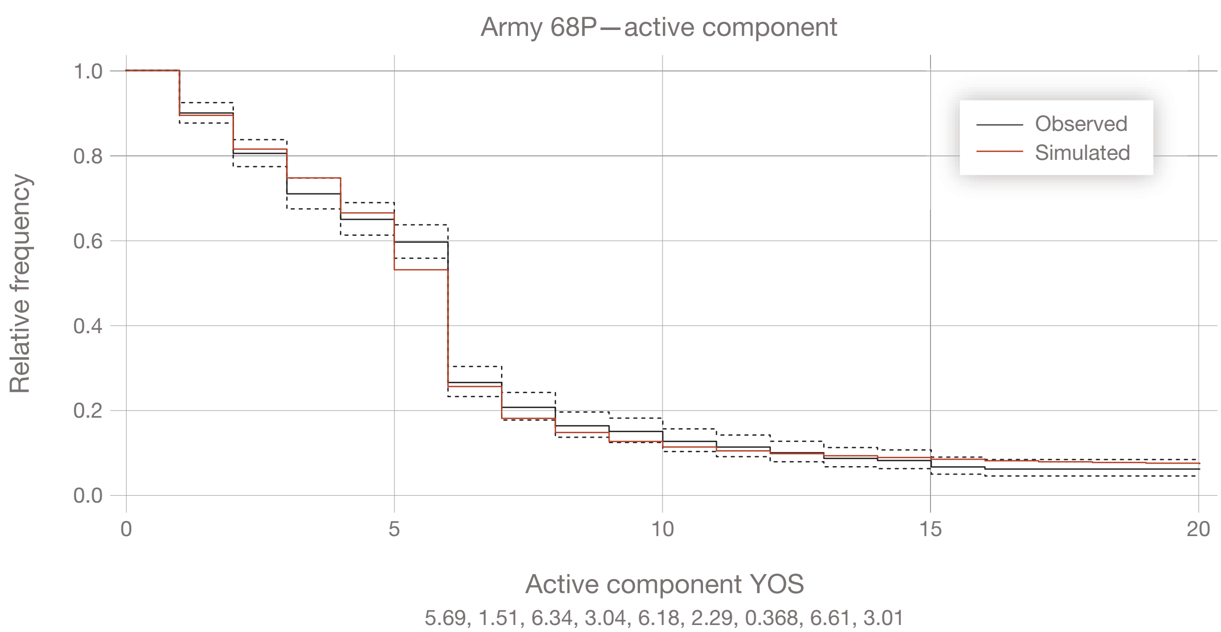
SOURCE: Authors' computations, DMDC WEX files.

FIGURE C.4
Model Fit Results: Enlisted MOS 35F



SOURCE: Authors' computations, DMDC WEX files.

FIGURE C.5
Model Fit Results: Enlisted MOS 68P



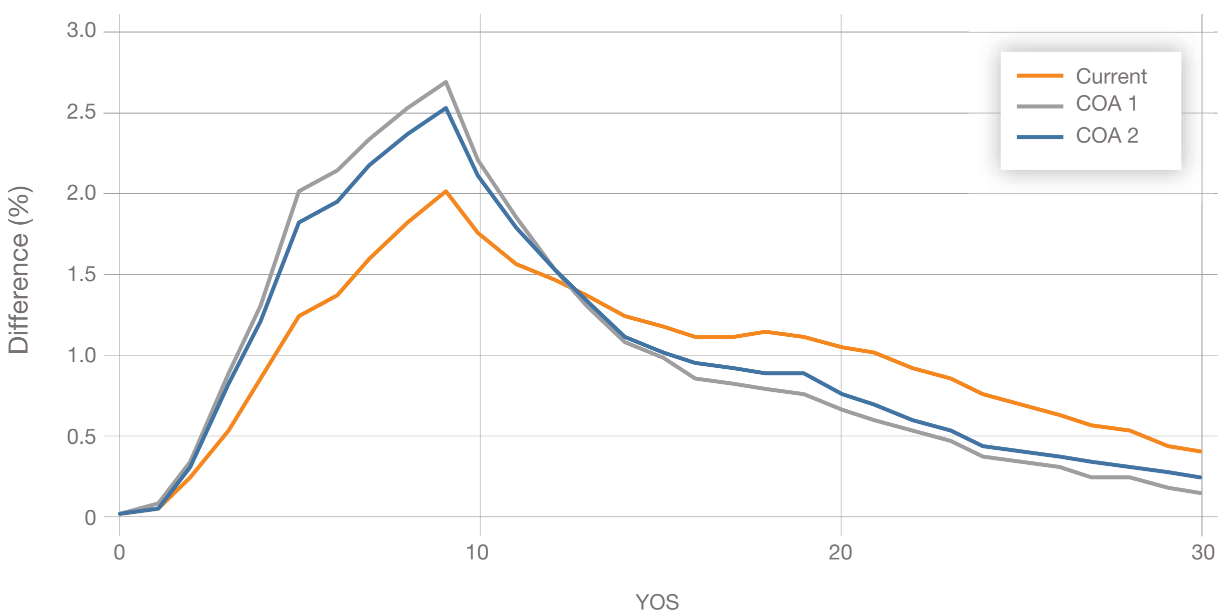
SOURCE: Authors' computations, DMDC WEX files.

Additional Results

This appendix shows the simulated effects of COAs 1–4 on retention, average ability, and cost per soldier for MOSs 14E, 17E, 18B, 35F, and 68P. These tables and figures correspond to the results for MOS 11B shown in Chapter Five. Before showing results for these other MOSs, we first show results for single-grade COAs for MOS 11B, discussed in Chapter Five.

