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Bonuses, Buy-outs, and Worker Sorting in the Public Sector: Evidence from the U.S. Military*

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Abstract

Constrained in their flexibility to hire and fire personnel, public sector organizations must pay close attention to employee retention. With few other options at their disposal, managers frequently use cash bonuses to incentivize retention or buy-out offers to incentivize exit. Both policies are known to be effective at achieving quantitative staffing goals, but how do such policies affect worker sorting? We develop a model of public employee retention to show that the marginal effect of cash retention incentives is theoretically non-monotone in ability, and that predicting which workers are likely to be most responsive requires empirical investigation.

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We then leverage administrative data and quasi-random exposure to both lump-sum bonuses and early retirement buy-outs in the U.S. Army to estimate their effects on the quality of retained workers. We find that low-ability soldiers are relatively more responsive to both lump-sum bonuses and early retirement offers, and both effects are large enough to meaningfully alter the organization's average ability profile. We provide suggestive evidence that differences in financial liquidity, time preferences, and individual taste for service may help explain the observed patterns of selection.

Keywords: Personnel Management; Retention; Internal Labor Markets; Public Sector Organizations

1 Introduction

Employee retention policies are critical for public sector organizations, where internal labor markets require managers to promote from within. Since they lack the flexibility to hire, fire and adjust compensation on an individual basis, public sector organizations must navigate retention challenges with a limited set of policy tools such as cash bonuses when shorthanded and early retirement incentives ("buy-outs") when drawdowns are in order. While managers and organizations carefully calibrate these policies to retain the right number of workers, we know very little about how these policies affect *who* chooses to stay.

We study this question using policy variation in the nation's largest public sector organization, the U.S. Army. Since the end of the draft and the transition to an all-volunteer force, the military has frequently used reenlistment bonuses and early retirement buy-outs to manage retention. Existing research documents that these policies are effective when evaluated against the narrow goal of adjusting the quantity of retained workers (see, e.g., Knapp et al. 2018; Asch et al. 2010; Clotfelter et al. 2008; Asch and Warner 2001), but as with the wider management literature, there is no evidence on how they affect worker sorting and, ultimately, the overall capability of the organizational workforce. While our setting is the U.S. Army, the policy incentives we study are widely used across the public sector (recently including the U.S. Border Patrol, the U.S. Postal Service, and the Social Security Administration).

Our empirical strategy leverages quasi-random variation in soldiers' exposure to two types of retention policies: Selective Reenlistment Bonuses (SRBs), which promise a lump sum payment to soldiers who choose to reenlist, and Voluntary Separation Incentive (VSI) "buy-outs", which promise soldiers immediate (though reduced) retirement benefits in exchange for early exit from

the military. SRB and VSI offers fluctuate frequently in response to changes in the Army's demand for soldiers of different ranks and skill sets, but they are offered to all soldiers of a given rank and occupational specialty regardless of individual ability or other unobservable criteria. We show that the rigid and formulaic implementation, based on a limited set of observable characteristics, generates a natural experiment that enables us to leverage time-series and cross-sectional variation in bonuses and early retirement offers in a generalized difference-in-differences design.

We find that low-ability soldiers are substantially more responsive than their high-ability peers to both types of incentives. For example, whereas a $10,000 SRB offer increases the probability of reenlistment by approximately 2.1 percentage points (3.6%) for the average soldier, the same offer increases the probability of reenlistment by more than 2.8 percentage points (4.9%) for soldiers with Armed Forces Qualification Test (AFQT) scores—which we use as our primary measure of individual ability—just 10 points (approximately one-half of a standard deviation) below average. Soldiers in the highest AFQT quintile are almost completely unresponsive to these SRBs. We document similar patterns for early retirement incentives: although buy-out offers are generally effective at inducing separation, such offers were approximately half as effective among soldiers in the top tercile of the AFQT distribution relative to those in the bottom tercile. We also show that the differential responsiveness of low- and high-ability soldiers to these incentives is large enough to meaningfully shift the ability profile of the Army's enlisted force.

We add to both empirical and theoretical literatures on public sector workplaces, including a rich literature analyzing the sources and consequences of worker sorting into and within the public sector (Katz and Krueger 1991, Borjas 2002, Dal Bo et al. 2013, Deserranno 2019, Simon and Warner 2007, Korb and Segal 2011). Public sectors are large and important for most economies. More than 15% of U.S. workers are employed by municipal, state, or federal governments, and these workers are responsible for producing public goods that contribute to economic growth and societal well-being. Worker quality positively impacts public sector outputs in education (Chetty et al. 2014), nursing (Aiken et al. 2003), law enforcement (Rydberg and Terrill 2010), and political leadership (Besley et al. 2011). While much of the existing research focuses on how differences in public versus private sector compensation levels affect selection into government service (see, e.g., Dal Bo et al. 2013, Finan 2017), our study highlights the importance of the *structure* of compensation. By estimating soldiers' differential sensitivity to potential reenlistment incentives by ability level, our estimates directly inform military policymakers' goals of jointly optimizing worker quantity and quality in order to retain the "best and brightest" (Wardynski et al. 2010, Kane 2012) while

increasing military productivity and reducing costs (Wardynski et al. 2010, Wallace et al. 2015).

Our results also offer theoretical insights regarding selection into and within the public sector. Simple Roy (1951) models of worker sorting suggest that high-ability workers disfavor the public sector because of its relatively low returns to ability (Borjas 2002), and one might therefore expect cash retention incentives to be most effective among high-ability workers who were previously near the margin between private and public sector employment. In Section 2, we show that this prediction does not hold in general. In a baseline probit model where military wages are fixed and civilian wages vary with individual ability plus a random earnings shock, we show that the marginal effect of a bonus on the retention probability is non-monotone in ability—increasing in ability until civilian earnings equal the military wage and decreasing thereafter. Whether bonuses have stronger effects on high- or low-ability workers therefore depends crucially on where the military wage falls relative to the within-military distribution of ability types. We further show that once we allow for heterogeneous taste for military service, the marginal bonus effect can be broadly decreasing in ability under empirically plausible conditions—consistent with what we find in Sections 3 and 4.

These results are also consistent with recent empirical evidence from elsewhere in the public sector, including education research (Springer et al. 2016, Fitzpatrick and Lovenheim 2014). Our results also align with the growing evidence that workers sort into the public sector in part due to intrinsic motivation or taste for public service (Deserranno 2019, Ashraf et al. 2020, Maczulskij and Viinikainen 2024, Cowley and Smith 2014, Banuri and Keefer 2013). In Section 5, we provide suggestive evidence that differences in taste for service may help explain the differential responsiveness we document.

The rest of the paper proceeds as follows. Section 2 develops a simplified model to show that, barring strong assumptions, the effect of cash incentives on worker sorting in the public sector cannot be established without empirical evidence. We provide our evidence on the effects of Selective Retention Bonuses in Section 3 and Voluntary Separation Incentives in Section 4. Section 5 explores potential mechanisms, and Section 6 and concludes.

2 Motivating Theory: Models of Retention & Ability

We develop a simple model of soldiers' reenlistment choices to show that the relationship between cash incentives, individual ability, and reenlistment is theoretically ambiguous. In this probit-style model the returns to Army service are determined by a constant military wage while the

returns to civilian employment depend on individual ability. Retention incentives take the form of reenlistment bonuses, but the model generalizes to other forms of retention incentives including buy-outs to entice separation. In Appendix Section A.1 we extend the model to incorporate soldiers' idiosyncratic taste for military service.

2.1 Baseline Model

Consider a two-period discrete choice model, where individuals decide whether or not to enlist in the Army in period 0, and where enlistees then decide whether or not to reenlist in period 1. Each individual has ability a, drawn from a population density $f_a(a)$. Utility as a civilian depends on ability through strictly increasing earnings functions $g_0(a)$ and $g_1(a)$ in periods 0 and 1, respectively. Civilian utility also depends on random shocks ε_0 and ε_1, which are i.i.d. as $N(0, \sigma_0^2)$ and $N(0, \sigma_1^2)$, respectively, and which together reflect the uncertainty of the civilian labor market. Utility in the Army in either period depends only on constant military wages (w_0, w_1).

Initial Entry. In period 0, agents decide whether to enlist by comparing Army versus civilian utilities:

$$U_0^A = w_0, \qquad U_0^C = g_0(a) + \varepsilon_0.$$

An agent enlists when $U_0^A \geq U_0^C$, which occurs with probability

$$P\left(\text{Enlist} \mid a\right) = \Phi\left(\frac{w_0 - g_0(a)}{\sigma_0}\right),$$

where $\Phi(\cdot)$ is the standard normal CDF. The resulting density of ability among enlistees in the Army is

$$f\left(a \mid \text{Enlisted}\right) \propto f_a(a)\, \Phi\left(\frac{w_0 - g_0(a)}{\sigma_0}\right).$$

Reenlistment. In period 1, soldiers decide whether to reenlist by comparing

$$U_1^A = w_1, \qquad U_1^C = g_1(a) + \varepsilon_1.$$

A soldier reenlists if $U_1^A \geq U_1^C$, which occurs with probability

$$P(\text{Reenlist} \mid a) = \Phi\left(\frac{w_1 - g_1(a)}{\sigma_1}\right). \tag{1}$$

Marginal Effect of Bonuses on Reenlistment. Suppose the Army is weighing a small cash reenlistment bonus Δw. Differentiating (1) with respect to w_1 yields a bell-shaped "marginal-effect curve," which expresses the effect of a marginal increase in bonus amount on the probability of reenlistment for soldiers of ability type a:

$$\mathcal{M}(a) = \frac{\partial P}{\partial w_1}(a) = \frac{1}{\sigma_1}\,\phi\left(\frac{w_1 - g_1(a)}{\sigma_1}\right), \tag{2}$$

where $\phi(\cdot)$ is the standard normal PDF. Figure 1 plots this curve for illustrative values.

Last, differentiating (2) with respect to ability yields the cross-partial

$$\begin{aligned}\mathcal{M}'(a) &= \frac{\partial^2 P}{\partial w_1\,\partial a} \\ &= \frac{w_1 - g_1(a)}{\sigma_1^3}\cdot\phi\left(\frac{w_1 - g_1(a)}{\sigma_1}\right)\cdot\frac{dg_1(a)}{da}.\end{aligned} \tag{3}$$

The sign of $\mathcal{M}'(a)$ relies entirely on the sign of $w_1 - g_1(a)$—that is, on average, whether soldiers of ability type a do better in the military or in civilian employment. More formally:

Proposition 1 (Non-Monotonicity in the Baseline Model)**.** *If $g_1(a)$ is strictly increasing in ability, then:*

1. *The marginal effect $\frac{\partial P}{\partial w_1}(a)$ is strictly positive for all a.*
2. *The marginal effect is strictly increasing for $a < a^*$, strictly decreasing for $a > a^*$, and achieves its global maximum at the unique $a^* = g_1^{-1}(w_1)$.*

Intuitively, bonuses are most effective at inducing reenlistment when soldiers are close to indifferent between reenlistment and separation, and in the simplified model, this has the highest likelihood of occurring for soldiers whose civilian earning potential (as a function of individual ability) is very similar to the prevailing military wage.

Finally, while equation (2) and Theorem 1 describe the overall structural relationship between ability and the marginal effect of bonuses, the relationship the econometrician observes in the data also depends upon the distribution of ability types that endogenously choose to enlist in period 0 of the model. In theory, while the marginal effect of bonuses is non-monotonic in ability across the population distribution of ability types, it is possible that selection at the entry margin generates a within-military ability distribution that is largely to the left or right of a^*, which would result in an observed marginal effect curve that appears monotonically increasing or decreasing, respectively.

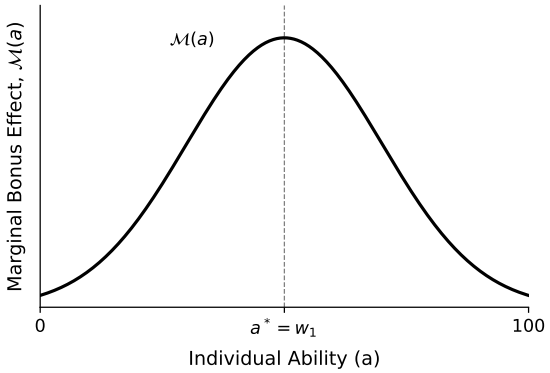


Figure 1: Marginal Effect of Bonuses on Probability of Reenlistment as a Function of Ability.

$\mathcal{M}(a)$ is the marginal effect of a small increase in reenlistment bonus on the probability of reenlistment as a function of individual ability (Equation 2). Parameter values are illustrative: $w_1 = 50$; $\sigma_1 = 20$. The bell shape and interior peak at $a^* = g_1^{-1}(w_1)$ are general properties that hold for any strictly increasing $g_1(a)$ and any positive parameter values w_1 and σ_1.

Two features of the entry margin stand out. First, higher first-term Army compensation (w_0) attracts more high-ability recruits, expanding the upper support of ability types observed in period 1. Second, greater civilian labor market uncertainty (higher σ_0) widens that support. Since the Army imposes a minimum AFQT score for most enlistees,[1] widening the support primarily expands and adds density at the upper end of the support. In practice, given that the Army's minimum AFQT requirement is low, civilian labor market opportunities are noisy, and reenlistment wages are similar to initial military wages, it is reasonable to assume that the within-military ability distribution spans a^*—which under the baseline model predicts a non-monotonic marginal bonus effect.

The baseline model predicts a relatively straightforward relationship between ability and the marginal effect of bonuses, but in the appendix we show that this relationship need not hold in more complex models. Specifically, Appendix Section A.1 extends the baseline model to make initial enlistment and reenlistment choices partially dependent upon an idiosyncratic taste-for-military-service parameter. The shape of the marginal effect curve then depends on both the joint distribution of ability and taste for service as well as on the shape of the civilian earnings function $g_1(a)$. In general, a positive correlation between taste and ability and a shallow civilian earnings gradient would both suggest a marginal effect curve increasing in ability.

Altogether, our models show that predicting how soldiers of different ability levels respond to cash retention incentives is theoretically ambiguous and requires empirical evidence. We provide

[1] The Army currently requires a minimum score of 31 (on a scale of 1–99) for enlistment.

such evidence in Sections 3 and 4. Although the extended model rationalizes our empirical finding that the marginal effect of bonuses is broadly decreasing in ability, we do not claim that taste for military service is the only mechanism at work; Section 5 discusses and provides preliminary evidence on several plausible explanations.

3 Evidence from Selective Reenlistment Bonuses (SRBs)

The Army's SRB program is a primary tool for enticing reenlistment. SRBs are cash bonuses offered to soldiers in the U.S. Army in exchange for a commitment to reenlist for a fixed term. This section provides empirical evidence that SRBs are more effective at retaining low- versus high-ability soldiers.

3.1 Institutional Background

Because the U.S. military relies exclusively on promotion-from-within, retention is essential for staffing leadership ranks with capable personnel. Enlisted soldiers serve fixed terms, with a typical first term lasting four years. At the end of each term, soldiers deemed eligible to reenlist will meet with a career counselor to discuss their options, which ordinarily include opportunities to reenlist for an additional term of between two and six years of service. While low-performing soldiers may be deemed ineligible, the vast majority (approximately 77% in our sample) have an option to reenlist. Eligible soldiers make their choice during their reenlistment "window," which opens 12-24 months before the end of their current term and closes 90 days prior to the end of the term. Soldiers serve in a specific occupation, known as their Military Occupational Specialty (MOS), and while mid-career changes are possible, most reenlisting soldiers maintain their MOS.

Like many public sector organizations, the military follows a rigid compensation scheme. Basic military pay is a function of only rank,[2] years of service, and whether the soldier has dependents. The military also offers housing allowances and educational benefits. While some benefits involve voluntary take-up, eligibility for benefits is always based on a limited set of observable characteristics.

SRB offers vary by a soldier's current rank, the selected MOS upon reenlistment, total years of service, reenlistment term length, specialty skill designators (e.g., if she is "airborne" qualified),

[2]We refer to ranks by their corresponding pay grades. Pay grades begin with a letter (e.g., "E" for enlisted personnel) and end with a number, denoting the level of the rank. For example, an E-5 (Sergeant) is superior by two ranks to an E-3 (Private First Class).

and the selected duty location. Based on their characteristics, a soldier may be eligible for a may be eligible for a "menu" of SRB offers, from which they choose which SRB (if any) to accept. Many soldiers are eligible for no SRB based on their characteristics and the timing of their reenlistment, but offers as high as $20,000 are not uncommon. SRB offers are continuously updated and once updated, old offers are no longer available.

3.2 Data & Empirical Approach

We leverage a generalized difference-in-difference framework to compare the reenlistment decisions of soldiers according to their SRB offers and ability levels. Our primary dataset is an extract of the U.S. Army's Total Army Personnel Database (TAPDB) from which we construct a panel of individual enlistment spells ending between 1997 and 2015, which are the years for which we also have SRB offer data. Each "spell" corresponds to a single enlistment term for a soldier (e.g., a soldier with a single four-year enlistment appears once while a soldier who reenlisted twice will appear three times). For each spell, the data record key dates (including enlistment and separation dates), the reason for any separation, military compensation, and demographic and military characteristics including age, race, gender, and MOS. We exclude all current enlistment spells (approximately 6%) as of the end of the sample since we do not observe their conclusion, and we further exclude spells ending in ineligibility for reenlistment (24% of all spells). We summarize the full dataset in Table 1, with column (2) showing our primary sample for analysis. Soldiers choose to reenlist in approximately 65% of spells ending with an option to do so, and the average number of enlistment spells per soldier in our sample is approximately 1.88.