Single-Grade COAs for MOS 11B

FIGURE D.1
MOS 11B Simulated Steady-State Difference in Retention for E-6 COAs



NOTES: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1 and 2 each increase MOS 11B force size by 5.3 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.1

MOS 11B Difference in Mean Ability Percentile Relative to Current Approach Case (by Grade, for E-6 COAs)

	Average	E-5	E-6	E-7	E-8
Baseline case	64.6	57.1	74.8	80.8	87.7
Current	64.7	57.0	73.5	78.5	86.7
Current – baseline	0.1	–0.1	–1.3	–2.3	–1.0
COA 1 – current	0.4	0.1	1.1	1.5	0.1
COA 2 – current	0.2	0.1	0.6	1.4	0.1

NOTES: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We computed the percentile of the ability distribution for each member in the force. The table shows the difference in mean percentile, by grade, relative to the current approach case.

TABLE D.2

Differences in MOS 11B SRB and Total Personnel Costs per Soldier for E-6 COAs, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	62,600
Current approach case	5,700	69,600
COA 1 – current	1,000	–3,000
COA 2 – current	1,000	–3,100

NOTES: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 11B inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

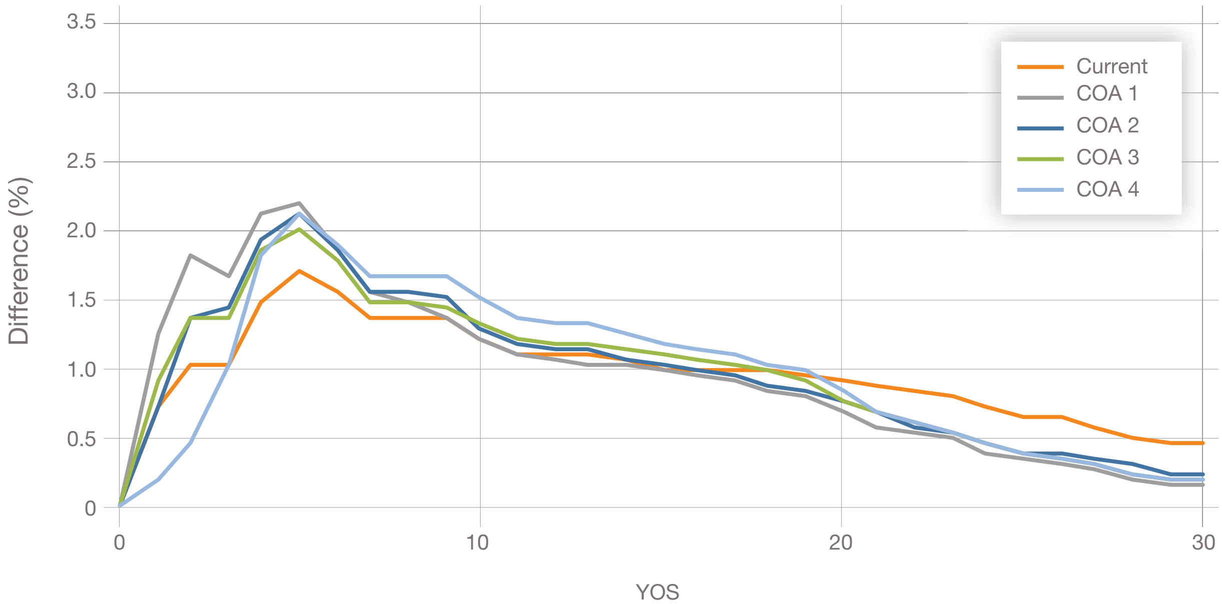
MOS 14E COAs

TABLE D.3
COAs for MOS 14E, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$2,650	$5,400	$4,750	$3,269	
	> 1	$0	$2,650	$0	$1,000	$0	
	= 0						$54,300
	> 0						$0
E-4	≤ 2	$0	$2,650	$5,400	$4,750	$3,621	
	> 2	$0	$2,650	$0	$1,000	$0	
	≤ 1						$54,300
	> 1						$0
E-5	≤ 4	$0	$2,650	$5,400	$4,750	$4,627	
	> 4	$0	$2,650	$0	$1,000	$0	
	≤ 3						$54,300
	> 3						$0
E-6	≤ 8	$0	$2,650	$5,400	$4,750	$5,846	
	> 8	$0	$2,650	$0	$1,000	$0	
	≤ 7						$54,300
	> 7						$0
E-7	≤ 14	$0	$2,650	$5,400	$4,750	$7,396	
	>14	$0	$2,650	$0	$1,000	$0	
	≤ 13						$54,300
	> 13						$0
E-8	≤ 18	$0	$2,650	$5,400	$4,750	$8,633	
	>18	$0	$2,650	$0	$1,000	$0	
	≤ 17						$54,300
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on 68P inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 5.20.

FIGURE D.2
MOS 14E Simulated Difference in Retention Relative to Baseline Case



NOTES: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 14E force size by 5.3 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.4
MOS 14E Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade

	Average	E-5	E-6	E-7	E-8
Baseline case	64.5	55.1	75	81.6	88.4
Current	64.2	54.8	73.6	81.4	86.8
Current – baseline	–0.3	–0.3	–1.4	–2.2	–1.6
COA 1 – current	0.7	0.1	1.4	1.6	1.5
COA 2 – current	0.5	0.1	1.1	1.1	1.1
COA 3 – current	0.6	0.1	1.5	1.8	1.6
COA 4 – current	1.7	0.4	2.4	3.0	2.5

NOTES: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We computed the percentile of the ability distribution for each member in the force. The graph shows the mean of the percentile, by grade. The table shows the difference in mean percentile, by grade, relative to the current approach case.

TABLE D.5

Difference in SRB and Total Personnel Costs per Soldier in MOS 14E for COAs 1–4, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	65,300
Current approach case	3,300	69,600
COA 1 – current	1,000	1,000
COA 2 – current	0	–100
COA 3 – current	200	500
COA 4 – current	–400	–100

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 14E inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

MOS 17E COAs

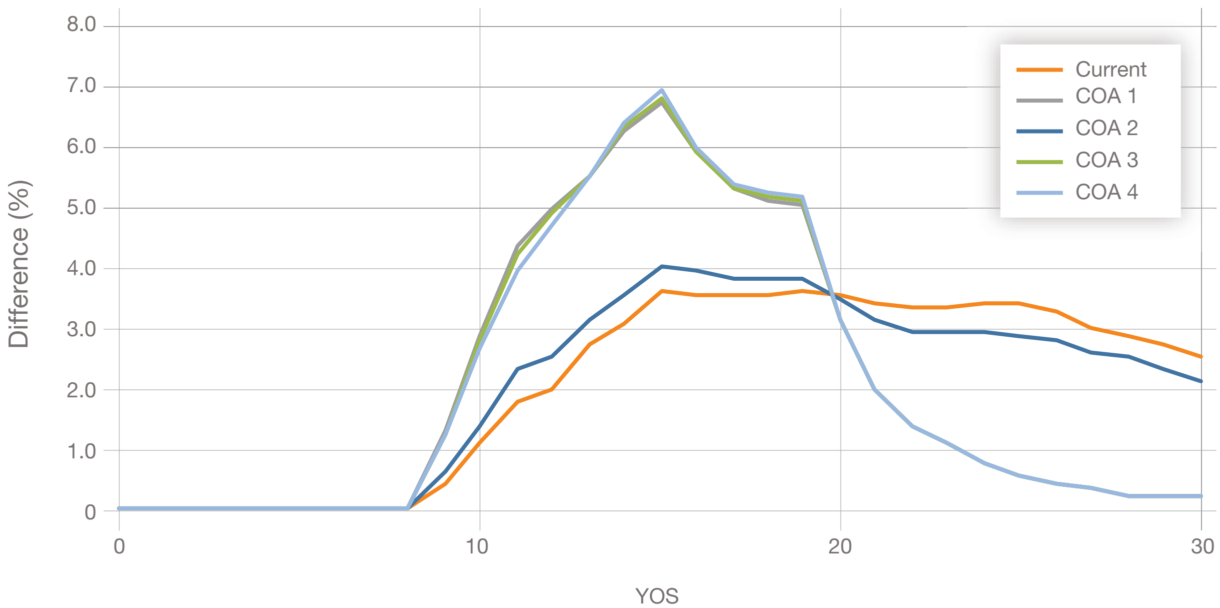
TABLE D.6

COAs for MOS 17E, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$2,630	$32,432	$6,800	$14,538	
	> 1	$0	$2,630	$0	$2,167	$0	
	= 0						$50,335
	> 0						$0
E-4	≤ 2	$0	$2,630	$32,432	$6,800	$16,103	
	> 2	$0	$2,630	$0	$2,167	$0	
	≤ 1						$50,335
	> 1						$0
E-5	≤ 4	$0	$2,630	$32,432	$6,800	$20,579	
	> 4	$0	$2,630	$0	$2,167	$0	
	≤ 3						$50,335
	> 3						$0
E-6	≤ 8	$0	$2,630	$32,432	$6,800	$26,001	
	> 8	$0	$2,630	$0	$2,167	$0	
	≤ 7						$50,335
	> 7						$0
E-7	≤ 14	$0	$2,630	$32,432	$6,800	$32,893	
	>14	$0	$2,630	$0	$2,167	$0	
	≤ 13						$50,335
	> 13						$0
E-8	≤ 18	$0	$2,630	$32,432	$6,800	$38,395	
	>18	$0	$2,630	$0	$2,167	$0	
	≤ 17						$50,335
	> 17						$0

NOTE: Assumes a 48-month additional obligation of service. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 3.0-percent effect on 17E inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 7.338.

FIGURE D.3
MOS 17E Simulated Difference in Retention Relative to Baseline Case



NOTE: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 17E force size by 3.0 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.7
MOS 17E Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade

	Average	E-5	E-6	E-7	E-8
Baseline case	56.5	53.6	54.5	56.6	58.2
Current	56.3	53.6	54.3	56.3	58.1
Current – baseline	–0.2	0.0	–0.2	–0.3	–0.1
COA 1 – current	0.3	0.0	0.2	0.4	0.5
COA 2 – current	0.0	–0.1	0.1	0.1	0.0
COA 3 – current	0.3	0.0	0.2	0.5	0.6
COA 4 – current	0.4	0.0	0.1	0.7	0.8

NOTE: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We compute the percentile of the ability distribution for each member in the force. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.8

Difference in SRB and Total Personnel Costs per Soldier in MOS 17E for COAs 1–4, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	82,400
Current approach case	3,200	86,200
COA 1 – current	11,400	12,000
COA 2 – current	1,200	1,300
COA 3 – current	7,500	8,100
COA 4 – current	7,900	8,600

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 3.0-percent effect on the 17E inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