We measure individual ability primarily using Armed Forces Qualification Test (AFQT) scores, which the military uses for personnel selection (i.e., suitability for service) and classification (i.e., occupational qualification). AFQT scores range from 0–99, corresponding to the percentile of the applicant's raw test score compared to all test-takers, and labor economists have long used these scores as a measure of general cognitive ability (Grilliches and Mason 1972). Table 1 shows that soldiers eligible to reenlist have higher average AFQT scores than ineligible ones, and those who reenlist have lower average scores than those who leave (see Appendix Figure 5).

Appendix Section C reports additional results using the speed of a soldier's first-term promotion—specifically, the number of months spent at or above the rank of Sergeant (E-5) during the first enlistment term—as an alternative ability measure.[3] Because promotion speed captures cognitive

[3]Promotion to Sergeant requires an individual to be eligible and to earn sufficient promotion points based a

Table 1: Spell- and Soldier-level Summary Statistics (SRB Sample)

Panel A: All Spells	All Spells	Spells Ending with Eligibility to Reenlist	Spells Ending with No SRB Offer	Spells Ending with Non-Zero SRB Offer
N (total spells)	2,359,520	1,805,770	1,288,792	516,978
% ending in reup	0.50	0.65	0.65	0.66
Avg. years of service at spell end	6.23 (5.44)	6.87 (5.65)	7.82 (6.27)	4.52 (2.45)
Median rank at spell end	E-4	E-5	E-5	E-4
Avg. age at spell end	28.35 (6.51)	28.98 (6.60)	29.99 (7.09)	26.47 (4.26)
% with non-zero SRB offer	0.26	0.29	0	1
Avg. SRB offer	2.48 (4.92)	2.82 (5.21)	0	9.86 (5.02)
Total unique soldiers	1,404,597	1,034,715	809,993	411,187
Avg. spells per soldier in data	1.77 (1.13)	1.90 (1.21)	2.05 (1.29)	1.42 (0.75)
Avg. reenlistments per soldier at separation	1.10 (1.53)	1.37 (1.71)	1.65 (1.82)	0.49 (0.81)
Avg. total years of service at separation	6.35 (6.11)	7.81 (6.79)	8.87 (7.37)	4.47 (2.35)
Median final rank at separation	E-4	E-5	E-5	E-4
% Male	0.84	0.85	0.84	0.89
% Nonwhite	0.38	0.40	0.43	0.29
% Married	0.53	0.57	0.61	0.43
Avg. AFQT	58.95 (19.26)	60.25 (19.78)	58.93 (19.64)	64.41 (19.66)
Avg. Months Sergeant or above in first term	2.59 (7.12)	3.65 (8.18)	3.38 (7.96)	4.43 (8.74)
% College or more	0.06	0.09	0.09	0.07
% Less than high school	0.10	0.07	0.06	0.08

Note. Column 1 displays summary statistics for the full sample of spells for which we have SRB offer data (ending in years 1997–2015). Column 2 displays summary statistics for spells at the end of which the soldier was eligible to reenlist. Column 3 displays summary statistics for spells ending with eligibility to reenlist but without a reenlistment bonus offer, and column 4 displays summary statistics for spells ending with eligibility to reenlist and a non-zero SRB offer. AFQT scores are measured at the time of initial accession into the Army; all other variables are measured at the end of the spell (for spell-level statistics) or the end of a soldier's career (for soldier-level statistics). Standard deviations are shown in parentheses.

and non-cognitive dimensions of job performance that AFQT may not fully reflect, it serves as a useful robustness check and extension of our main results. We focus on AFQT scores for two reasons. First, the AFQT is designed to test general abilities (including reading comprehension and mathematical ability), which are presumably most relevant to potential private sector employers, whereas promotion speed reflects a mix of general and firm-specific skills and abilities.[4] Second—and more practically—promotion speed exhibits limited variation in our sample, as only approximately 25% of soldiers make Sergeant during their first term. In addition to personnel data, we collect monthly SRB offers according to publicly available policy announcements known as "U.S. Army Military Personnel Messages." From these announcements, we record the amount of the bonus offer and the eligibility criteria.

A soldier's eligibility for a bonus offer can depend on fixed criteria (i.e., MOS, rank, years-of-service, and specialty skills) and endogenous choices (e.g., a soldier's willingness to reenlist for a longer term, a different MOS or to move to a certain location). To isolate the exogenous aspects of

standardized scoring system for physical fitness, weapons qualification, military awards, military education and civilian education (Department of the Army 2023b)). Appendix Figure 8 shows a histogram of this variable.

[4] Appendix Figure 10 shows that AFQT scores and speed of promotion are strongly correlated overall ($\rho = 0.24$, $p < 0.0001$) and within individual occupational specialties.

the program, we assign each soldier a single SRB offer for each enlistment spell, namely the highest non-location-specific bonus to which a soldier is entitled for a 4-year reenlistment given the soldier's current MOS, rank, years-of-service, and specialty skills designations. We show in Appendix Table 8 that our assigned generic SRB offers are highly correlated with the other SRBs a soldier might unlock, for example by choosing a particular length of reenlistment term or a particular duty location. Since SRBs can vary throughout the reenlistment window, we assign each soldier the SRB offer that was available on the first day of the first month of their window. This addresses potential strategic timing, if for example a soldier tried to delay her reenlistment due to the belief that SRB offers are likely to rise during her reenlistment window. We also show that our results are not sensitive to when during a reenlistment window we assign SRB offers (Appendix Tables 11 and 15).

3.3 Identification

Our empirical strategy compares soldiers' reenlistment decisions according to their individual ability and the bonus amounts they are offered by estimating the following equation:

$$\begin{aligned} \text{Stay}_{it} = \beta_0 + \beta_1 \text{SRB}_{it} + \beta_2 \text{SRB}_{it} \times \text{Ability}_i \\ + \beta_3 \text{Ability}_i + \gamma_{MOS,rank,yos} + \mu_t + \delta \mathbf{X}_{it} + \epsilon_{it} \end{aligned} \tag{4}$$

where Stay_{it} is an indicator for whether soldier i chooses to reenlist at time t; SRB_{it} represents a soldier's SRB offer as described above, and Ability_i is the soldier's AFQT score. Our coefficient of interest,β_2, reflects the differential responsiveness of high- and low-ability soldiers to reenlistment bonus offers.

Our estimation of β_2 relies on the identifying assumption that, conditional on observables, SRB offers are effectively as-good-as-random and uncorrelated with both individual ability and unobservable determinants of reenlistment. Since SRB offers vary by occupation, rank, tenure, and date, our specifications include fixed effects for offer-date (i.e. year*month) and for MOS*rank*years-of-service, as well as separate fixed effects for specialty skills designators. By including fixed effects for the same key variables that determine SRB eligibility, we account for the basic fact that the military adjusts SRBs according to its retention needs.[5] To the extent that soldiers' outside employment

[5]These same fixed effects effectively control for most other aspects of military compensation, which are similarly fixed according to observable characteristics like rank, years-of-service, and marital status.

Table 2: Relationship Between SRB Offer Amounts and Individual Ability

	Dependent Var.: SRB Offers	
	(1)	(2)
AFQT	0.273***	-0.006
	(0.036)	(0.007)
Adjusted R^2	0.082	0.520
Year*Month FE	✓	✓
MOS*Rank*YOS FE		✓
Demographic Controls	✓	✓
Avg. SRB	0.28	0.28
Avg. AFQT	0.58	0.58
Observations	1,804,892	1,804,326

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows results from regressing SRB offer amounts on individual ability. Column (1) does not control for SRB eligibility criteria whereas column (2) do. Ability is defined as AFQT percentile (on a scale from 0-1).

options—and thus, their individual retention decisions—differ by MOS, rank, and military tenure, our fixed effects control for such differences.[6] By controlling for years-of-service, we also ensure that the effect of SRBs will not be confounded by a soldier's distance to retirement. Lastly, while not necessary for identification, a matrix $\mathbf{X}_{it}$ of individual demographic controls (e.g. marital status, race, gender, and age) improves the precision of our estimates.

Although we cannot directly test for correlation between SRB offers and unobservable characteristics, we can test whether SRB offers are systematically correlated with ability. In Table 2 we report results from regressing SRB offer amounts on individual ability; while the column (1) indicates that higher AFQT scores are associated with higher SRB offers, the column (2) shows that this association disappears after conditioning on MOS*rank*years-of-service fixed effects. Since SRBs are conditionally uncorrelated with observable AFQT scores, this supports our identifying assumption that they are similarly uncorrelated with unobservables (Altonji et al. 2005). Moreover, extensive research into the history of the SRB program gives us additional confidence that Army officials generated new SRB offers based on a limited set of considerations, none of which related to individual ability.[7] Rather, Army regulations indicate that the program's sole objective was to retain a sufficient quantity of personnel without regard to ability.[8]

Our coefficient of interest β_2 is identified off of high-frequency variation in SRB offers within

[6] In addition, the same fixed effects account for any mechanical correlation between SRB offers and ability owing to the fact that a new recruit's eligibility for each MOS is partially determined by their AFQT score.

[7] See Appendix Section B.4 for additional details.

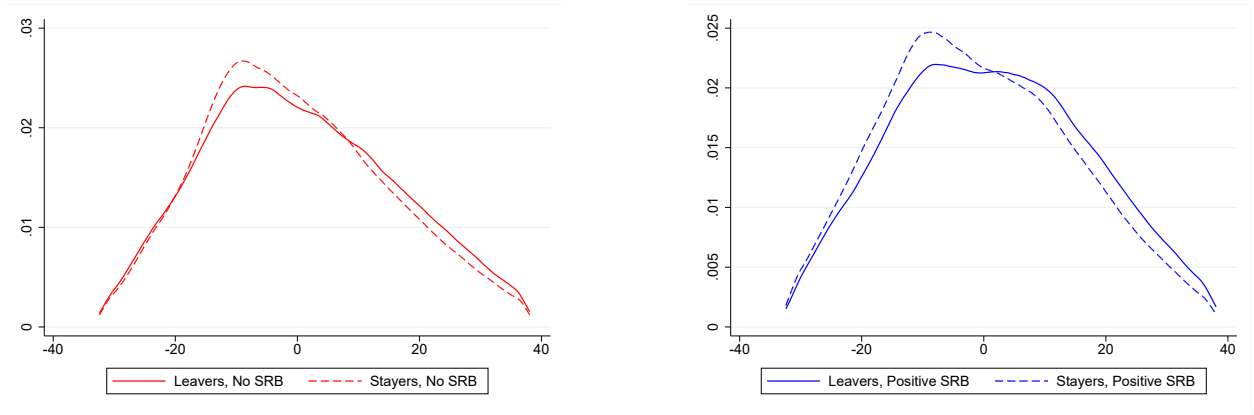
[8] The Army regulation states "The objective of the SRB Program is to increase the number of reenlistments in critical MOSs that do not have adequate retention levels to staff the force." (Department of the Army 2023a) Additionally, career counselors who administer SRBs do not observe individual ability.

an MOS, rank, and years-of-service cell and within a month and year, thereby resembling a generalized difference-in-difference design, estimated within a two-way fixed effects (TWFE) framework. In Appendix Section B.4 we present illustrative case studies for two specific MOSs to illustrate some of the factors that might influence SRB offers. In general, however, we have confirmed through interviews with Army officials responsible for the SRB program that SRB offers were determined through a combination of "inside" factors (i.e., the military's operational and strategic requirements and force levels) and "outside" factors (i.e., economic trends affecting civilian labor market opportunities).[9] Given Year*Month and MOS*rank*years-of-service fixed effects, outside economic conditions will threaten identification only insofar as they vary at a high frequency in a manner that is specific to soldiers of a particular MOS, rank, and tenure—and even then only if they correlate with both ability and reenlistment. Since a soldier's individual reenlistment decision is unlikely to meaningfully affect the time series of SRB offers even within his MOS, rank, or cohort (all large groups), reverse causality is unlikely. Overall, it seems reasonable to think of individual soldiers as "price takers" with respect to SRB offers.

Still, a key challenge to our identification is that, while the Army's SRB program was never intended to directly account for soldiers' ability levels, SRB offers did vary in at least indirect response to various types of supply and demand shocks both inside and outside the military, and the effects of these shocks could themselves depend upon a soldier's ability. For example, to the extent that retention may fall and SRBs may rise when the economy improves (e.g., following the Great Recession) or when military service becomes more dangerous (e.g., during the war in Iraq), our results could be biased if the effects of labor market conditions or mortality risk on reenlistment were themselves correlated with ability.

To confront these challenges, we augment our baseline model with models including a variety of different high-dimensional fixed effects to account non-parametrically for unique time-specific shocks that may vary across our standard controls. In our most demanding specification, for example, we include time-varying MOS fixed effects (specifically, MOS*year*month) to address concerns about differential responses to changing labor market opportunities or mortality risk within a military occupation. In other specifications we include time-varying fixed effects for the commuting zone in which a soldier resided immediately before enlisting in the Army. Because this "home of record" is likely to represent the most salient local labor market for soldiers, we believe that these fixed effects are likely to do a good job of controlling for shocks to a soldier's private labor market opportunities.

[9] Borgschulte and Martorell (2018) show higher exit rates from the Army when the civilian labor market is strong.



(a) Soldiers receiving no SRB offer.

(b) Soldiers receiving positive SRB offer.

Figure 2: Distribution of AFQT Scores, Split by Reenlistment Decisions and SRB Offers.

Figures 2a and 2b plot the residualized distribution of AFQT scores (following a regression of AFQT score on MOS*rank*YOS dummies as well as date dummies). Sample restricted to soldiers with eligibility to reenlist. Figure 2a plots separate distributions for stayer and leavers, conditional on having received no SRB offer at the start of their reenlistment window. Figure 2b plots separate distributions for stayers and leavers, conditional on having received any non-zero SRB offer.

Our results are qualitatively similar across these specifications, lending further credibility to our identification strategy.

3.4 Selective Reenlistment Bonus Results

In Figure 2, we provide summary, albeit descriptive, evidence for the effect of SRBs on selection. Both the left and right panels depict the residualized AFQT distributions for soldiers who reenlist compared to those leave. Figure 2a plots AFQT distributions for soldiers who were offered no SRB, while Figure 2b plots distributions for the 29% of soldiers in our sample who were offered an SRB (among whom the average offer is $9,867). In both panels the stayer distribution (dashed lines) is shifted left relative to the leaver distribution (solid lines), meaning that the average ability of the soldiers who reenlist is lower than those who leave. The key takeaway, however, is that the disparity between stayers and leavers is even greater for soldiers who receive a positive SRB offer in Panel B. Appendix Figure 11 shows a similar pattern when ability is measured by a soldier's speed of promotion.

In Table 3 we formalize this result with regression estimates from Equation **??**. Starting with column (1), we see that for each one point increment AFQT soldiers are 0.112 percentage points less likely to reenlist on average. The column (1) results also suggests that SRBs work as intended: on average, a $10,000 bonus offer increases the probability of reenlistment by 1.7 percentage points

Table 3: The Effects of SRB Offer Amounts and Individual Ability on Soldier Retention

	Dep. Var.: Individual Reenlistment			
	(1)	(2)	(3)	(4)
SRB	0.017***	0.062***	0.033***	0.038***
	(0.004)	(0.007)	(0.006)	(0.008)
SRB * AFQT		-0.070***	-0.027***	-0.073***
		(0.011)	(0.010)	(0.011)
AFQT	-0.112***	-0.092***	-0.141***	-0.091***
	(0.009)	(0.009)	(0.006)	(0.010)
Adjusted R^2	0.155	0.155	0.139	0.176
Year*Month FE	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓
Year*Month*CZ FE			✓	
Year*Month*MOS FE				✓
Demographic Controls	✓	✓	✓	✓
Avg. Reenlistment Rate	0.65	0.65	0.67	0.65
Avg. SRB	0.28	0.28	0.32	0.28
Avg. AFQT	0.58	0.58	0.59	0.58
Observations	1,804,326	1,804,326	1,463,546	1,800,355

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effects of SRB offer amounts and individual soldier ability on soldiers' reenlistment decisions. Standard errors are two-way clustered at the MOS*Rank*YOS and individual level and reported in parentheses. Sample is restricted to spells ending with eligibility for reenlistment and with reenlistment windows opening between 1997–2015. SRBs are in $10,000s of 2015 dollars. Demographic controls include gender, age, marital status, race, and special skill dummies. Ability is defined as AFQT percentile (on a scale from 0-1).

(2.6%), relative to no bonus offer.[10]

Our key result in column (2) reveals that a soldier's responsiveness to bonus offers is decreasing in her AFQT score. Specifically, a soldier who has an AFQT score that is 10 percentile points higher is approximately 0.7 percentage points less responsive to a $10,000 SRB bonus offer, and the result is statistically significant. The results suggest, moreover, that SRBs have practically no effect on the highest AFQT soldiers.[11] Appendix Table 13 shows a similar pattern when measuring individual ability with a soldier's speed of first-term promotion.

In columns (3)–(4) we go further by including higher-dimensional fixed effects to account for potential time-varying shocks to soldiers' inside and outside options. Specifically, column (3) con-

[10]Past estimates of the effect of SRBs on reenlistment have varied widely, but our estimate is similar in magnitude to most others. We estimate a smaller effect than Hogan et al. (2005), Moore et al. (2007), and Asch et al. (2010), which estimate the effect of a one-unit increase in the SRB multiplier (roughly equivalent to a $9,000 increase for the average soldier in our sample) at between 3 and 7 percentage points; our result is similar, however, to Joffrion and Wozny (2015)'s study of SRBs in the U.S. Air Force, where the authors estimate a reenlistment effect of between 0 and 2.4 percentage points for a one-unit increase in the SRB multiplier, depending upon how far into their current contract a servicemember is.

[11]While the sum of our point estimates implies a negative net effect of SRBs on reenlistment for soldiers with the highest AFQT scores, the combined estimate is not significantly different from zero (see Figure 2).

trols for nonparametric time trends at the home-of-record commuting zone level, capturing local labor market conditions that could differentially affect reenlistment by ability. While the estimated effects are smaller, we show in Appendix Table 10 (Column 3) that this is largely due to sample changes induced by these additional controls. Column (4) introduces similar MOS-specific time trends, flexibly accounting for time-varying shocks at the occupation level—such as changes in overseas deployment tempo, casualty risk, or civilian labor market demand for different skill sets—that may also correlate with ability. The overall pattern demonstrates that high-ability soldiers appear less responsive to SRBs.

In these specifications, we find that SRBs may not only fail to retain high-ability soldiers but could even *negatively* affect their reenlistment rates. This could have logical explanations—it could be, for example, that non-merit-based bonuses signal to high-ability personnel that their talents are undervalued, thereby reducing morale (Deserranno 2019, Deserranno et al. 2025). Nonetheless, we caution against overinterpreting these negative point estimates. Our aim throughout this paper is not to precisely estimate the average treatment effect of retention schemes but rather to evaluate their relative effectiveness across the ability distribution. For that reason, we emphasize results from the model in column (2) where key fixed effects are introduced incrementally.

Finally, in Figure 3 we plot regression coefficients from separately interacting SRB offers with indicators for ten equally-sized AFQT score decile bins. This allows us to non-parametrically explore the effect of SRB offers throughout the ability distribution. We find that SRB offers decline in effectiveness roughly linearly and throughout the ability distribution.[12] Soldiers in the bottom decile are approximately 5 percentage points more likely to reenlist when offered a $10,000 SRB versus no SRB, and above the 80th percentile of this AFQT distribution, we can no longer reject the hypothesis that SRBs have no effect on reenlistment rates. We find similar results using our speed-of-promotion-based ability measure in Appendix Figure 14.

While the estimates in Table 3 and Figure 3 may seem small, the magnitude of selection they entail is substantial. Our estimates in Appendix D imply that if the Army were to counterfactually increase average SRB offers by $10,000 it would retain more than 1,600 additional soldiers per year. However, the average AFQT score of marginally-retained soldiers would be just 41—nine tenths of a standard deviation below the historical average AFQT score for a reenlisting cohort in our data.

[12]In Appendix Table 16 and Appendix Figure 15 we show that these results are robust to adjusting for changes to average AFQT scores and average promotion speeds across initial enlistment cohorts.

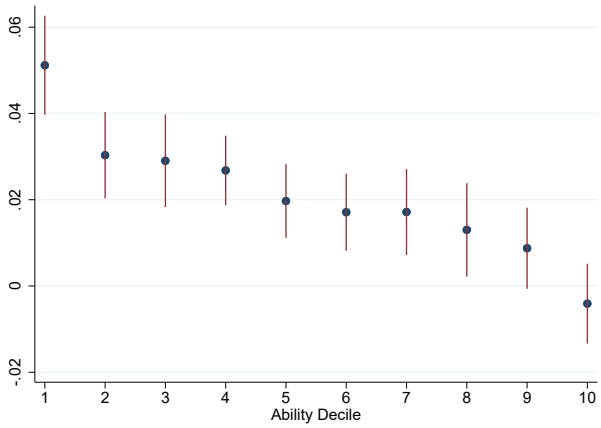


Figure 3: The Effect of Selective Reenlistment Bonuses on Soldier Retention, by Soldier Ability Deciles.

Figure plots non-parametic estimates of the marginal effect of SRBs on the probability of reenlistment within each decile of the within-military AFQT score distribution. SRB values are in $10,000s of 2015 U.S. dollars.

3.5 Robustness to Alternative DiD Estimator

A growing literature (Callaway and Sant'Anna 2021, Sun and Abraham 2021, Goodman-Bacon 2021, de Chaisemartin and D'Haultfœuille 2020) has raised concerns about the validity of two-way fixed effects estimators in settings with staggered treatment adoption and heterogeneous treatment effects. We therefore implement the estimator from de Chaisemartin and D'Haultfœuille (2024) (CDH) as a robustness check, binning the data by AFQT decile and obtaining separate estimates for each bin.[13] The CDH estimator flexibly accommodates treatments that, like SRB offers, are continuous and non-absorbing.

We report the CDH estimator results with two important caveats. First, while our TWFE estimator identifies the effect of SRBs from cross-sectional variation in bonus offers across MOS*rank*YOS cells within a given month, the CDH estimator identifies effects from within-cell variation in bonus offers over time. These related but distinct sources of identifying variation may not yield identical estimates even in the absence of bias. Because SRB offers change frequently in our data—often month to month—the dynamic effects at longer horizons are of limited interest, and we focus instead on CDH's estimates of the normalized first-period effect, which most closely parallels the contemporaneous effect our TWFE estimator identifies. Second, the CDH standard errors are roughly five to six times larger than the corresponding TWFE standard errors. The CDH approach restricts identification to "clean" contemporaneous comparison groups using only a subset of the variation

[13] We use the `did_multiplegt_dyn` command in Stata (de Chaisemartin et al. 2025).

that TWFE exploits, reducing precision regardless of whether treatment effect heterogeneity is severe enough to contaminate the TWFE estimates. The similar patterns we find across various TWFE specifications (see Appendix Section C) suggests that such bias is unlikely in our setting.

The CDH results offer only weak corroboration of our main findings . Our normalized first-period estimates are positive across all ten AFQT deciles and of roughly similar magnitude to the corresponding TWFE estimates. However, the estimates are statistically indistinguishable from one another and show no clear pattern across ability levels. Appendix Figure 16 displays the CDH and TWFE estimates side by side. Given their imprecision, we interpret the CDH results as neither confirming nor contradicting the pattern of declining marginal SRB effects documented above; our evidence on the differential responsiveness of low- and high-ability soldiers to SRBs rests on the TWFE results, identified under stronger but standard assumptions.

4 Evidence from the Army's Early Retirement programs

The Army also occasionally leverages early retirement offers to reduce the size of its workforce. In this section we provide empirical evidence that low-ability soldiers are more responsive to these early retirement offers, as they were with SRBs.

4.1 Institutional Background

Throughout the period of our study the military offered a generous defined benefit pension to workers who completed 20 or more years of service. The pension started at 40% of the average of the soldier's highest three annual salaries for soldiers who retired after exactly 20 years of service and grew to 100% of final annual salary for soldiers who served 40 years or more, but importantly, it was "cliff vested," meaning that soldiers who separated with fewer than 20 years of service received no retirement benefit whatsoever.

During occasional drawdowns, however, Congress authorized the military to grant early retirement benefits to those with fewer than 20 years of service. To claim the benefit, eligible soldiers (based on rank, years-of-service, and MOS) were required to separate from the military immediately.

We study the Voluntary Separation Incentive (VSI), which remains one of the military's largest drawdown initiatives in recent decades.[14] We study a particular wave of the VSI offered to early-to-

[14]We use the 1990s offers for reasons of data availability and due to access to the precise formula for determining early retirement offers. The latter allows us to isolate quasi-random variation in early retirement offers that were made without regard to individual ability.

mid-career soldiers between August 1993 and June 1995 in which offers were extended to non-first term soldiers in certain overstaffed MOS/rank combinations who had accrued more than 6 but fewer than 20 years of total service as of a program cutoff date (December 5, 1991). While prior research has documented the effectiveness of the VSI program at drawing down the military to the desired quantity of workers (Asch and Warner 2001), we focus on how early retirement inducements may have sorted workers by ability level.[15] As with SRBs, the military made these offers solely based on eligibility criteria and without regard to individual ability or performance.[16] The Army offered sizable benefits and a choice in form between a reduced annuity (relative to a full pension) and a single lump-sum payment.

4.2 Data & Empirical Approach

The Army left VSI offers open from August 1, 1993, to June 30, 1995—a period of approximately 23 months. Accordingly, rather than evaluating whether a soldier reenlists at the end of her current spell, we evaluate whether the soldier remained in the Army for the duration of the early retirement program window, comparing that outcome across early retirement eligibility status and ability levels.

We collect soldiers' retention outcomes and code their eligibility for early retirement using the TAPDB, with a sample of one enlistment observation per soldier. We combine that data with historical U.S. Army Military Personnel Messages, which specify eligibility criteria (i.e., rank, MOS, and years-of-service) for the VSI and other early retirement programs. Our method identifies 6,480 soldiers who satisfied all eligibility requirements for early retirement under the VSI program. To assess the effect of program eligibility on a soldier's probability of remaining in the Army, we compare the retention rates of eligible soldiers to all other non-first-term soldiers who were serving in the Army on February 1, 1993, which was six months prior to the VSI program's implementation date. Alternative specifications further restrict the sample to soldiers who met the VSI program's basic years-of-service requirement by having between 6 and 20 years of service upon program implementation. We summarize our early retirement analysis samples in Table 4.

[15] Asch and Warner (2001) previously found a negative correlation between early retirement take-up and soldiers' AFQT scores in a broader drawdown program that targeted low-performing soldiers.

[16] Final eligibility for early retirement was formally subject to approval by the soldier's commanding officer. Evidence from Army archives suggests these approvals did not consider individual ability. For example, archival records state that 100% of on-time applications were approved in 1992 (the only year for which records are available), and an internal Army report states that the Army "stressed maximum approvals while accepting the inherent risk of a personnel shortfall." Author interviews with Army officials familiar with these programs further confirmed that commander approval was essentially pro forma.

Table 4: Soldier-level Summary Statistics (VSI Sample)

	Soldiers Serving on Feb. 1, 1993	Soldiers with 6–20 YOS Prior to VSI	Serving Feb. 1, 1993 but Not Eligible for VSI	Serving Feb. 1, 1993 and Eligible for VSI
N (total soldiers)	135,579	45,647	129,099	6,480
% remaining after 24 months	0.77	0.80	0.77	0.64
Years of service at program start	6.48 (6.04)	13.23 (3.69)	6.12 (5.95)	13.54 (2.73)
Median rank at program start	E-4	E-6	E-4	E-5
Avg. age at program start	26.62 (6.53)	33.14 (4.63)	26.29 (6.45)	33.32 (3.88)
% eligible for early retirement	0.05	0.14	0	1
Avg. total years of service at separation	12.21 (8.00)	18.88 (4.57)	11.96 (8.06)	17.14 (4.47)
Median final rank at separation	E-5	E-7	E-5	E-6
% Male	0.86	0.89	0.86	0.87
% Nonwhite	0.42	0.51	0.41	0.55
% Married	0.61	0.85	0.60	0.84
Avg. AFQT	58.57 (19.72)	54.69 (20.86)	58.95 (19.59)	50.95 (20.71)
Avg. Months Sergeant or above in first term	1.49 (5.18)	0.54 (3.47)	1.55 (5.25)	0.47 (3.53)
% College or more	0.04	0.05	0.04	0.03
% Less than high school	0.04	0.06	0.04	0.09

Note. Column 1 displays summary statistics for the full sample of soldiers who were eligible for reenlistment and actively serving in Feb. 1993, six months prior to the VSI program rollout date. Column 2 restricts that sample to soldiers meeting the basic years-of-service eligibility requirements for VSI (with between 6 and 20 years of service as of Dec. 5, 1991). Column 3 shows the full sample but restricts to soldiers not eligible for VSI, and column 4 restricts to soldiers meeting all VSI eligibility criteria. AFQT scores and educational attainment are measured at the time of initial accession into the Army.

4.3 Identification

Our empirical strategy compares soldiers' retention decisions according to their individual ability and their eligibility for a buy-out under the VSI program by estimating Equation 5 below:

$$\begin{aligned} \text{Stay}_{i,t=T} = \beta_0 + \beta_1 \text{VSI}_i + \beta_2 \text{VSI}_i \times \text{Ability}_i + \beta_3 \text{Ability}_i \\ + \beta_4 YOS_{i,t_0} + \gamma_{MOS,rank} + \delta \mathbf{X}_i + \epsilon_i \end{aligned} \tag{5}$$

where VSI_i is an indicator for soldier i's eligibility for the program, YOS_{i,t_0} is the soldier's years of service as of program start date t_0, and $\text{Stay}_{i,t=T}$ is an indicator for whether the soldier has remained in the Army at T months since the program first went into effect. By running separate regressions for different values of T, we can evaluate the VSI's effects on retention upon the program's conclusion ($\overline{T}$, approximately 23 months for the VSI program), and we can also evaluate how retention rates evolved over time before and after the program's initial roll-out. In all regressions we include MOS*rank fixed effects to capture any average differences in retention probabilities across ranks and occupations, and we control for the soldier's years of service, since reenlistment probabilities generally decrease with tenure after a soldier's first enlistment.

Given these controls, we identify the effect of program eligibility from within-years-of-service variation in MOS and rank and from within-MOS*rank-bin variation in years of service. Our

Table 5: Relationship Between VSI Eligibility and Individual Ability

	Dependent Var.: VSI Eligibility	
	(1)	(2)
AFQT	-.064***	.003
	(0.008)	(0.003)
Adjusted R^2	0.057	0.448
MOS FE		✓
Rank FE		✓
YOS FE		✓
Demographic Controls	✓	✓
Avg. Share Eligible	0.05	0.05
Avg. AFQT	0.59	0.59
Observations	135,523	135,497

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows results from regressing VSI program eligibility on individual ability. Column (1) does not control for VSI eligibility criteria whereas column (2) does. Ability is defined as AFQT percentile (on a scale from 0-1).

key identifying assumption is that, after controlling for these observable determinants of program eligibility, eligibility for an early retirement program is correlated with neither an individual's ability nor with other determinants of her reenlistment decision. In other words, absent program implementation, we assume that reenlistment rates for eligible and ineligible groups of soldiers would have followed parallel trends. In fact, Figure 4 shows that the effect of VSI eligibility on a soldier's probability of retention was indistinguishable from zero in the months prior to the VSI program's rollout, suggesting that retention rates for eligible and ineligible soldiers were previously moving in close tandom. Further, while Table 4 shows that soldiers eligible for VSI tended to have lower AFQT scores than non-eligible soldiers, in Table 5 we use regression results to show that the association between eligibility and ability largely disappears after controlling for the program's official eligibility criteria of MOS, rank, and years of service. Our identifying assumption is also consistent with our review of contemporaneous Army policy documents and our interviews with Army officials, who described the early retirement programs as "blunt" policy tools that ignored a soldier's individual ability.

4.4 Early Retirement Results

We present our early retirement results in Table 6, which reports regression results from Equation 5 showing the effect of VSI eligibility on soldiers' probability of remaining in the Army at the conclusion of the VSI program, and in Figure 4, which shows how the VSI program's effects on retention evolved before and after its initial rollout.

Table 6: The Effects of VSI Eligibility and Individual Ability on Soldier Retention

	Dep. Var.: Retention at Program Expiration			
	(1)	(2)	(3)	(4)
VSI/SSB Eligibility	-0.121***	-0.186***	-0.107***	-0.132***
	(0.009)	(0.018)	(0.009)	(0.018)
VSI/SSB Eligibility * AFQT		0.128***		0.048*
		(0.029)		(0.029)
AFQT	-0.056***	-0.063***	-0.006	-0.013
	(0.009)	(0.009)	(0.010)	(0.010)
Adjusted R^2	0.183	0.183	0.190	0.190
Sample	All Active	All Active	6–20 YOS	6–20 YOS
MOS FE	✓	✓	✓	✓
Rank FE	✓	✓	✓	✓
YOS FE	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓
Avg. Retention Rate	0.79	0.79	0.82	0.82
Share Eligible	0.05	0.05	0.14	0.14
Avg. AFQT	0.59	0.59	0.55	0.55
Observations	135,497	135,497	45,598	45,598

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effect of VSI program eligibility and individual soldier ability on soldier's likelihood of remaining in the Army at program expiration. Standard errors are two-way clustered at the MOS*Rank and YOS level and reported in parentheses. Columns 1–2 samples include all soldiers actively serving on February 1, 1993 (that is, six months prior to the VSI/SSB program start date of August 1, 1993). Columns 3–4 samples are further restricted to soldiers meeting the basic years-of-service eligibility requirement (with between 6 and 20 years of service prior to program implementation). All regressions include occupation and rank fixed effects and control for years-of-service, gender, age, marital status, race, and special skill dummies. Ability is defined as AFQT percentile (on a scale from 0–1).

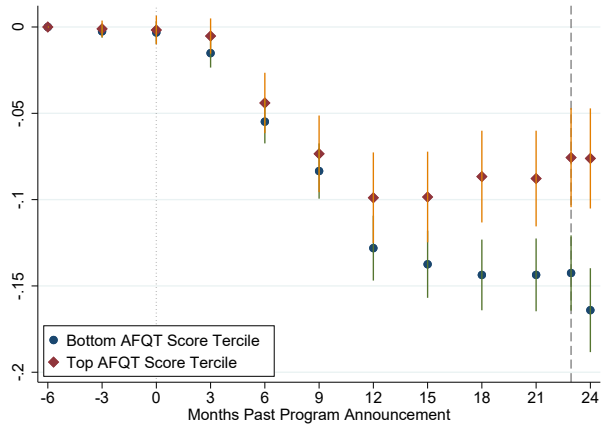


Figure 4: The Effect of VSI Eligibility on Soldier Retention, by Soldier Ability Terciles.