TABLE D.9

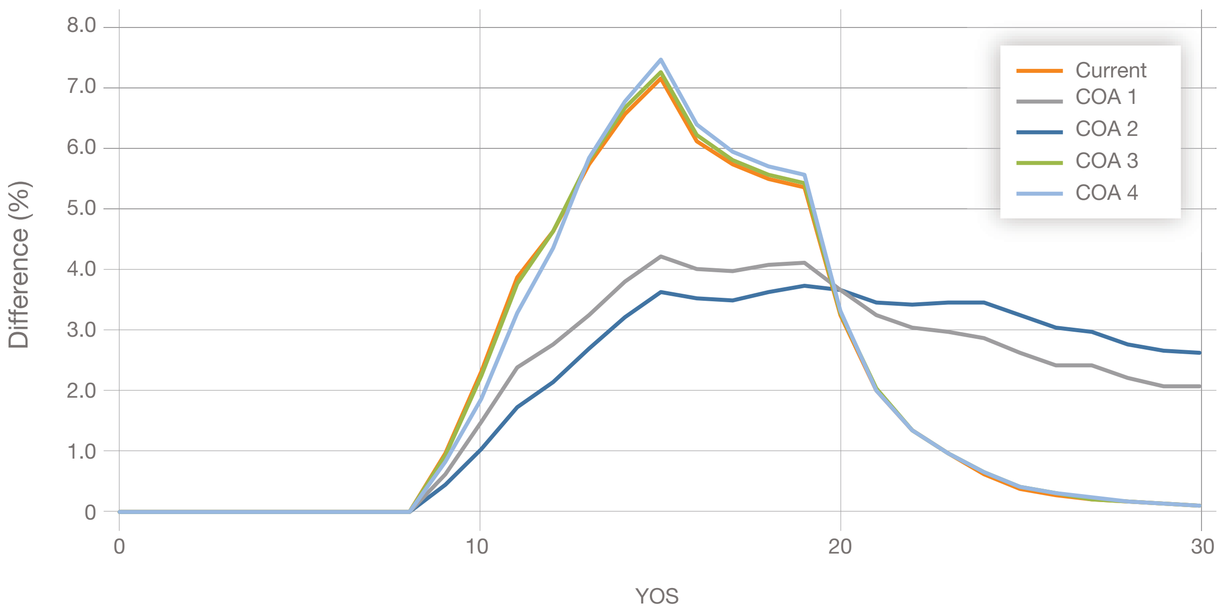
COAs for MOS 17E, Assuming a 48-Month Additional Obligation of Service and Log-Normal Ability

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$2,900	$37,500	$7,750	$17,236	
	> 1	$0	$2,900	$0	$2,250	$0	
	= 0						$61,000
	> 0						$0
E-4	≤ 2	$0	$2,900	$37,500	$7,750	$19,092	
	> 2	$0	$2,900	$0	$2,250	$0	
	≤ 1						$61,000
	> 1						$0
E-5	≤ 4	$0	$2,900	$37,500	$7,750	$24,398	
	> 4	$0	$2,900	$0	$2,250	$0	
	≤ 3						$61,000
	> 3						$0
E-6	≤ 8	$0	$2,900	$37,500	$7,750	$30,827	
	> 8	$0	$2,900	$0	$2,250	$0	
	≤ 7						$61,000
	> 7						$0
E-7	≤ 14	$0	$2,900	$37,500	$7,750	$38,999	
	>14	$0	$2,900	$0	$2,250	$0	
	≤ 13						$61,000
	> 13						$0
E-8	≤ 18	$0	$2,900	$37,500	$7,750	$45,521	
	>18	$0	$2,900	$0	$2,250	$0	
	≤ 17						$61,000
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.2. The COAs and the current approach case are simulated to produce approximately the same 3.0-percent effect on 17E inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 8.7.

FIGURE D.4

MOS 17E Simulated Difference in Retention Relative to Baseline Case Assuming Log-Normal Ability



SOURCE: Authors' calculations.

NOTE: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 17E force size by 3.0 percent. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.2.

TABLE D.10

MOS 17E Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade, Assuming Log-Normal Ability

	Average	E-5	E-6	E-7	E-8
Baseline case	54.6	54.4	55.5	54.1	52.3
Current	54.6	54.3	55.4	54.1	52.3
Current – baseline	0.0	–0.1	–0.1	0.0	0.0
COA 1 – current	0.5	0.1	0.2	0.7	1.4
COA 2 – current	0.0	0.0	0.0	0.1	0.1
COA 3 – current	0.5	0.1	0.2	0.8	1.6
COA 4 – current	0.6	0.1	0.1	0.8	1.8

NOTE: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.2. We compute the percentile of the ability distribution for each member in the force. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.11

Difference in SRB and Total Personnel Costs per Soldier in MOS 17E for COAs 1–4 Assuming Log-Normal Ability, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	84,000
Current approach case	3,500	88,000
COA 1 – current	16,600	17,300
COA 2 – current	1,900	2,000
COA 3 – current	12,400	13,100
COA 4 – current	15,700	16,400

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.2. The COAs and the current approach case are simulated to produce approximately the same 3.0-percent effect on the 17E inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

MOS 18B COAs

TABLE D.12

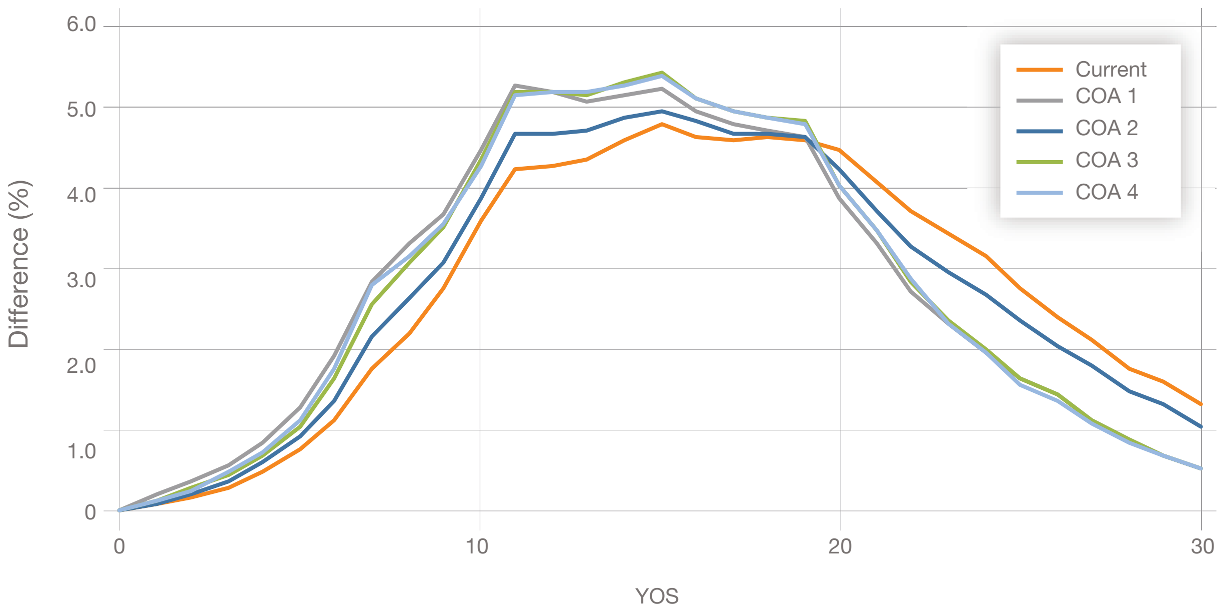
COAs for MOS 18B, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$2,180	$8,630	$4,400	$4,269	
	> 1	$0	$2,180	$0	$1,425	$0	
	= 0						$14,300
	> 0						$0
E-4	≤ 2	$0	$2,180	$8,630	$4,400	$4,729	
	> 2	$0	$2,180	$0	$1,425	$0	
	≤ 1						$14,300
	> 1						$0
E-5	≤ 4	$0	$2,180	$8,630	$4,400	$6,043	
	> 4	$0	$2,180	$0	$1,425	$0	
	≤ 3						$14,300
	> 3						$0
E-6	≤ 8	$0	$2,180	$8,630	$4,400	$7,636	
	> 8	$0	$2,180	$0	$1,425	$0	
	≤ 7						$14,300
	> 7						$0
E-7	≤ 14	$0	$2,180	$8,630	$4,400	$9,660	
	>14	$0	$2,180	$0	$1,425	$0	
	≤ 13						$14,300
	> 13						$0
E-8	≤ 18	$0	$2,180	$8,630	$4,400	$11,276	
	>18	$0	$2,180	$0	$1,425	$0	
	≤ 17						$14,300
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on 18B inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 2.155.

FIGURE D.5

MOS 18B Simulated Difference in Retention Relative to Baseline Case



NOTE: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 18B force size by 5.3 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.13

MOS 18B Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade

	Average	E-5	E-6	E-7	E-8
Baseline case	55.2	50.5	53.0	57.9	58.7
Current	55.1	50.8	52.8	57.2	58.2
Current – baseline	−0.1	0.3	−0.2	−0.7	−0.5
COA 1 – current	0.6	−0.2	0.4	1.6	1.3
COA 2 – current	0.2	0.0	0.3	0.6	0.3
COA 3 – current	0.6	−0.2	0.4	1.7	1.6
COA 4 – current	0.1	−0.2	0.5	2.2	2.3

NOTE: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We compute the percentile of the ability distribution for each member in the force. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.14

Difference in SRB and Total Personnel Costs per Soldier in MOS 18B for COAs 1–4, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	79,000
Current approach case	2,700	82,900
COA 1 – current	2,000	2,300
COA 2 – current	400	500
COA 3 – current	1,100	1,400
COA 4 – current	1,100	1,400

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 18B inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

TABLE D.15

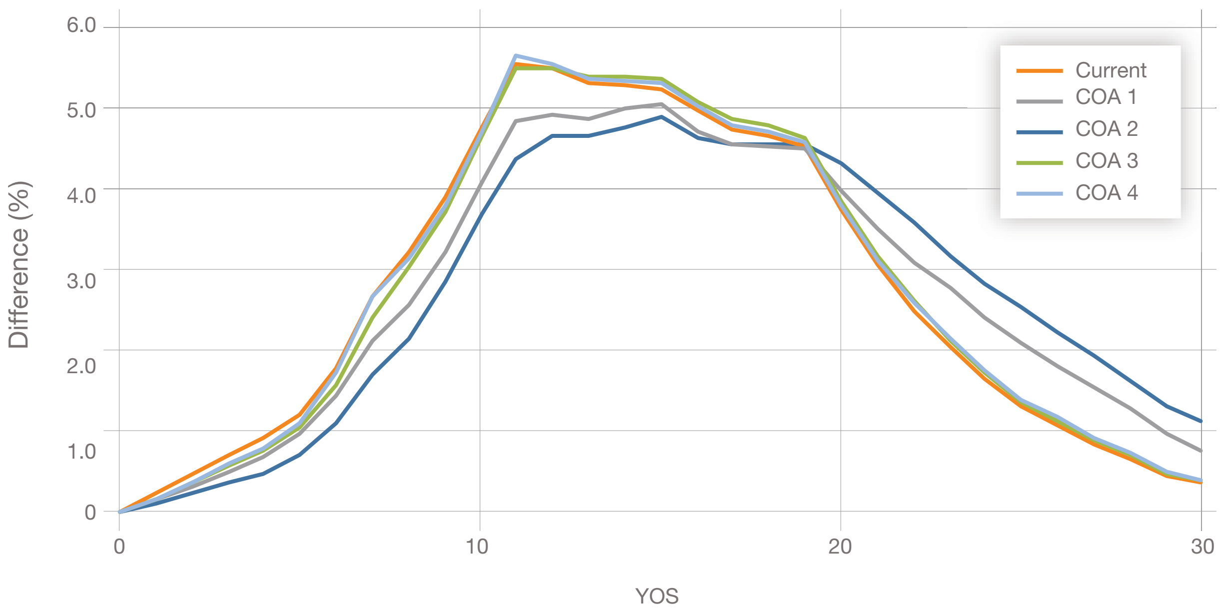
COAs for MOS 18B, Assuming a 48-Month Additional Obligation of Service and Log-Normal Ability