Figure plots non-parametric estimates of the marginal effect of VSI program eligibility on the probability of remaining in the Army in period t for high- and low-ability soldiers, where t is defined as the number of months since the start of the VSI program on August 1, 1993. Coefficients are obtained from separate regressions for each time period t where program eligibility is interacted with dummies for a soldier's within-military AFQT score tercile. The middle tercile was also included but is not plotted here. Sample consists of all soldiers actively serving on February 1, 1993.

The VSI program achieved its intended purpose of enticing soldiers to separate from the Army, but the effects were much larger among the lowest ability soldiers. For example, using our preferred sample of all non-first-term soldiers who were serving in the Army on February 1, 1993 (reflected in the first two columns of Table 6), we find that VSI eligibility negatively affected the probability of retention after 23 months by more than 11 percentage points for soldiers near the sample average AFQT score of 59 ($-0.186+0.128*0.59$), but that effect was dampened by more than 1.2 percentage points for each additional 10 points of AFQT score. Figure 4 confirms these results by comparing the effects of VSI eligibility on soldiers in the top versus bottom terciles of the AFQT score distribution before and after program implementation. VSI eligibility induced separation among both groups, but by 24 months after the VSI program's initial rollout, early retirement offers were less than half as effective at inducing separation for soldiers in the top AFQT score tercile relative to soldiers in the bottom AFQT tercile. We find similar results using promotion speed as our measure of ability (Appendix Table 18).

These magnitudes are modest but likely economically significant to military officials. Our results, discussed in more detail in Appendix Section D, suggest that counterfactually extending early retirement offers to a cohort of 1,000 additional early-career soldiers would induce 121 additional early separations. Among these marginal soldiers, the average AFQT score would be 2.5 points (one sixth of a standard deviation) below the usual average for separating soldiers. Thus, in con-

trast to SRBs, which tend to negatively select soldiers for retention, early retirement offers tend to negatively select soldiers for early separation, and the self-selection induced by these offers is large enough to meaningfully increase the average ability profile of retained soldiers.

5 Explanatory Mechanisms

Why would high-ability soldiers be less responsive to cash retention incentives, whether in the form of reenlistment bonuses or early retirement buy-outs? In this section we explore the role of three potential mechanisms, namely differences between high- and low-ability soldiers in financial liquidity, personal discount rates, and unobservable "taste for service." We focus on SRBs for reasons of statistical power and data access, but we believe that similar mechanisms explain worker sorting in the early retirement context.

First, low-ability soldiers may exhibit differential sensitivity to cash incentives because they are less liquid and more credit constrained than high-ability soldiers. For example, credit-constrained soldiers may use the lump-sum early retirement benefit to prolong and optimize their job search in the civilian labor market. Given that family resources account for a large share of the variation in AFQT scores (Neal and Johnson 1996) and that AFQT scores are strongly correlated with future labor market outcomes (Heckman et al. 2006), access to credit is likely to be correlated with cognitive ability. We match individuals in our sample to their credit records and confirm that AFQT scores and credit scores are correlated in our sample ($\rho = 0.22$, $p < 0.0001$).

To formally explore the liquidity mechanism, we estimate regressions similar to equation **??**, augmenting them with two- and three-way interaction terms in Table 7. Our estimates (Column 3) reveal a negative and statistically significant coefficient on the three-way interaction between SRB offer, AFQT score, and individual credit scores. These results suggest that, while high-ability soldiers are less responsive to SRBs in general, the pattern is especially stark among those high-ability soldiers with high credit scores. Conversely, while low-ability soldiers continue to be quite responsive to SRBs, the relationship is largely driven by low-ability soldiers with low credit scores.

Next, we explore the potential role of different personal discount rates (PDRs) across high- and low-ability soldiers. Previous research has established that cognitive ability is correlated with decision-making characteristics including patience and risk tolerance (see, e.g., Frederick 2005, Benjamin et al. 2013). In the military context, Warner and Pleeter (2001) and Simon et al. (2015) document a negative correlation between AFQT scores and PDRs. Their findings help to

Table 7: The Effects of SRB Offer Amounts and Individual Ability on Soldier Retention, Controlling for Possible Mechanisms

	Credit Score			TSP Contribution Share			County Veteran Share		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SRB Offer	0.080***	0.187***	0.065	0.068***	0.068***	0.067***	0.031***	0.014**	-0.009
	(0.010)	(0.017)	(0.053)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.013)
SRB Offer * Ability	-0.087***	-0.068***	0.113	-0.062***	-0.059***	-0.058***	-0.025***	-0.026***	0.011
	(0.014)	(0.014)	(0.075)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.020)
Ability	-0.093***	-0.039	-0.075*	-0.102***	-0.103***	-0.104***	-0.152***	-0.169***	-0.181***
	(0.010)	(0.037)	(0.039)	(0.010)	(0.010)	(0.010)	(0.006)	(0.010)	(0.011)
SRB Offer * Mechanism Var.		-0.019***	0.000		-0.084***	-0.017		0.129***	0.303***
		(0.002)	(0.008)		(0.019)	(0.061)		(0.025)	(0.077)
Ability * Mechanism Var.		-0.007	-0.001		-0.317***	-0.292***		0.141**	0.231***
		(0.006)	(0.006)		(0.050)	(0.056)		(0.058)	(0.067)
Mechanism Var.		-0.000***	-0.000***		0.542***	0.525***		0.315***	0.262***
		(0.000)	(0.000)		(0.038)	(0.042)		(0.040)	(0.043)
SRB * Ability * Mechanism Var.			-0.028**			-0.085			-0.275**
			(0.011)			(0.078)			(0.111)
Adjusted R^2	0.184	0.186	0.186	0.202	0.203	0.203	0.134	0.135	0.135
Year*Month FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.69	0.69	0.69	0.65	0.65	0.65	0.67	0.67	0.67
Avg. SRB	0.20	0.20	0.20	0.26	0.26	0.26	0.32	0.32	0.32
Avg. Ability	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Avg. of Mechanism Proxy	633.90	633.90	633.90	0.02	0.02	0.02	0.13	0.13	0.13
Observations	626,242	626,242	626,242	1,201,372	1,201,372	1,201,372	1,483,861	1,483,861	1,483,861

Note. Table shows possible explanatory mechanisms for main effect of SRBs and ability on soldier reenlistment. Standard errors are two-way clustered at the MOS*Rank*YOS and individual level and reported in parentheses. SRBs are in $10,000s of 2015 dollars. Demographic controls include gender, age, marital status, race, and special skill dummies. Ability is defined as AFQT percentile (on a scale from 0-1). Columns (1)-(3) proxy for liquidity with individual credit scores; columns (4)-(6) proxy for personal discount rates with contributions (as % of base pay) to the Thrift Savings Plan; columns (7)-(9) proxy for individual taste for military service with the veteran share of the total adult population in a soldier's home-of-record county according to the 2000 Decennial Census. Samples are restricted to spells ending with eligibility for reenlistment and with reenlistment windows opening between 1997–2015; samples are further restricted to constant samples based on non-missingness of mechanism proxies.

explain why it is that, among soldiers in our sample who opted for early separation through the VSI program, soldiers with lower AFQT scores and soldiers with slower promotion speeds were substantially more likely to choose the lump-sum SSB option over the VSI annuity, despite the latter having more than double the net present value at discount rates below 7%.

We explore the relationship between PDRs and our observed patterns of selection by augmenting our models with a proxy for PDRs, namely how much a soldier is currently saving for retirement in the Thrift Savings Plan, a 401(k)-style retirement savings program available to most federal employees. Retirement savings inherently involve a willingness to transfer resources from the present to the future, and existing research has shown savings to depend on an individual's pure time preferences (Finke and Huston 2013). We observe soldier's TSP contributions as a share of total base pay over the course of an enlistment and interact this with our measures of ability and SRB offers. As predicted and consistent with prior research, we find that AFQT scores are indeed positively correlated with a soldier's TSP contribution share. Columns (4)–(6) of Table 7 show the effects of SRB offers and individual ability on reenlistment rates after controlling for two- and three-way interactions with a soldier's TSP contribution share. While we find that high-ability, high-TSP-contribution soldiers are particularly insensitive to SRB offers, the effect is relatively small and statistically insignificant.

Third, we explore whether idiosyncratic "taste for service" may be correlated with individual ability such that high-ability soldiers tend to be inframarginal and consequently less sensitive to pecuniary retention incentives. While taste for service is unobservable and hard to analyze, we proxy for it using the veteran share of the total adult population in the soldier's home-of-record county (where they joined the Army from) from the 2000 Decennial Census. We expect that soldiers from high veteran-share home counties are more likely to have grown up in or around military households, to have had greater exposure to the military, and thus to have a higher taste for service.

In Columns (7)–(9) of Table 7 we explore the role of veteran share as a proxy for taste for service. The negative and statistically significant coefficient on the three-way interaction term in column (9) suggests that high-ability soldiers from high veteran-share counties are especially insensitive to SRB offers. Notably, when we include the two- and three-way interactions between SRBs, ability, and county veteran share, the coefficient on SRB offers alone goes to approximately zero, as does coefficient on the two-way interaction between SRBs and individual ability. To the extent our veteran share proxy accurately captures something like taste for military service, the

positive coefficient on the two-way interaction between SRBs and county veteran share suggests that SRBs are especially effective at retaining relatively low-ability, high-taste-for-service soldiers. While our measure of taste for service is less direct and less nuanced than the measures of public sector motivation used elsewhere in the literature (see, e.g., Dal Bo et al. 2013, Deserranno 2019, Leaver et al. 2021, Khan 2025), they nonetheless suggest that the effect of cash retention incentives may be both amplified and diminished by non-pecuniary dimensions of military service, especially for high- or low-ability soldiers. They also highlight the tradeoff between retaining soldiers with high ability and those with high taste for service.

Our data do not enable us to distinguish the relative contributions of these mechanisms, and absent any random variation in their provision, our Table 7 results should be interpreted as providing correlational evidence on the heterogeneous effects of SRBs. Nor do we mean to suggest that our list is exhaustive. Another possibility, which we are unable to test with the current data, is that ability may correlate with lifetime wealth or earnings such that low-ability soldiers possess greater marginal utility of income and thus derive more utility from cash offers. Altogether, our analysis of individual liquidity, personal discount rates, and taste for service explanatory mechanisms is largely suggestive, but it may be especially helpful to public sector officials inside and outside the military to appreciate the potential role of each. Personnel managers should use contextual knowledge of their own organizations to consider how susceptible their workforces are to the mechanisms of selection we identify here.

6 Conclusion

This paper explores the nature of selection in public sector employee retention with evidence from the U.S. Army. We extend the literature on worker sorting between the public and private sectors, bringing new attention to the retention margin and to the structure of commonly used retention incentives. In various public sector settings, policymakers and personnel managers may need to know not only whether such retention incentives are effective on average but also how they affect the composition of their organization's workforce. Our formal models establish that the relationship between individual ability and responsiveness to retention incentives is theoretically ambiguous and requires empirical investigation.

We provide novel empirical evidence leveraging large samples and administrative data from the U.S. Army. Using variation in reenlistment bonuses and early retirement "buy-out" offers, we show

that low-ability soldiers are more sensitive to immediate lump-sum transfers than their higher-ability peers. On the margin, lump sum bonus offers induce lower-ability soldiers to reenlist, while early retirement offers induce lower-ability soldiers to leave the Army. Moreover, we estimate that both patterns are large enough to meaningfully affect the average ability level of the military. We provide suggestive evidence for three explanatory mechanisms: differences in individual's liquidity, time preferences, and "taste for service." Although our results are derived from the particular context of the U.S. military, we nonetheless view our findings as potentially relevant to other public sector organizations where personnel managers lack the flexibility to target incentives to individual high-ability workers.

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Appendix for Online Publication

A Theory

A.1 Extended Model: Incorporating Taste for Military Service

Consider a slightly extended model where the attractiveness of the military option depends not just on military wages (w_0, w_1) but also on an individual's idiosyncratic taste for military service, denoted by c. Individual ability and taste for service are arbitrarily jointly distributed according to an unconditional population joint density function $f_{a,c}(a, c)$.

Initial Entry with Taste. Period 0 Army utility is now written as $U_0^A = w_0 + c$ and civilian utility remains $U_0^C = g_0(a) + \varepsilon_0$. Written as a function of ability and taste, individuals enlist with probability

$$P(\text{Enlist} \mid a, c) = \Phi\left(\frac{w_0 + c - g_0(a)}{\sigma_0}\right),$$

and the joint distribution of ability and taste among military entrants is

$$f(a, c \mid \text{Enlisted}) \propto f_{a,c}(a, c)\, \Phi\big(\tfrac{w_0+c-g_0(a)}{\sigma_0}\big). \tag{6}$$

Reenlistment with taste heterogeneity. Incorporating taste for military service, utilities are

$$U_1^A = w_1 + c, \qquad U_1^C = g_1(a) + \varepsilon_1,$$

and soldiers reenlist with probability

$$P(\text{Reenlist} \mid a, c) = \Phi\left(\frac{w_1 + c - g_1(a)}{\sigma_1}\right).$$

The marginal effect of bonuses conditional on (a, c) is

$$\frac{\partial P}{\partial w_1}(a, c) = \frac{1}{\sigma_1}\, \varphi\left(\frac{w_1 + c - g_1(a)}{\sigma_1}\right),$$

and integrating over tastes yields the marginal-effect curve as a function of ability alone:

$$\begin{aligned}\mathcal{M}(a) &= \frac{\partial P}{\partial w_1}(a, c) \\ &= \int \underbrace{\frac{1}{\sigma_1}\,\phi\Big(\frac{w_1 + c - g_1(a)}{\sigma_1}\Big)}_{\equiv h(a,c)} f(c \mid a, \text{Enlisted})\, dc. \end{aligned} \tag{7}$$

Differentiating with respect to a and applying the product rule yields the following cross-partial derivative:

$$\begin{aligned}\mathcal{M}'(a) = &\int \frac{\partial h(a,c)}{\partial a}\, f(c \mid a, \text{Enlisted}) dc \\ &+ \int h(a,c) \frac{\partial f(c \mid a, \text{Enlisted})}{\partial a} dc. \end{aligned} \tag{8}$$

Although more complicated than the baseline model, equation 8 has an inuitive explanation: the first integral—which should be familiar from the baseline cross-partial written in Equation (3)—captures how marginal responsiveness to bonuses changes with ability while holding taste for service fixed; the second integral captures how the composition of tastes for military service changes as ability changes.

Our extended model shows that sharp theoretical predictions are even harder to come by when we allow for heterogeneity in additional dimensions like taste for military service. For each taste level c, the marginal effect $\mathcal{M}(a \mid c)$ is single-peaked in ability and roughly analogous to the simple bell-shaped marginal effect curve predicted by the baseline model. The overall marginal effect $\mathcal{M}(a)$, however, averages these taste-specific curves using weights that vary with ability throughout the conditional taste distribution. Without further structure on how $f(c \mid a, \text{Enlisted})$ varies with ability, the weighted average need not inherit any particular shape. Under realistic assumptions, the marginal effect of bonuses may be strictly decreasing throughout the observed distribution of within-military ability types, which is approximately what we find in our empirical analysis. We formalize this result in the following two propositions, which we prove in Appendix Section A.2.

Proposition 2 (Indeterminacy in the Extended Model)**.** *Absent any restriction on the conditional taste distribution $f(c \mid a, \text{Enlisted})$, the within-military marginal effect $\mathcal{M}(a) = \int \frac{1}{\sigma_1}\varphi\big(\frac{w_1+c-g_1(a)}{\sigma_1}\big) f(c \mid a, \text{Enlisted})\, dc$ need not be monotone or even single-peaked in a.*

Proposition 3 (Sufficient Conditions for Decreasing Marginal Effects in the Extended Model)**.**

Define

$$D(a) = w_1 + \mathbb{E}[c \mid a, \textit{Enlisted}] - g_1(a)$$

as the net military advantage for ability type a (that is, the expected difference in military versus civilian utility for individuals of ability type a). Suppose $g_1(a)$ and $\mathbb{E}[c \mid a, \textit{Enlisted}]$ are differentiable $\forall a$ on the within-military support of ability types. Further suppose that $f(c \mid a, \textit{Enlisted}) = f_0\big(c - \mu(a)\big)$, so that the center of the distribution of observed taste c is allowed to vary with a but the shape of the distribution is not.

1. *Then $D(a)$ is a sufficient statistic for $\mathcal{M}(a)$.*
2. *$\mathcal{M}(a)$ is strictly decreasing in ability whenever either $D(a) < 0$ and $D'(a) < 0$ or $D(a) > 0$ and $D'(a) > 0$.*

In short, if the shape of the taste distribution is invariant to ability type, then the shape of $\mathcal{M}(a)$ depends only on the average relationship between ability and taste for service and the shape of the civilian earnings function $g_1(a)$, and we should expect to see the marginal effect of bonuses decreasing in ability whenever higher ability levels tend on average to widen the gap between the returns to military service and the returns to civilian employment. It may seem natural to anticipate that selection at the initial enlistment stage would tend to generate a positive correlation between ability and taste for military service among enlisted soldiers—since high-ability individuals who enlist despite attractive civilian options likely have above-average taste for service—which would push against a decreasing marginal effect curve. However, even a broadly positive correlation between ability and taste for service could in principle be overcome by a sufficiently steep civilian earnings gradient $g_1'(a)$. Ultimately, the net relationship between ability and taste for service among enlisted soldiers is an empirical question. Using the veteran share of a soldier's home-of-record county as a proxy for taste for service, we find that the relationship is in fact non-monotone: Appendix Figure 12 shows that the relationship between AFQT scores and veteran share is generally positive in the bottom and middle portions of the within-military ability distribution but flattens and then becomes negative at the top. While our extended model offers no straightforward predictions, it nonetheless demonstrates that the marginal effect of bonuses can be broadly decreasing in ability under strong but reasonable assumptions.