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$2,350	$7,800	$4,500	$3,715	
	> 1	$0	$2,350	$0	$1,350	$0	
	= 0						$10,950
	> 0						$0
E-4	≤ 2	$0	$2,350	$7,800	$4,500	$4,115	
	> 2	$0	$2,350	$0	$1,350	$0	
	≤ 1						$10,950
	> 1						$0
E-5	≤ 4	$0	$2,350	$7,800	$4,500	$5,258	
	> 4	$0	$2,350	$0	$1,350	$0	
	≤ 3						$10,950
	> 3						$0
E-6	≤ 8	$0	$2,350	$7,800	$4,500	$6,644	
	> 8	$0	$2,350	$0	$1,350	$0	
	≤ 7						$10,950
	> 7						$0
E-7	≤ 14	$0	$2,350	$7,800	$4,500	$8,405	
	>14	$0	$2,350	$0	$1,350	$0	
	≤ 13						$10,950
	> 13						$0
E-8	≤ 18	$0	$2,350	$7,800	$4,500	$9,811	
	>18	$0	$2,350	$0	$1,350	$0	
	≤ 17						$10,950
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.45. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on 18B inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 1.875.

FIGURE D.6

MOS 18B Simulated Difference in Retention Relative to Baseline Case Assuming Log-Normal Ability



NOTE: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 18B force size by 5.3 percent. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.45.

TABLE D.16

MOS 18B Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade, Assuming Log-Normal Ability

	Average	E-5	E-6	E-7	E-8
Baseline case	49.6	43.7	48.7	50.7	53.9
Current	49.5	44.0	48.6	50.3	53.3
Current – baseline	–0.1	0.3	–0.1	–0.4	–0.6
COA 1 – current	0.2	–0.2	–0.1	0.5	0.6
COA 2 – current	0.0	–0.3	0.0	0.3	0.1
COA 3 – current	0.2	–0.2	–0.1	0.6	0.6
COA 4 – current	0.3	–0.2	–0.2	0.9	0.9

NOTE: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.45. We compute the percentile of the ability distribution for each member in the force. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.17

Difference in SRB and Total Personnel Costs per Soldier in MOS 18B for COAs 1–4 Assuming Log-Normal Ability, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	80,000
Current approach case	2,900	84,100
COA 1 – current	2,200	2,400
COA 2 – current	600	600
COA 3 – current	1,200	1,500
COA 4 – current	1,200	1,500

NOTE: Assumes a 48-month AOS. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 18B inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB. Ability is assumed to follow a log-normal distribution with mean zero and standard deviation of 0.45.

MOS 35F COAs

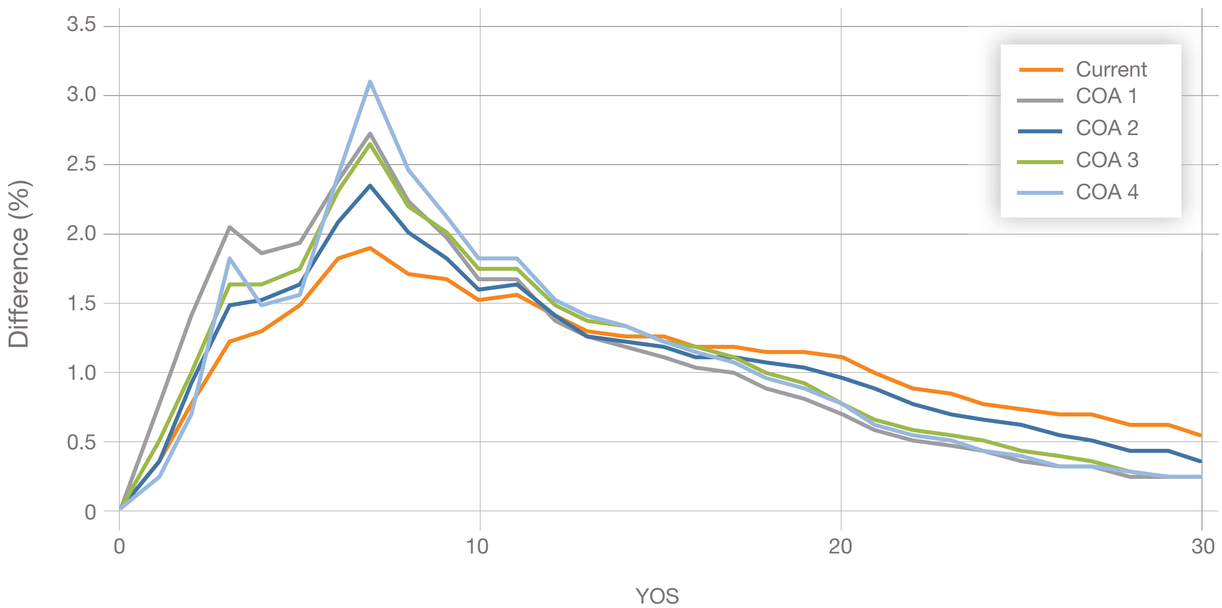
TABLE D.18
COAs for MOS 35F, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$5,000	$10,950	$7,825	$6,241	
	> 1	$0	$5,000	$0	$2,500	$0	
	= 0						$18,000
	> 0						$0
E-4	≤ 2	$0	$5,000	$10,950	$7,825	$6,913	
	> 2	$0	$5,000	$0	$2,500	$0	
	≤ 1						$18,000
	> 1						$0
E-5	≤ 4	$0	$5,000	$10,950	$7,825	$8,834	
	> 4	$0	$5,000	$0	$2,500	$0	
	≤ 3						
	> 3						
E-6	≤ 8	$0	$5,000	$10,950	$7,825	$11,161	
	> 8	$0	$5,000	$0	$2,500	$0	
	≤ 7						$18,000
	> 7						$0
E-7	≤ 14	$0	$5,000	$10,950	$7,825	$14,120	
	>14	$0	$5,000	$0	$2,500	$0	
	≤ 13						$18,000
	> 13						$0
E-8	≤ 18	$0	$5,000	$10,950	$7,825	$16,482	
	>18	$0	$5,000	$0	$2,500	$0	
	≤ 17						$18,000
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on 35F inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 3.15.