A.2 Model Proofs

Proof for Proposition 2 :

Proof. Suppose a one-to-one mapping between ability and taste for service, so that all soldiers of ability level a have the same taste for service $c = \tilde{c}(a)$. Then equation (7) collapses to

$$\mathcal{M}(a) = \frac{1}{\sigma_1}\,\phi\Big(\frac{w_1 + \tilde{c}(a) - g_1(a)}{\sigma_1}\Big),$$

which is increasing in a whenever $w_1 + \tilde{c}(a) > g_1(a)$ and $\tilde{c}'(a) - g_1'(a) < 0$ *or* $w_1 + \tilde{c}(a) < g_1(a)$ and $\tilde{c}'(a) - g_1'(a) > 0$, decreasing in a whenever $w_1 + \tilde{c}(a) > g_1(a)$ and $\tilde{c}'(a) - g_1'(a) > 0$ *or* $w_1 + \tilde{c}(a) < g_1(a)$ and $\tilde{c}'(a) - g_1'(a) < 0$, and which obtains a global maximum any time that $g_1(a) = w_1 + \tilde{c}(a)$. Absent restrictions on the shape of $\tilde{c}(a)$, the marginal effect curve $\mathcal{M}(a)$ can be monotonically increasingly or decreasing, single-peaked, or multi-peaked with an arbitrary number of local and global maxima. □ □

Proof for Proposition 3 :

Proof. Write the marginal effect from (7) as

$$\mathcal{M}(a) = \int \frac{1}{\sigma_1}\,\phi\Big(\frac{w_1 + c - g_1(a)}{\sigma_1}\Big)\, f(c \mid a, \text{Enlisted})\, dc.$$

Because we assume the taste distribution keeps the same shape and only shifts with ability, $f(c \mid a, \text{Enlisted}) = f_0\big(c - \mu(a)\big)$, perform the change of variables $x = c - \mu(a)$. This yields

$$\mathcal{M}(a) = \frac{1}{\sigma_1}\int \phi\Big(\frac{w_1 + \mu(a) + x - g_1(a)}{\sigma_1}\Big)\, f_0(x)\, dx.$$

Define the one-dimensional map

$$H(u) \equiv \frac{1}{\sigma_1}\int \phi\Big(\frac{u + x}{\sigma_1}\Big)\, f_0(x)\, dx,$$

which is a fixed function determined by the baseline shape f_0 and the normal kernel. Noting that $u = D(a) = w_1 + \mathbb{E}[c \mid a, \text{Enlisted}] - g_1(a)$ differs from $w_1 + \mu(a) - g_1(a)$ only by the constant shift between $\mu(a)$ and the mean, we may equivalently write $\mathcal{M}(a) = H\big(D(a)\big)$. This proves part (1): under the shape-invariance assumption the entire dependence of $\mathcal{M}$ on a runs through the scalar index $D(a)$, so $D(a)$ is a sufficient statistic for $\mathcal{M}(a)$.

For part (2), note that $H(\cdot)$ is a single-peaked continuous function of its scalar argument (it rises toward a unique maximum at some scalar u^* and falls thereafter). Consequently $H'(u) > 0$

for $u < u^*$. If $D(a) < u^*$ for every observed a then $H'(D(a)) > 0$ throughout the observed support. If in addition $D(a)$ is strictly decreasing on that support, i.e. $D'(a) < 0$ for all observed a, the chain rule gives

$$\mathcal{M}'(a) = H'\big(D(a)\big)\, D'(a),$$

which is positive times negative, hence strictly negative for every observed a. Therefore $\mathcal{M}(a)$ is strictly decreasing on the within-military support, as claimed. □ □

A.3 Relevance of Reduced-Form Parameter to Objects of Policy Interest

We next relate the parameter that we estimate in Section 3 to the effect of retention policies on the average ability profile of retained military members $\overline{A}$, which is itself an important quantity for military analysts (Wigdor and Green 1991). Using the example of cash reenlistment bonuses, the average ability of retained soldiers is

$$\overline{A} = \sum_u p_i(K) * a_i$$

where $p_i(K)$ is the probability that individual i reenlists as a function of a reenlistment bonus offer K, and a_i is the ability of soldier i. The response of this average to an across-the-board marginal increase in reenlistment bonus offers K is

$$\frac{d\overline{A}}{dK} = \sum_i \frac{dp_i(K)}{dK} * a_i = \sum_i \gamma_i a_i$$

where $\gamma_i = \frac{dp_i(K)}{dK}$. Recall from Section 3 that, in estimating the effects of SRBs, the coefficient of interest is β_2, which we interpreted as the differential responsiveness of high- versus low-ability soldiers to SRB offers—that is, the effect of ability a_i on individual responsiveness γ_i. Using expectations, and rewriting β_2 in terms of variances, we see that we can express the effect of a retention bonus on the average ability of retained soldiers as:

$$\begin{aligned}
\frac{d\overline{A}}{dK} &= \overline{\gamma}\ \overline{a} + \mathrm{Cov}(\gamma_i, a_i) \\
&= \overline{\gamma}\ \overline{a} + \frac{\mathrm{Cov}(a_i, \gamma_i)}{\mathrm{Var}(a_i)}\mathrm{Var}(a_i) \\
&= \overline{\gamma}\ \overline{a} + \beta_2 \mathrm{Var}(a_i)
\end{aligned}$$

where $\overline{\gamma}$ is the average response of soldiers to the bonus and $\overline{a}$ is average ability in the military. In other words, the key parameter that needs to be estimated to inform the effect of retention policies on average soldier ability is β_2, which is precisely the parameter we focus on estimating in Section 3.

B Data Appendix

B.1 Reenlistment Data

The main data for this analysis comes from the U.S. Army's Total Army Personnel Database (TAPDB). For the SRB analysis we construct a panel of enlistment spells with reenlistment windows opening between 1997 and 2015 (which is the period for which we have SRB offer data). We exclude from the analysis all current spells, and we also exclude spells lasting fewer than three months. For the early retirement analysis we construct a sample of soldiers who were serving in the Army on February 1, 1993, which was six months prior to the VSI program's implementation date of August 1, 1993.

The primary outcome of both analyses is whether a soldier chooses to reenlist. In addition to making the choice of whether to reenlist at the end of their spell, some soldiers have the option of extending their contract by up to a year. Since we are interested in major reenlistment decisions, we absorb all extensions into the previous spell. For example, if a soldier served for 3 years and extended their spell for 1 year, but then left the military, we code the soldier as having 1 four year spell before choosing not to reenlist. The left panel of Figure 10d shows the distribution of spell length in the resulting sample, and the right panel of Figure 10d shows the distribution of total enlistment spells per soldier; the modal enlistment spell lasts between 3 and 4 years, and a majority of soldiers serve just one spell prior to separation.

In addition to knowing the date at which the soldier decided to reenlist and the date at which a term of service was due to end, we need to identify the date at which the soldier entered the reenlistment window. We use this date to assign the SRB offer that the soldier faces; in some specifications we also use the date to control for local labor market conditions in the soldier's home commuting zone. Reenlistment windows typically lasted between 12 and 24 months throughout our sample, and soldiers are free to make a final reenlistment decision at any point within their window. Although a soldier can theoretically time their reenlistment based upon a belief that prevailing SRB offers (or other relevant considerations, like local labor market conditions) will

change over the course of their reenlistment window, we abstract from such strategic timing by assigning soldiers the SRB offered to them in the first month of their reenlistment window. In fact, among soldiers who choose to reenlist, more than 50% do so within the first three months of their reenlistment window, and we have confirmed that our results are robust to alternative SRB assignment protocols (for example, assigning soldiers the SRB they were offered in the last month of their reenlistment window or assigning soldiers the minimum, maximum, or average SRB offered throughout their reenlistment window).

We use as our primary measure of individual ability a soldier's AFQT score at the time of initial Army accession. In Appendix Section C we report additional results using the speed of a soldier's early career promotions, which we specifically define as the number of months that the soldier spends at or above the rank of Sergeant (E-5) in their first term of service. Appendix Table 9 summarizes correlation coefficients from Wigdor and Green (1991) showing that AFQT score is highly correlated with within-military hands-on performance metrics. Figure 10 also shows that AFQT scores and promotion speed are highly correlated with one another.

B.2 Credit, Thrift Savings Plan (TSP), and Veteran Share of Population Data

In Table 7 we probed possible explanatory mechanisms by controlling for credit scores, Thrift Savings Plan (TSP) participation, and veteran share of a soldier's home-of-record county. Credit data were obtained from a major credit reporting agency, which we then matched with the TAPDB enlistment database. Credit data consists of a panel of twice-annual observations for soldiers with service between April 2007 and March 2015. Among soldiers who were eligible for at least one reenlistment during that time period, we are able to match nearly 90% to credit reporting data. For each soldier facing a reenlistment choice, we match the soldier to the credit report that is closest in time to the beginning of their reenlistment window. In addition to individual credit scores, we observe open lines of credit, balances, and delinquencies, grouped by major lending categories. For simplicity, we focus our analysis on credit scores, but we have confirmed that our results are largely robust to proxying for credit constraints with past delinquencies.

We observe Thrift Savings Plan (TSP) contribution data using payroll data from the Defense Finance Accounting Service. The TSP is a 401(k)-like retirement savings plan available to many federal workers. First established for civilian workers in 1986, members of the military became eligible for the TSP in 2001. For spells ending after 2001, we observe the soldier's total contribution to their TSP account over the course of the spell. We also observe their total base military pay over

that period, which we use to calculate their TSP contribution as a share of their total base pay. Since 2001, approximately 32% of spells show a positive contribution to the TSP, and the average contribution was approximately 2.2% of the soldier's total base pay of the spell.

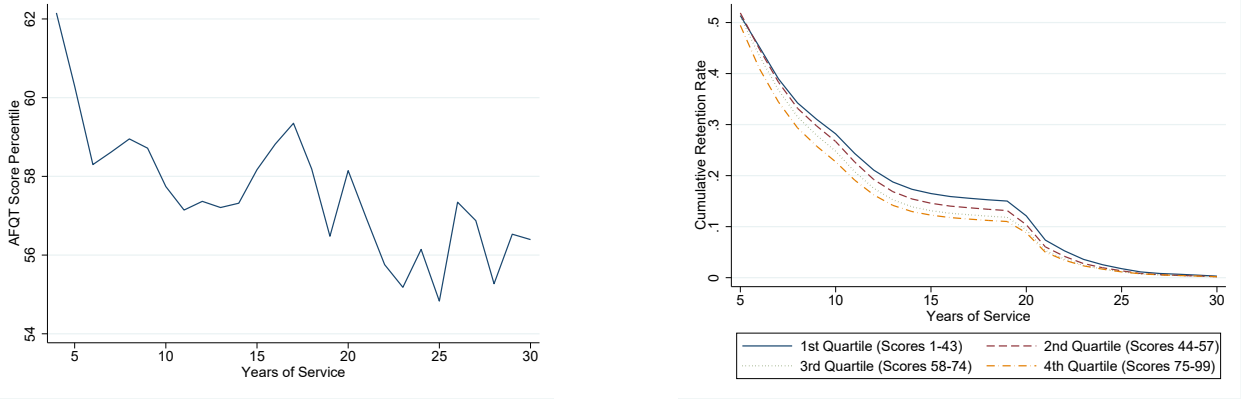
Veteran shares are calculated using veterans and active or reserve armed forces members as a share of the total adult population in a soldier's home-of-record county according to the 2000 Decennial Census (see Summary File 3, Table ID P039).

Table 8: Correlation Between Available SRB Offers

	(1)		(2)
2-year offer	0.578***	CONUS 1	0.422***
3-year offer	0.986***	CONUS 2	0.550***
5-year offer	0.988***	CONUS 3	0.586***
6-year offer	0.964***	CONUS 4	0.704***
		OCONUS 1	0.582***
		OCONUS 2	0.639***

Note. Column 1 shows within-spell correlations between a soldier's highest non-location specific SRB offer for a four-year reenlistment in the first month of their reenlistment window (i.e. their "regular" offer) and their highest non-location specific SRB offers for two-, three-, five-, and six-year reenlistments. Column 2 shows within-spell correlations between a soldier's highest regular offer and several of their highest location-specific offers within the continental U.S. ("CONUS") and outside the continental U.S. ("OCONUS").

B.3 Additional Tables and Figures

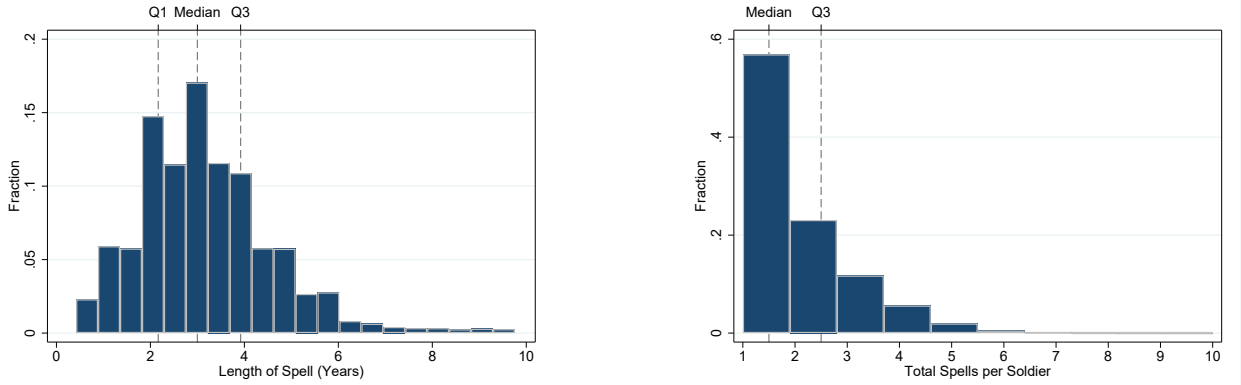


(a) Average AFQT Score Percentile by Total Years of Service.

(b) Continuation Profiles by AFQT Score Quartile.

Figure 5: Average Ability by Military Tenure.

Left panel plots the average AFQT score percentiles by soldiers' total years of service at separation. AFQT score percentiles are adjusted for accession-year fixed effects. Right panel plots separately by AFQT score quartile the share of soldiers remaining in the Army at various tenures.

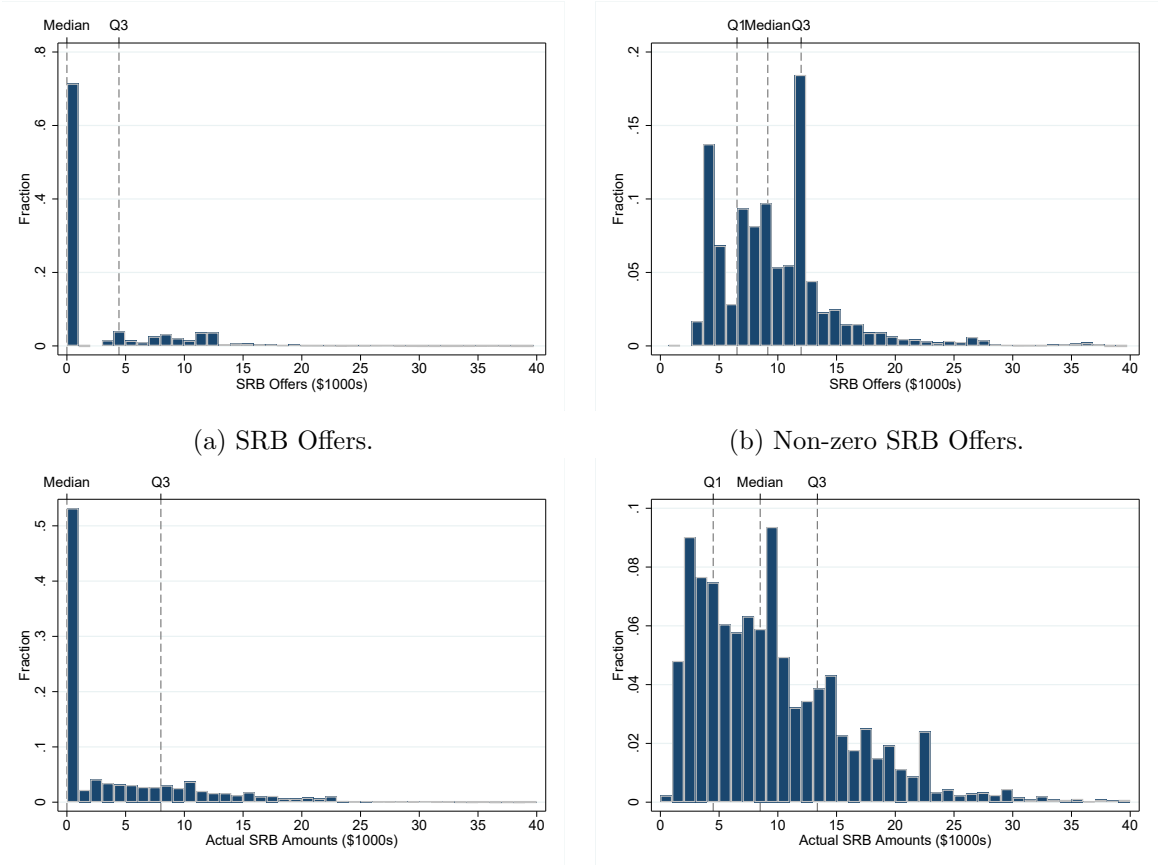


(a) Spell Length.