FIGURE D.7

MOS 35F Simulated Difference in Retention Relative to Baseline Case



NOTES: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 35F force size by 5.3 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.19

MOS 35F Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade

	Average	E-5	E-6	E-7	E-8
Baseline case	63.4	56	71.7	79.6	85.8
Current	63.2	56.1	70.1	77	83.9
Current – baseline	−0.2	0.1	−1.6	−2.6	
COA 1 – current	0.5	−0.3	0.7	2.4	2.1
COA 2 – current	0.3	−0.2	0.3	1.1	1.8
COA 3 – current	0.5	−0.3	0.7	2.3	1.8
COA 4 – current	0.9	−0.3	1.3	3.4	2.9

NOTES: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We compute the percentile of the ability distribution for each member in the force. The graph shows the mean of the percentile, by grade. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.20

Difference in SRB and Total Personnel Costs per Soldier in MOS 35F for COAs 1–4, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	63,400
Current approach case	6,100	70,700
COA 1 – current	2,600	2,500
COA 2 – current	200	100
COA 3 – current	700	700
COA 4 – current	–1,000	–1,000

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 35F inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

MOS 68P COAs

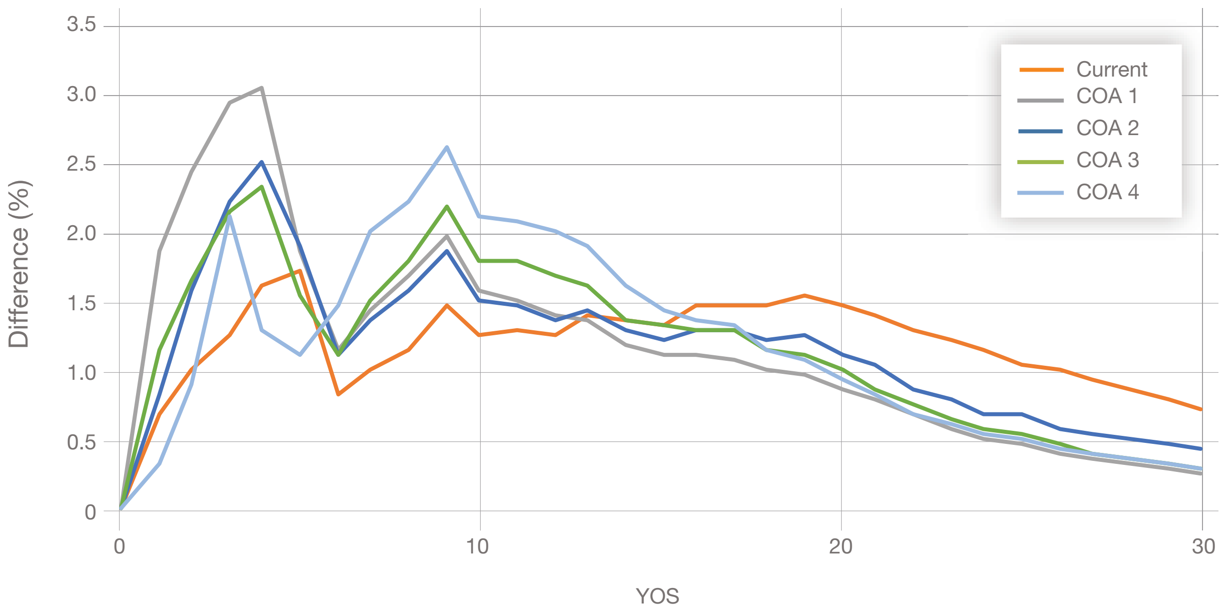
TABLE D.21
COAs for MOS 68P, Assuming a 48-Month Additional Obligation of Service