(b) Total Terms per Soldier.

Figure 6: Distributions of Spell Length and Total Terms per Soldier.

Left panel plots the distribution of spells by length in years. Right panel plots the distribution of soldiers by the total number of terms they had served at the time of separation. Sample includes all enlisted soldiers from 1992-2015 and excludes soldiers currently serving in the Army.



(a) SRB Offers.

(b) Non-zero SRB Offers.

(c) Actual SRB Amounts Received.

(d) Non-zero SRB Amounts Received.

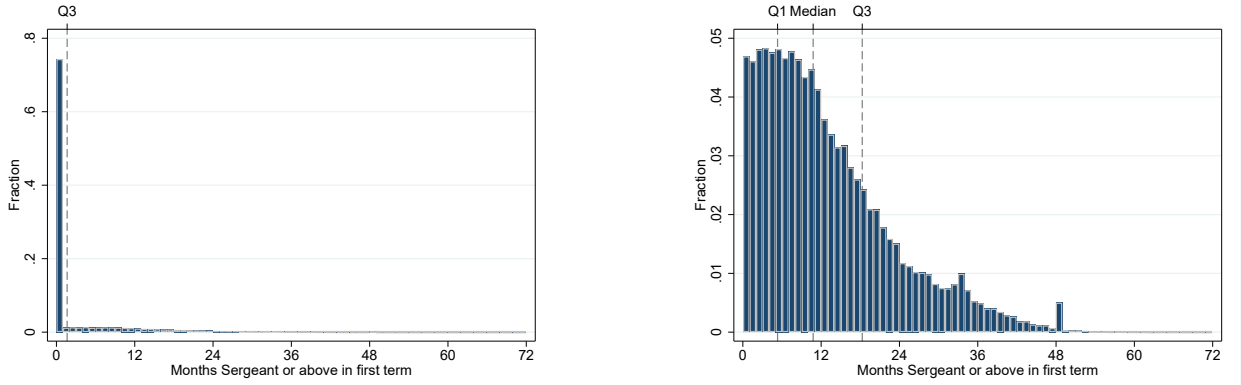
Figure 7: Distrubutions of SRB Offers and Actual SRB Amounts Received, 1997–2015.

Panels (a) and (b) plot the distribution of SRB offers. Panel (a) shows all offers (including where no SRB is offered) and panel (b) shows positive offers only. Panels (c) and (d) plot the distribution of actual SRB amounts received, with panel (d) showing positive amounts only.

Table 9: Wigdor and Green (1991) Correlation Coefficients
(AFQT Scores vs. Job-Specific Hands-On Performance)

Specialty	ρ (AFQT w/ Job Performance)
Administrative specialist	0.35
Air traffic control operator	0.10
Rifleman	0.40
Machinegunner	0.49
Mortarman	0.33
Motor transport operator	0.24
Radio operator	0.22
Median Correlation	0.26

Source: Wigdor and Green (1991), Table 8-10.



(a) All Soldiers.

(b) Soldiers who made Sergeant in their first term.

Figure 8: Promotion speed distributions.

Left panel plots the distribution of the number of months soldiers spent at or above the rank of Sergeant in their first term. Right panel plots the same distribution for the 25% of soldiers who made Sergeant at any time in their first term.

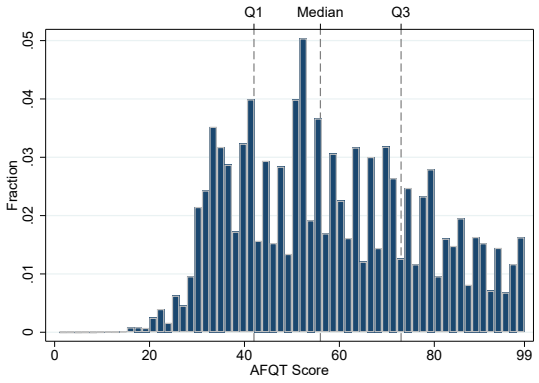
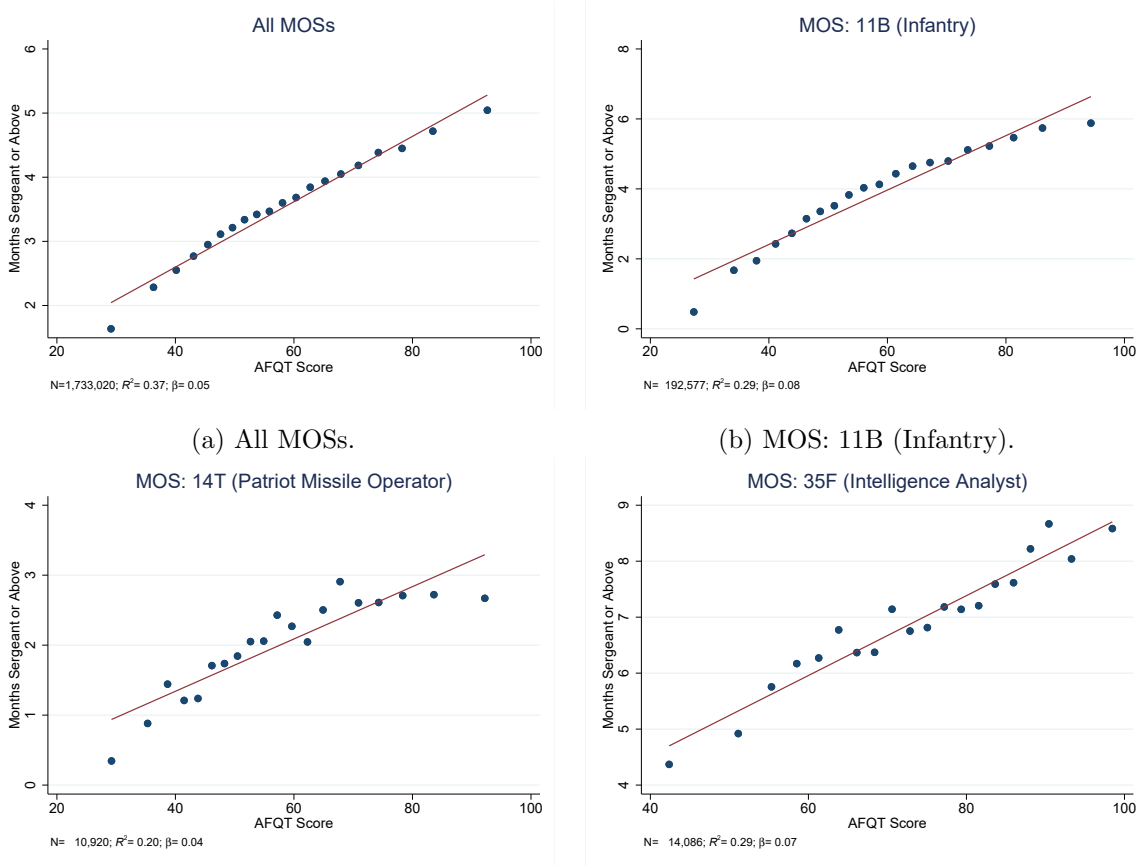


Figure 9: AFQT score distributions.

Figure plots the unconditional distribution of AFQT scores among spells ending with eligibility for reenlistment.



(a) All MOSs.

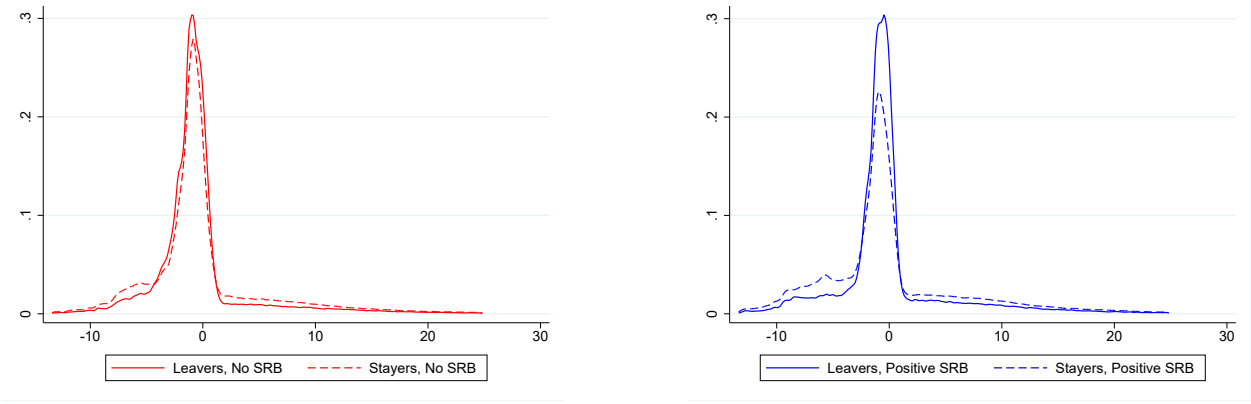
(b) MOS: 11B (Infantry).

(c) MOS: 14T (Patriot Missile Operator).

(d) MOS: 35F (Intelligence Analyst).

Figure 10: Correlation of AFQT scores and speed of promotion.

Panels display binscatter plots of promotion speeds (defined as months a soldier spends at or above the rank of Sergeant in their first term of service) against AFQT scores. Panel (a) includes all soldiers in all MOSs; panel (b) restricts to infantry soldiers; panel (c) restricts to "Patriot" missile operators; panel (d) restricts to intelligence analysts.



(a) Soldiers receiving no SRB offer.

(b) Soldiers receiving positive SRB offer.

Figure 11: Distribution of Promotion Speeds (months at or above Sergeant in first term), Split by Reenlistment Decisions and SRB Offers.

Figures 11a and 11b plot the residualized distribution of promotion speeds (months at or above Sergeant in first term following a regression of promotion speed on MOS*rank*YOS dummies as well as date dummies). Sample restricted to soldiers with eligibility to reenlist. Figure 11a plots separate distributions for stayer and leavers, conditional on having received no SRB offer at the start of their reenlistment window. Figure 11b plots separate distributions for stayers and leavers, conditional on having received any non-zero SRB offer.

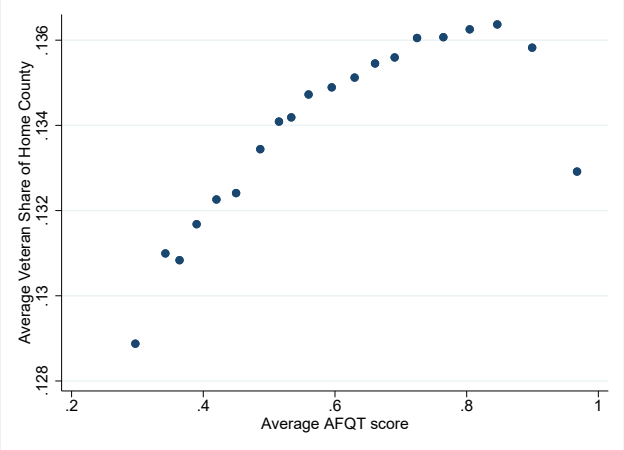


Figure 12: Average Home-of-Record County Veteran Share by AFQT Score Bin.

Figure plots the mean veteran share of a soldier's home county for each of twenty equally sized bins of the within-military AFQT score distribution. Each dot represents the mean veteran share among soldiers in that AFQT ventile. Veteran share is defined as the fraction of adults in a soldier's home-of-record county who are military veterans according to the 2000 Decennial Census. The within-military AFQT distribution is right-skewed relative to the general population due to the Army's minimum enlistment score requirement.

B.4 Case Studies: Time Series Variation in SRBs

Department of Defense guidance establishes that SRB amounts are to be determined by a combination of "inside" factors—i.e., the military's operational and strategic requirements—and "outside factors"—namely, labor market conditions and other economic trends affecting civilian labor market opportunities. Specifically, DoD guidance requires the Army and other branches to consider (1) the potential impact of a "critical personnel shortage" on the mission of the branch, (2) the degree to which current or historic retention in a particular military skill falls short of "established retention objectives," (3) the length and cost of training associated with a particular military skill, (4) any overall Army-wide personnel shortage and shortages within particular ranks, (5) the "relatively arduous or otherwise demanding nature of the military skill, as compared to other military or civilian alternatives," and, finally, (6) the degree of demand for the military skill in the civilian labor market.[17] In fact, our conversations with U.S. Army officials revealed that inside factors—those reflecting the "needs of the Army"—predominate, and outside factors are incorporated only indirectly. Rather than directly adjusting SRB offers based on civilian labor market conditions or other economic indicators, the Army typically only adjusts SRBs according to its own manning levels. Thus, to the extent that soldiers are more likely to exit the Army when the civilian labor market is strong (Borgschulte and Martorell 2018), SRB offers will indirectly reflect outside economic conditions by way of their effect on aggregate retention rates (either at the MOS, grade, or Army-wide level).

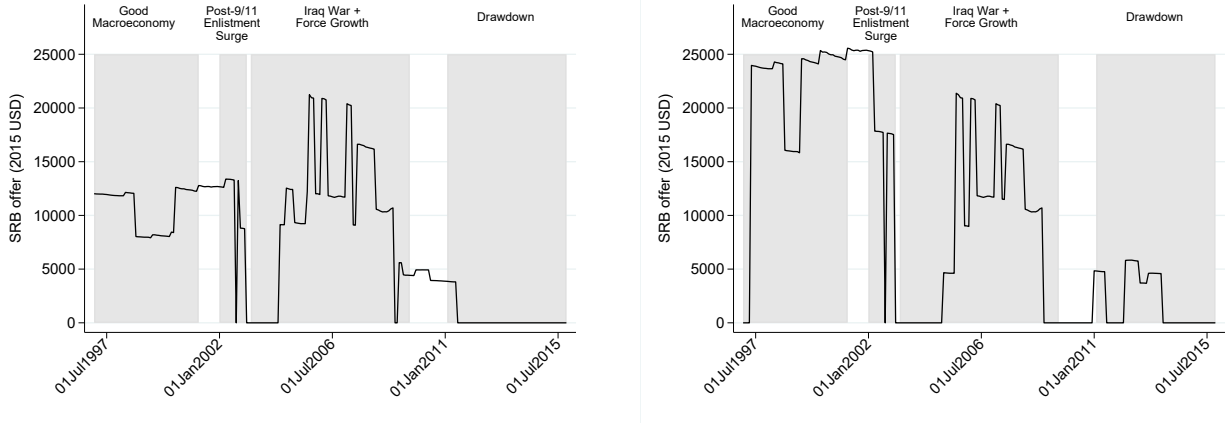
Here we briefly consider how these factors may have driven time-series variation in SRB offers for two separate MOSs. Specifically, in Figure 13, we plot the time series of SRB offers for infantrymen on the left and Patriot missile operators (responsible for operating a type of surface-to-air missile system that gained notoriety during the 1991 Gulf War) on the right. The Infantry MOS is not only the largest in the Army (11% of our sample) but also the most representative of the Army as a whole. Infantry SRBs remained moderately high throughout the period preceding the September 11, 2001 attacks. Although operational requirements were relatively minimal during this period, pre-war SRBs might reflect positive macroeconomic conditions, which forced the military to compete with civilian employers for qualified workers. Relatively high pre-war SRBs for infantry personnel may also reflect lower average retention rates relative to other MOSs as well as the

[17] See Department of Defense Instruction (DoDI) 1304.31, "Enlisted Bonus Program; DoDI 1304.29, "Administration of Enlistment Bonuses, Accession Bonuses for New Officers in Critical Skills, Selective Reenlistment Bonuses, and Critical Skills Retention Bonuses for Active Members."

perceived "arduousness" of the specialty relative to other civilian jobs. Still, infantry SRBs dipped dramatically in early 2002 and remained low throughout much of the 2002-2004 period. This may reflect higher accessions and retention during a period of surging enlistment, which many attribute to heightened patriotism in the aftermath of the 9/11 attacks. Infantry SRBs increased again in 2004, and despite considerable volatility, they remained high through approximately 2008, most likely reflecting the military's growing operational requirements in Iraq and Afghanistan. Though we might be concerned that this period also had higher casualties than other periods (a negative job amenity that is likely to affect reenlistment outside of its effect on SRBs), we control for month fixed effects in all regressions and occupation-by-month fixed effects in others. Infantry SRBs have remained low since approximately 2011, likely reflecting the military's gradual exit from Iraq and its overall drawdown of personnel.

In contrast to infantry SRBs, SRB offers for Patriot missile operators, plotted in the right panel of Figure 13, appear to be largely driven by operational requirements and large-scale changes to the Army's overall force structure. SRB offers to Patriot missile operators were highest between 1997 and 2002, which was precisely the period during which the Army was expanding its number of Patriot missile battalions from 13 to 15. The Army's focus on Patriot missiles was likely influenced by a period of perceived threat by Iraqi Scud missiles, against which Patriot missiles were intended to defend. The Patriot missile operator SRBs illustrate how exogenous changes in Army force structure—due to the standing-up of a new unit or perhaps the introduction of new military technology—can be an important driver of variation in SRBs over time.

Figure 13: Selective Reenlistment Bonus (SRB) Case Studies
SRB offers by MOS (E-4), 1997-2015



(a) MOS: 11B (Infantry)

(b) MOS: 14T (Patriot Missile Operator)

C Robustness of Empirical Results

Table 10: The Effects of SRB Amounts and Individual Ability (AFQT scores) on Soldier Retention: Alternative Specifications

	(1) Baseline	(2) SRB in logs	(3) CZ FE sample	(4) Main MOS only	(5) High Corr. MOS only	(6) Excl. Iraq Surge	(7) Positive SRB offer
SRB	0.062***		0.032***	0.043**	0.064***	0.056***	0.022**
	(0.007)		(0.006)	(0.019)	(0.020)	(0.007)	(0.011)
SRB * Ability	-0.070***		-0.025***	-0.072**	-0.058*	-0.065***	-0.024**
	(0.011)		(0.010)	(0.031)	(0.033)	(0.011)	(0.012)
Ability	-0.092***	-0.090***	-0.151***	-0.124***	-0.106***	-0.088***	-0.180***
	(0.009)	(0.010)	(0.006)	(0.021)	(0.030)	(0.010)	(0.014)
log(SRB)		0.007***					
		(0.001)					
log(SRB) * Ability		-0.008***					
		(0.002)					
Adjusted R^2	0.155	0.155	0.133	0.128	0.141	0.154	0.111
Year*Month FE	✓	✓	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.65	0.65	0.67	0.66	0.63	0.64	0.66
Avg. SRB	0.28	0.28	0.32	0.28	0.34	0.27	0.99
Avg. AFQT	0.58	0.58	0.59	0.53	0.60	0.58	0.61
Observations	1,804,326	1,804,326	1,463,546	643,859	394,353	1,473,306	516,400

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. All samples are restricted to soldiers who were eligible to reenlist with reenlistment windows opening between 1997 and 2015. Column (1) shows the baseline specification reported in Table 3 column (1). Column (2) uses an identical specification except that SRBs are log-scaled. Column (3) uses the same specification as Column (1) but is restricted to a sample with non-missing Year*Month*CZ fixed effects. Column (4) is restricted to the 10 highest-density MOSs in our sample (namely: infantry, artillery crew members, calvary scouts, wheeled vehicle mechanics, combat medics, motor transport operators, logistics specialists, culinary specialists, supply specialists, and armor crew members). Column (5) is restricted to the MOSs which Wigdor & Green (1991) identified as exhibiting a high correlation between AFQT scores and hands-on job performance (namely: infantry, armor crew members, health care specialists, information systems specialists, radio operators, and administrative specialists). Column (6) excludes soldiers who entered their reenlistment windows during the Iraq war years (2007–2009). Column (7) is restricted to soldiers who were offered a non-zero SRB.

Table 11: The Effects of SRB Amounts and Individual Ability (AFQT scores) on Soldier Retention: Alternative SRB Assignment Rules

	(1) Baseline (First SRB Offer)	(2) 6-mo. Avg. SRB	(3) 12-mo. Avg. SRB	(4) 6-mo. Max. SRB	(5) 12-mo. Max. SRB
SRB	0.062***	0.064***	0.063***	0.062***	0.061***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
SRB * Ability	-0.070***	-0.075***	-0.079***	-0.071***	-0.072***
	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)
Ability	-0.092***	-0.092***	-0.092***	-0.089***	-0.088***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Adjusted R^2	0.155	0.155	0.155	0.155	0.155
Year*Month FE	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.65	0.65	0.65	0.65	0.65
Avg. SRB	0.28	0.26	0.25	0.31	0.33
Avg. AFQT	0.58	0.58	0.58	0.58	0.58
Observations	1,804,326	1,804,326	1,804,326	1,804,326	1,804,326

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. samples are restricted to soldiers who were eligible to reenlist with reenlistment windows opening between 1997 and 2015. Column (1) shows the baseline specification reported in Table 3 column (1), which assigns soldiers the highest non-location-specific SRB offer available to them for a 4-year reenlistment on the first day of the first month of their reenlistment windows. Column (2) and (3) assign soldiers the average of the highest non-location-specific 4-year offers available to them on the first day of the first 6 or 12 months of their reenlistment windows, respectively. Column (4) and (5) assign soldiers the maximum of the highest non-location-specific 4-year offers available to them on the first day of the first 6 or 12 months of their reenlistment windows, respectively.

Table 12: Relationship Between SRB Offer Amounts and Individual Ability (Promotion Speed)

	Dependent Var.: SRB Offers	
	(1)	(2)
Months E-5	0.007***	0.000
	(0.001)	(0.000)
Adjusted R^2	0.073	0.518
Year*Month FE	✓	✓
MOS*Rank*YOS FE		✓
Demographic Controls	✓	✓
Avg. SRB	0.32	0.32
Avg. Months E-5	3.77	3.77
Observations	1,615,560	1,615,026

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows results from regressing SRB offer amounts on individual ability. Column (1) does not control for SRB eligibility criteria whereas column (2) does. Ability is defined as months a soldier spent at or above the rank of Sergeant in their first term of service.

Table 13: The Effects of SRB Offer Amounts and Individual Ability (Promotion Speed) on Soldier Retention

	Dep. Var.: Individual Reenlistment			
	(1)	(2)	(3)	(4)
SRB	0.016***	0.026***	0.025***	-0.008
	(0.004)	(0.004)	(0.004)	(0.006)
SRB * Months E-5		-0.002***	-0.002***	-0.002***
		(0.000)	(0.000)	(0.000)
Months E-5	0.002***	0.003***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)
Adjusted R^2	0.145	0.145	0.139	0.166
Year*Month FE	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓
Year*Month*CZ FE			✓	
Year*Month*MOS FE				✓
Demographic Controls	✓	✓	✓	✓
Avg. Reenlistment Rate	0.67	0.67	0.67	0.67
Avg. SRB	0.32	0.32	0.33	0.32
Avg. Ability	3.77	3.77	3.81	3.77
Observations	1,615,026	1,615,026	1,415,361	1,611,106

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effects of SRB offer amounts and individual soldier ability on soldiers' reenlistment decisions. Standard errors are two-way clustered at the MOS*Rank*YOS and individual level and reported in parentheses. Sample is restricted to spells ending with eligibility for reenlistment and with reenlistment windows opening between 1997–2015. SRBs are in $10,000s of 2015 dollars. Demographic controls include gender, age, marital status, race, and special skill dummies. Ability is defined as months at or above Sergeant.

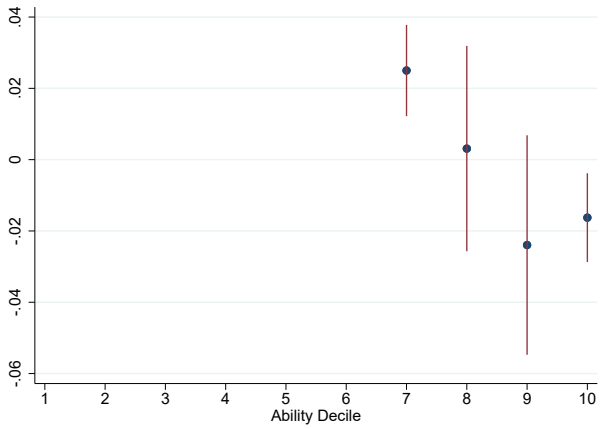


Figure 14: The Effect of Selective Reenlistment Bonuses on Soldier Retention, by Soldier Ability (Promotion Speed) Deciles.

Figure plots non-parametic estimates of the marginal effect of SRBs on the probability of reenlistment within each decile of the within-military speed-of-promotion distribution (measured as months at or above Sergeant in first term). SRB values are in $10,000s of 2015 U.S. dollars.

Table 14: The Effects of SRB Amounts and Individual Ability (Promotion Speed) on Soldier Retention: Alternative Specifications

	(1) Baseline	(2) SRB in logs	(3) CZ FE sample	(4) Main MOS only	(5) High Corr. MOS only	(6) Excl. Iraq Surge	(7) Positive SRB offer
SRB	0.029***		0.026***	0.012	0.042**	0.025***	0.026***
	(0.004)		(0.004)	(0.010)	(0.018)	(0.004)	(0.007)
SRB * Ability	-0.002***		-0.002***	-0.002	-0.003**	-0.002***	-0.003***
	(0.000)		(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Ability	0.003***	0.003***	0.003***	0.003**	0.004**	0.003***	0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
log(SRB)		0.003***					
		(0.000)					
log(SRB) * Ability		-0.000***					
		(0.000)					
Adjusted R^2	0.149	0.149	0.131	0.124	0.138	0.149	0.107
Year*Month FE	✓	✓	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.66	0.66	0.67	0.67	0.64	0.65	0.66
Avg. SRB	0.29	0.29	0.32	0.29	0.35	0.28	0.99
Avg. Months Above E-4	3.53	3.53	3.71	2.59	3.58	3.33	4.39
Observations	1,750,220	1,750,220	1,473,794	633,626	388,670	1,418,353	521,516

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. All samples are restricted to soldiers who were eligible to reenlist with reenlistment windows opening between 1997 and 2015. Column (1) shows the baseline specification reported in Table 3 column (1). Column (2) uses an identical specification except that SRBs are log-scaled. Column (3) uses the same specification as Column (1) but is restricted to a sample with non-missing Year*Month*CZ fixed effects. Column (4) is restricted to the 10 highest-density MOSs in our sample (namely: infantry, artillery crew members, calvary scouts, wheeled vehicle mechanics, combat medics, motor transport operators, logistics specialists, culinary specialists, supply specialists, and armor crew members). Column (5) is restricted to the MOSs which Wigdor & Green (1991) identified as exhibiting a high correlation between AFQT scores and hands-on job performance (namely: infantry, armor crew members, health care specialists, information systems specialists, radio operators, and administrative specialists). Column (6) excludes soldiers who entered their reenlistment windows during the Iraq war years (2007–2009). Column (7) is restricted to soldiers who were offered a non-zero SRB.

Table 15: The Effects of SRB Amounts and Individual Ability (Promotion Speed) on Soldier Retention: Alternative SRB Assignment Rules

	(1) Baseline (First SRB Offer)	(2) 6-mo. Avg. SRB	(3) 12-mo. Avg. SRB	(4) 6-mo. Max. SRB	(5) 12-mo. Max. SRB
SRB	0.029***	0.029***	0.025***	0.028***	0.027***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
SRB * Ability	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ability	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.149	0.149	0.149	0.149	0.149
Year*Month FE	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.66	0.66	0.66	0.66	0.66
Avg. SRB	0.29	0.28	0.26	0.32	0.35
Avg. Months Above E-4	3.53	3.53	3.53	3.53	3.53
Observations	1,750,220	1,750,220	1,750,220	1,750,220	1,750,220

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

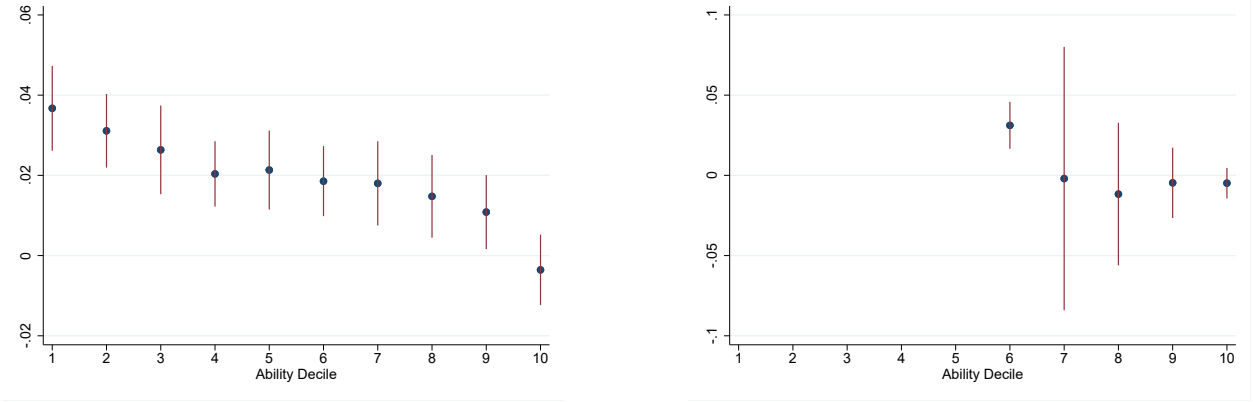
Note. All samples are restricted to soldiers who were eligible to reenlist with reenlistment windows opening between 1997 and 2015. Column (1) shows the baseline specification reported in Table 3 column (1), which assigns soldiers the highest non-location-specific SRB offer available to them for a 4-year reenlistment on the first day of the first month of their reenlistment windows. Column (2) and (3) assign soldiers the average of the highest non-location-specific 4-year offers available to them on the first day of the first 6 or 12 months of their reenlistment windows, respectively. Column (4) and (5) assign soldiers the maximum of the highest non-location-specific 4-year offers available to them on the first day of the first 6 or 12 months of their reenlistment windows, respectively.

Table 16: The Effects of SRB Amounts and Cohort-Adjusted Individual Ability

	AFQT Score				Months Sergeant in First Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SRB	0.017***	0.053***	0.031***	0.027***	0.019***	0.028***	0.025***	-0.001
	(0.004)	(0.006)	(0.006)	(0.007)	(0.004)	(0.004)	(0.004)	(0.005)
SRB * Ability		-0.058***	-0.025***	-0.057***		-0.001***	-0.001***	-0.001***
		(0.010)	(0.009)	(0.010)		(0.000)	(0.000)	(0.000)
Ability	-0.125***	-0.109***	-0.143***	-0.109***	0.002***	0.003***	0.003***	0.003***
	(0.008)	(0.008)	(0.006)	(0.008)	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.156	0.156	0.139	0.176	0.149	0.149	0.137	0.169
Year*Month FE	✓	✓	✓	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓	✓	✓	✓	✓
Year*Month*CZ FE			✓				✓	
Year*Month*MOS FE				✓				✓
Demographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.65	0.65	0.67	0.65	0.66	0.66	0.67	0.66
Avg. SRB	0.28	0.28	0.32	0.28	0.29	0.29	0.32	0.29
Avg. Ability	0.57	0.57	0.57	0.57	4.08	4.08	4.01	4.07
Observations	1,804,311	1,804,311	1,463,532	1,800,340	1,750,210	1,750,210	1,473,784	1,746,345

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effects of SRB offer amounts and individual soldier ability on soldiers' reenlistment decisions. Standard errors are two-way clustered at the MOS*Rank*YOS and individual level and reported in parentheses. Sample is restricted to soldiers who were eligible to reenlist in spells ending between 1997–2015. SRBs are in $10,000s of 2015 dollars. Demographic controls include gender, age, marital status, race, and special skill dummies. Ability is defined as cohort-adjusted AFQT percentile (on a scale from 0-1) for columns (1)-(4) and cohort-adjusted months a soldier spent at or above the rank of Sergeant in their first term of service for columns (5)-(8).



(a) By Within-Military Cohort-Adjusted AFQT Score Decile.

(b) By Speed-of-Promotion Decile.

Figure 15: The Effect of Selective Reenlistment Bonuses on Soldier Retention, by Cohort-Adjusted Soldier Ability Deciles.

Panels plot non-parametic estimates of the marginal effect of SRBs on the probability of reenlistment within each decile of either the cohort-adjusted AFQT score distribution or cohort-adjusted speed-of-promotion (measured as months at or above Sergeant in first term) distribution. SRB values are in $10,000s of 2015 U.S. dollars.

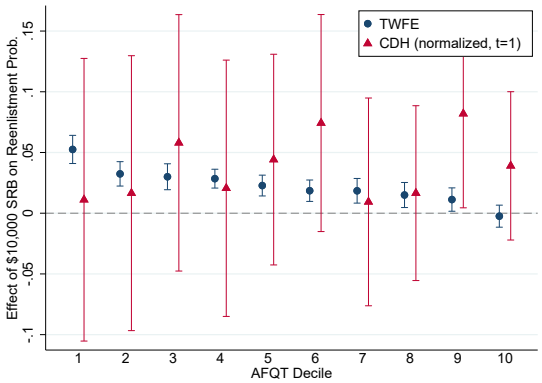


Figure 16: Comparison by TWFE vs. CDH Estimates, by Ability Deciles.

Figure plots TWFE estimates of the average effect of a $10,000 increase in SRB vs. CDH estimates of the average first-period effect of a $10,000 increase in SRB, both estimated separately by within-military decile of AFQT score. Due to computational limitations of the CDH estimator, both sets of estimates are clustered at the MOS*rank*YOS level only, and both sets of estimates omit demographic and specialty skills designator controls.

Table 17: Relationship Between VSI Eligibility and Individual Ability (Promotion Speed)

	Dependent Var.: VSI Eligibility	
	(1)	(2)
Months E-5	-.0025***	.0004***
	(0.000)	(0.000)
Adjusted R^2	0.136	0.585
MOS FE		✓
Rank FE		✓
YOS FE		✓
Demographic Controls	✓	✓
Avg. Share Eligible	0.05	0.05
Avg. Months E-5	1.51	1.51
Observations	114,143	114,107

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows results from regressing VSI program eligibility on individual ability. Column (1) does not control for VSI eligibility criteria whereas column (2) does. Ability is defined as months a soldier spent at or above the rank of Sergeant in their first term of service.