	YOS	Baseline (1)	Current Approach (2)	COA 1 (3)	COA 2 (4)	COA 3 (5)	COA 4 (6)
E-3	≤ 1	$0	$22,500	$60,500	$50,000	$33,680	
	> 1	$0	$22,500	$0	$10,000	$0	
	= 0						$104,000
	> 0						$0
E-4	≤ 2	$0	$22,500	$60,500	$50,000	$37,307	
	> 2	$0	$22,500	$0	$10,000	$0	
	≤ 1						$104,000
	> 1						$0
E-5	≤ 4	$0	$22,500	$60,500	$50,000	$47,675	
	> 4	$0	$22,500	$0	$10,000	$0	
	≤ 3						
	> 3						
E-6	≤ 8	$0	$22,500	$60,500	$50,000	$60,236	
	> 8	$0	$22,500	$0	$10,000	$0	
	≤ 7						$104,000
	> 7						$0
E-7	≤ 14	$0	$22,500	$60,500	$50,000	$76,204	
	>14	$0	$22,500	$0	$10,000	$0	
	≤ 13						$104,000
	> 13						$0
E-8	≤ 18	$0	$22,500	$60,500	$50,000	$88,949	
	>18	$0	$22,500	$0	$10,000	$0	
	≤ 17						$104,000
	> 17						$0

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on 68P inventory size relative to the baseline case. The multiplier of monthly basic pay used for COA 3 is 17.

FIGURE D.8

MOS 68P Simulated Difference in Retention Relative to Baseline Case



NOTES: The chart shows the difference in the cumulative percentage of an entry cohort retained. The current approach case and COAs 1–4 each increase MOS 68P force size by 5.3 percent. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5.

TABLE D.22

MOS 68P Difference in Mean Ability Percentile Relative to Current Approach Case, by Grade

	Average	E-5	E-6	E-7	E-8
Baseline case	62.9	53.7	74.6	79.5	87.5
Current	61.2	53.0	70.1	73.0	81.8
Current – baseline	–1.7	–0.7	–4.5	–6.5	–5.7
COA 1 – current	0.8	0.1	1.9	2.3	1.8
COA 2 – current	0.5	0.0	1.2	1.6	1.5
COA 3 – current	0.9	0.2	1.8	2.3	1.6
COA 4 – current	1.3	0.3	2.1	3.7	2.4

NOTES: Ability is a unitless measure in the model with an assumed mean and standard deviation for the accession cohort. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. We compute the percentile of the ability distribution for each member in the force. The graph shows the mean of the percentile, by grade. The table shows the difference in mean percentile by grade relative to the current approach case.

TABLE D.23

Difference in SRB and Total Personnel Costs per Soldier in MOS 68P for COAs 1–4, in 2019 Dollars

	SRB Cost per Member ($)	Total Personnel Costs per Member ($)
Baseline case	0	63,700
Current approach case	26,800	91,900
COA 1 – current	19,400	19,100
COA 2 – current	8,100	7,900
COA 3 – current	8,700	8,700
COA 4 – current	3,100	3,100

NOTE: Assumes a 48-month AOS. Ability is assumed to follow a normal distribution with mean zero and standard deviation of 0.5. The COAs and the current approach case are simulated to produce approximately the same 5.3-percent effect on the 68P inventory size relative to the baseline case. Costs per member are computed across the entire force, not just among those receiving an SRB.

Abbreviations

ADSO	active-duty service obligation
AOS	additional obligated service
ASI	Additional Skill Identifier
BAH	basic allowance for housing
BEAR	Bonus Extension and Retraining program
CMF	Career Management Field
COA	course of action
CRAM	Combinatorial Retention Auction Mechanism
DMDC	Defense Manpower Data Center
DoD	U.S. Department of Defense
DRM	dynamic retention model
DSRB	Deployed Selective Reenlistment Bonus
ESRB	Enhanced Selective Reenlistment Bonus
ETS	expiration of term of service
FY	fiscal year
GAO	U.S. General Accounting Office, U.S. Government Accountability Office
LSRB	Location Selective Reenlistment Bonus
MOS	Military Occupational Specialty
OSD	Office of the Secretary of Defense
QRMC	Quadrennial Review of Military Compensation
RA	Regular Army
RUM	random utility model
RMC	regular military compensation
S&I	special and incentive
SRB	Selective Reenlistment Bonus
SQI	Special Qualification Identifier
SSPP	Special Duty Assignment and Superior Performance Pay
TAFMS	Total Active Federal Military Service
TAFS	Total Active Federal Service
TSRB	Targeted Selective Reenlistment Bonus
VRB	Variable Reenlistment Bonus
WEX	Work Experience File
YOS	years of service

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RAND ARROYO CENTER

This report documents research and analysis conducted as part of a project entitled *Improving the Efficiency and Effectiveness of Special and Incentive Pays in the Army*, sponsored by the Assistant Secretary of the Army for Manpower and Reserve Affairs. The purpose of the project was to help the Army determine how to best increase incentives for higher performance among enlisted members and to more efficiently achieve Army retention objectives.

While past research consistently found that reenlistment bonuses increase the likelihood that a service member reenlists and continues to serve, there is little evidence on how they increase performance. The Army requested that RAND Arroyo Center provide analyses to improve the setting of special and incentive pays, focusing on its selective reenlistment bonus (SRB) program.

Since the beginning of fiscal year 2011, the Army has used what it calls the *Tiered SRB program*, in which soldiers who reenlist receive a lump-sum dollar amount. One notable attribute of the Tiered SRB program from the standpoint of performance incentives is that it provides the same SRB to soldiers regardless of whether they are promoted faster or slower than their peers, given their grade, military occupational specialty, and additional obligated service length. The authors simulated alternative SRB programs in which SRBs also varied by years of service, giving higher SRBs to those promoted faster to a grade. Restructuring SRBs to reward those who are promoted faster would increase performance incentives relative to the current approach used by the Army.

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