Table 18: The Effects of VSI Eligibility and Individual Ability (Promotion Speed) on Soldier Retention

	Dep. Var.: Retention at Program Expiration			
	(1)	(2)	(3)	(4)
VSI/SSB Eligibility	-0.153***	-0.156***	-0.141***	-0.144***
	(0.011)	(0.011)	(0.011)	(0.011)
VSI/SSB Eligibility * Months E-5		0.006***		0.005***
		(0.002)		(0.002)
Months E-5	-0.000	-0.000	0.001**	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Adjusted R^2	0.165	0.165	0.146	0.146
Sample	All Active	All Active	6–20 YOS	6–20 YOS
MOS FE	✓	✓	✓	✓
Rank FE	✓	✓	✓	✓
YOS FE	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓
Avg. Retention Rate	0.80	0.80	0.84	0.84
Share Eligible	0.05	0.05	0.22	0.22
Avg. Ability	1.51	1.51	0.57	0.57
Observations	114,107	114,107	24,213	24,213

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effect of VSI program eligibility and individual soldier ability on soldier's likelihood of remaining in the Army at program expiration. Standard errors are two-way clustered at the MOS*Rank and YOS level and reported in parentheses. Columns 1–2 samples include all soldiers actively serving on February 1, 1993 (that is, six months prior to the VSI/SSB program start date of August 1, 1993). Columns 3–4 samples are further restricted to soldiers meeting the basic years-of-service eligibility requirement (with between 6 and 20 years of service prior to program implementation). All regressions include occupation and rank fixed effects and control for years-of-service, gender, age, marital status, race, and special skill dummies. Ability is defined as months at or above Sergeant.

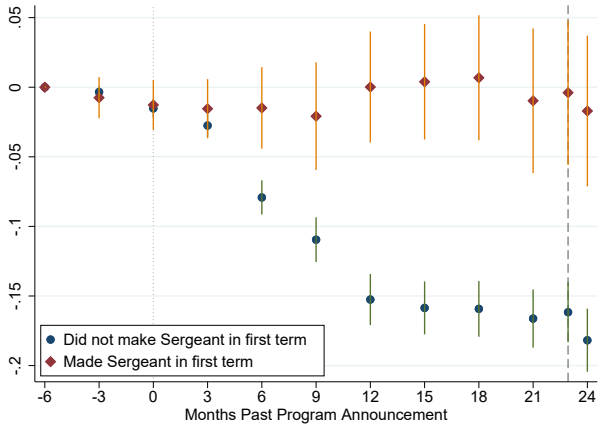


Figure 17: The Effect of VSI Eligibility on Soldier Retention, by Soldier Ability Terciles.

Figure plots non-parametric estimates of the marginal effect of VSI program eligibility on the probability of remaining in the Army in period t, where t is defined as the number of months since the start of the VSI program on August 1, 1993. Effects are separately estimated for soldiers who spent greater-than-zero months as a Sergeant or above in their first term of service versus soldiers who spent zero months at or above the rank of Sergeant. Coefficients are obtained from separate regressions for each time period t where program eligibility is interacted with dummies for a soldier's relative speed-of-promotion bin. Sample consists of all soldiers actively serving on February 1, 1993.

D Selection Effects on Average Ability Levels

So far we have showed in Sections 3 and 4 that soldiers of higher ability are less responsive to both SRB offers (intended to retain soldiers) and early retirement "buy-out" offers (intended to entice soldiers to separate). Appendix Section A.3 further demonstrates that the effect this has on the average ability profile of retained soldiers is ambiguous and depends on the magnitude of the individual-level selection effects. In this section, we show that our individual-level effects are large enough to generate changes in the average ability level of a cohort of retained soldiers. This analysis also enables us to characterize the ability profile of marginal soldiers—that is, soldiers who were induced to either reenlist or separate as a consequence of SRB or early retirement offers.

We start this section with the Army's SRB program. Stated in terms of in a regression framework, our goal is to estimate the effect of SRB offers on the *average* ability levels of soldiers who choose to reenlist ("stayers") and those who choose to separate ("leavers"). Specifically, we estimate the following:

$$\begin{aligned} \text{Ability}_i = \alpha_0 &+ \alpha_1 \text{SRB}_{it} * \text{Stay}_{it} \\ &+ \alpha_2 \text{SRB}_{it} * \text{Leave}_{it} + \alpha_3 \text{Stay}_{it} \\ &+ \gamma_{MOS,rank,yos} + \mu_t + \delta \mathbf{X}_{it} + \epsilon_{it} \end{aligned} \tag{9}$$

The coefficients of interest are α_1 and α_2, which estimate the effect of higher reenlistment bonus offers on the average ability of stayers or leavers, respectively. The intuition behind Equation 9 is that, at any given time t, the Army possesses a fixed cohort of soldiers entering their reenlistment windows. The cohort is then sorted into subcohorts of stayers and leavers, due in part to soldiers' endogenous responses to reenlistment bonus offers. A negative value on α_1 would suggest that higher bonus offers induce sufficient sorting (for example, low-ability soldiers reenlisting at higher rates, high-ability soldiers separating at higher rates, or both) to reduce the average ability profile of the stayer subcohort.

As in Equation **??**, we include MOS∗rank∗years-of-service fixed effects in an attempt to control for the observable criteria for SRB eligibility. The identifying assumption underlying this analysis is that, conditional on these observable criteria, higher SRBs are not systematically offered to cohorts of soldiers that are of higher average ability. If this were the case, then we would observe that higher

SRB offers are associated with higher ability reenlistees, but it would not reflect soldier selection.[18] The first column of Table 19 shows that this assumption is indeed satisfied—once we control for the set of fixed effects that determine the SRB offer, there is no correlation between ability and SRB offers. Columns 2–4 then split the sample by the soldier's reenlistment decision, with each column mirroring the high-dimensional fixed effect specifications featured in columns 2–4 of Table 3. Column 2 shows that, for each additional $10,000 dollars of SRB offer, the average AFQT score of the soldiers who endogenously reenlist is 0.4 points (0.7%) lower and the average AFQT score of those who exit the Army is 0.7 points (1.2%) higher. The magnitudes vary somewhat but are qualitatively consistent across fixed effects specifications. The confirms the finding from Section 3.4 that lower ability soldiers are more responsive to SRB offers, but it also goes further by showing the the selection effect is large enough bring down the average ability level of a reenlisting cohort.

While these magnitudes may appear small at first glance, they are likely economically significant from the military's perspective. Setting aside the effect of SRBs, soldiers who reenlist tend to have AFQT scores that are approximately 1.2 points lower than soldiers who separate, on average. As previously discussed, that discrepancy has been enough to prompt military officials and policymakers to complain of a "brain drain" problem in the military. What we show here is that a $10,000 increase in the average SRB bonus offer increases the difference in AFQT scores between these two groups by an additional 1.1 $(0.4 + 0.7)$ points—a near doubling of the "brain drain" phenomenon. In columns 5–8 we repeat this analysis using soldiers' promotion speed as our measure of ability. The results are noisier but similar: reenlisting soldiers are in general almost sixth tenths of a month behind separating soldiers in average promotion speed, but on top of that, a $\$10,000$ SRB offer nearly doubles the discrepancy.

Combining estimates from Table 19 with the previous results from Table 3, we can also benchmark the effect of SRBs on the ability level of the *marginal* soldier—the soldier who would not have reenlisted but for a bonus offer. Specifically, for any increase in average SRB offers, we can express the average AFQT score of all retained soldiers ($\tilde{A}$) as a convex combination of the average AFQT score of inframarginal soldiers (i.e. those who would have reenlisted regardless of the heightened bonus offers) and that of marginally-retained soldiers (those who are specifically induced to reenlist

[18] Note that on average in the raw data, higher ability soldiers are offered slightly higher bonuses. This reflects the fact that soldiers of higher ability tend to be in higher skill occupations with more outside options. However, once we control for the soldiers' occupation, tenure, and rank, this positive correlation goes away.

Table 19: The Effects of SRBs on Average Soldier Ability

	AFQT Score				Months Sergeant in First Term			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SRB	-0.001				0.091			
	(0.001)				(0.080)			
SRB * Stay		-0.004***	-0.005***	-0.002*		-0.089	-0.147	-0.091
		(0.001)	(0.002)	(0.001)		(0.094)	(0.091)	(0.115)
SRB * Leave		0.007***	0.001	0.010***		0.468***	0.332***	0.491***
		(0.002)	(0.002)	(0.002)		(0.082)	(0.075)	(0.132)
Stay		-0.012***	-0.018***	-0.012***		0.597***	0.505***	0.626***
		(0.001)	(0.001)	(0.001)		(0.070)	(0.078)	(0.068)
Adjusted R^2	0.310	0.311	0.323	0.319	0.456	0.457	0.483	0.464
Year*Month FE	✓	✓	✓	✓	✓	✓	✓	✓
MOS*Rank*YOS FE	✓	✓	✓	✓		✓	✓	✓
Year*Month*CZ FE			✓				✓	
Year*Month*MOS FE				✓				✓
Demographic Controls	✓	✓	✓	✓	✓	✓	✓	✓
Avg. Reenlistment Rate	0.65	0.65	0.67	0.65	0.66	0.66	0.67	0.66
Avg. SRB	0.28	0.28	0.32	0.28	0.29	0.29	0.32	0.29
Avg. Ability	0.58	0.58	0.59	0.58	3.53	3.53	3.71	3.53
Observations	1,804,326	1,804,326	1,463,546	1,800,355	1,750,220	1,750,220	1,473,794	1,746,355

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effects of SRB offer amounts on stayers and leavers' average ability levels. Sample is restricted to soldiers who were eligible to reenlist in spells ending between 1997–2015. SRBs are in $10,000s of 2015 dollars. Demographic controls include gender, age, marital status, race, and special skill dummies. Columns (1) and (5) pool stayers and leavers whereas columns (2)–(4) and (6)–(8) estimate SRB effects separately for stayers and leavers. Ability is defined as AFQT percentile (on a scale from 0-1) for columns (1)-(4) and months at or above Sergeant for columns (5)-(8).

by the additional cash bonuses):

$$\tilde{A} = \frac{r}{r + r'} * \bar{A} + \frac{r'}{r + r'} * \bar{A}', \tag{10}$$

where $\bar{A}$ is the average AFQT score of inframarginal soldiers, r is the quantity of inframarginal soldiers, $\bar{A}'$ is the average AFQT score of marginally-retained soldiers, and r' is the quantity of such soldiers. By solving for $\bar{A}'$, we can describe how the average ability of marginally-retained soldiers would respond to a counterfactual \$10,000 increase in the Army's average SRB offer.

On average, approximately 96,400 enlisted soldiers are eligible to reenlist in each year of our sample, of whom approximately 62,950 (65.3%) actually do. Column 1 of Table 3 shows that a \$10,000 increase in the average SRB offer makes soldiers approximately 1.7 percentage points more likely to reenlist. Therefore, were the Army to counterfactually increase the average SRB offer by \$10,000, it would retain approximately 1,640 additional soldiers in an average year. These marginally-retained soldiers would account for approximately 2.5% of all retained soldiers, whereas the remaining 97.5% would have reenlisted absent the additional bonus offers. We also know from our data that soldiers who choose to reenlist at the end of their spell have an average AFQT score of 57.4. Finally, from column 2 of Table 19, we saw that a \$10,000 increase in SRB offers would lower the average AFQT score of retained soldiers by 0.4 points, resulting in a new average AFQT score of 57.0. Plugging these quantities ($r = 62,950$; $r' = 1,640$; $\bar{A} = 57.4$; and $\tilde{A} = 57.0$) into Equation (10) and solving for $\bar{A}'$, we find that, given a \$10,000 increase in the average SRB offer, the group of marginally-retained soldiers would have an average AFQT score of just 41—almost a full standard deviation below retained soldiers' usual AFQT average of 57.4, and not much above the Army's current minimum score of 31 for first-time enlistments. Moreover, our results from Figure 3 (in which we allow the effect of SRBs on reenlistment to vary by decile of the AFQT distribution) suggest that almost four-fifths of the marginally-retained group would come from below the median of the Army's AFQT score distribution.[19]

We can similarly analyze the effect of the VSI program on the average ability of retained versus separated soldiers by estimating the following equation:

[19] We arrive at this estimate by taking a Riemann sum of the regression coefficients for the bottom five deciles in Figure **??**, then dividing that number by a separate Riemann sum of all ten deciles.

$$\begin{aligned}\text{Ability}_i = \alpha_0 &+ \alpha_1 \text{VSI}_i * stay_{i,t_T} \\ &+ \alpha_2 * \text{VSI}_i * leave_{i,t_T} + \alpha_3 stay_{i,t_T} \\ &+ \gamma_{MOS,rank} + \delta \mathbf{X}_i + \epsilon_i \end{aligned} \tag{11}$$

The coefficients of interest from Equation 11 are α_1 and α_2, which estimate the effect of VSI program eligibility on the average ability of stayers and leavers, respectively. In this context, stayers are those who remain in the military at the end of the program eligibility window (t_T), and leavers are those who separate from the military at any point during the program eligibility window.

Table 20 presents estimates from Equation 11, showing how the average ability of those who chose to stay in the Army at the end of the program and those who chose to leave the Army varies with VSI program eligibility. The first column shows that even after controlling for soldier rank, occupation, tenure and demographics, the average AFQT score of VSI-eligible soldiers is slightly higher than that of ineligible soldiers, though the difference is statistically insignificant. This is not automatically a problem for identification unless VSI eligibility is also correlated with unobservable factors influencing retention decisions. It does however mean that the coefficients in column 2, which show the relative ability of stayers and leavers by the end of the VSI sample period, must be interpreted relative to the coefficient on VSI/SSB eligibility in Column 1, rather than relative to 0 as in the earlier analysis.

While the samples are small and the estimates noisy, column 2 at least suggests that by the end of the VSI period the average AFQT score of the eligible stayers is about 0.1 points higher $(0.005 - 0.004)$ and the average AFQT score of the eligible leavers is almost 0.9 points lower $(-0.005 - 0.004)$ than the average for the eligible population, shown in Column 1. Finally, as we did with SRBs, we can perform a back-of-the-envelope calculation in order to characterize the group of marginal soldiers. Here, the question is not which soldiers were induced to reenlist at the end of their contract, but rather, which soldiers were induced to separate from the Army by the end of the program eligibility window. From Table 4 we know that approximately 135,500 enlisted soldiers were exposed to the VSI/SSB program (in the sense that they were actively serving on August 1, 1993, when the program was first offered). Of these, only 6,480 soldiers (5%) met the eligibility criteria based on tenure, rank, and MOS. A relevant counterfactual, then, is how the average ability profile of marginal soldiers would respond to a relaxation of program eligibility rules.

Table 20: The Effects of VSI Eligibility on Average Soldier Ability

	AFQT Score		Months Sergeant in First Term	
	(1)	(2)	(3)	(4)
VSI/SSB Eligibility	0.004		0.561***	
	(0.004)		(0.146)	
VSI/SSB Eligibility * Stay		0.005		0.431***
		(0.004)		(0.155)
VSI/SSB Eligibility * Leave		-0.005		0.388**
		(0.005)		(0.160)
Stay		-0.012***		-0.020
		(0.002)		(0.052)
Adjusted R^2	0.299	0.299	0.238	0.236
MOS FE	✓	✓	✓	✓
Rank FE	✓	✓	✓	✓
Demographic Controls	✓	✓	✓	✓
Avg. Retention Rate	0.79	0.79	0.80	0.80
Share Eligible	0.05	0.05	0.05	0.05
Avg. Ability	0.59	0.59	1.51	1.51
Observations	135,497	135,497	114,107	114,107

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note. Table shows the effects of early retirment program eligibility on stayers and leavers' average ability levels. Stayers are those who remain in the Army as of the VSI/SSB program's expiration date. Sample comprises all soldiers who were actively serving on February 1, 1993 (that is, six months prior to the VSI/SSB program start date of August 1, 1993). Demographic controls include gender, age, marital status, race, and special skill dummies. Columns (1) and (3) pool stayers and leavers whereas columns (2) and (4) estimate SRB effects separately for stayers and leavers. Ability is defined as AFQT percentile (on a scale from 0-1) for columns (1)-(2) and months at or above Sergeant for columns (3)-(4).

We consider a counterfactual scenario in which VSI/SSB offers are extended to an additional 1,000 soldiers (roughly a 15% increase relative to actual VSI/SSB offers), either by relaxing the tenure criteria or by extending early retirement offers to additional MOSs and ranks. We can benchmark the effect of VSI/SSB offers on the ability of the marginal soldier by constructing another weighted average similar to Equation (10). From Table 6 we know that, of the soldiers serving on August 1, 1993, just 21% would separate from the Army by the end of June 1995, when the VSI/SSB program expired. The same table shows that eligibility for VSI/SSB increased the separation rate by 12.1 percentage points (58%). Therefore, were the Army to counterfactually extend VSI/SSB-style early retirement incentives to an additional 1,000 soldiers, we can anticipate that an additional 121 soldiers would exit the military by June 1995, on top of the roughly 210 soldiers who would be expected to separate regardless of the early retirement incentives. Under actual program eligibility criteria, soldiers who separated from the Army by the conclusion of the VSI/SSB period had an average AFQT percentile score of 60.5, more than two points above the average score of those who remained in the Army over the same period (58.1). However, Column 2 of Table 20 shows that VSI/SSB eligibility reduced the average AFQT score of leavers by 0.9 points, resulting in a new average AFQT score of 59.6. Plugging these quantities ($r = 210$; $r' = 121$; $\bar{A} = 60.5$; and $\tilde{A} = 59.6$) into Equation (10), we find that, were the Army to extend VSI/SSB offers to an additional 1,000 soldiers, approximately 121 additional soldiers would be induced to leave, and their average AFQT score would be approximately 58.0—approximately one sixth of a standard deviation below the usual average of 60.5 for soldiers exiting the Army during this time period. Our results from Figure 4 make a similar point, suggesting that, given an expansion in VSI/SSB eligibility, well over half of marginal leavers would come from the bottom tercile of the AFQT score distribution.