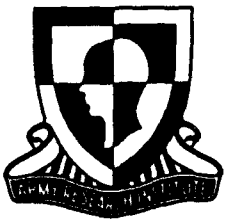

U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1656

An Analysis of Personal Discount Rates: Evidence From Survey Data

32 pg

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George Mason University

December 1993

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

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Director

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13. ABSTRACT *(Maximum 200 words)*

In fiscal year 1992 the Army began reducing the number of active duty personnel as part of post-Cold War efforts to reduce defense spending. Two financial incentives--a lump sum and an annuity--were offered to induce mid-career personnel to leave before retirement. Among soldiers who accepted these incentives, over 90% of enlisted and 57% of officers chose the lump sum. At this time, the U.S. Army Research Institute for the Behavioral and Social Sciences mailed surveys to 51,000 soldiers. The surveys examined a number of policy issues, including separation programs. Unlike earlier surveys, soldiers were given the opportunity to reveal their preferences for lump sum and annuity programs. From the survey data, a series of personal discount rates were derived. A wide disparity is found between personal discount rates and the program's internal rate of return. Personal discount rates explain the strong preference that separating soldiers have for the lump sum option and suggest improvement in the design of exit options. The survey is validated by comparing survey responses of approximately 400 soldiers with their subsequent decisions concerning early separation.

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Research Report 1656

An Analysis of Personal Discount Rates: Evidence From Survey Data

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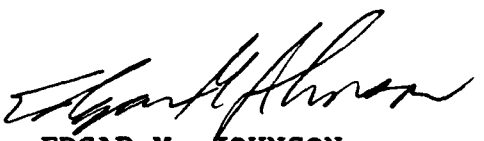
FOREWORD

The Manpower and Personnel Policy Research Technical Area of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) performs research and research-based studies and analyses in the economics of manpower, personnel, and training issues of significance to the U.S. Army. This research-based study analyzes the personal discount rate (PDR) and its role in the soldier's evaluation of exit bonus options.

The work reported here was requested by Major General Stroup, Director of Military Personnel Management, by memorandum (DAPE-MPA) dated 5 February 91, and funding for the basic data collection was approved by the Deputy Chief of Staff for Personnel and the Under Secretary of the Army for Operations Research (memorandum, DAPE-ZXA, dated 13 March 91, subject: Urgency Statement--Mobilization, Total Army Retention). Results were briefed on 11 September 92 to the Assistant Deputy Chief of Staff for Personnel, the Director of Military Personnel Management, and the Director of Human Resources.

The PDR reported in this paper may be applied to existing models of retirement and retention, such as the Annualized Cost of Leaving Models (ACOL-2). Policymakers can design more efficient exit bonus programs that also involve present value analysis by using recent estimates of the PDR.



EDGAR M. JOHNSON
Director

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The Survey of Total Army Military Personnel was designed by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and conducted by Data Recognition Corporation of Minnetonka, Minnesota. This project was directed by Timothy Elig of ARI.

I would like to thank members of the Office of the Deputy Chief of Staff for Personnel, notably Lieutenant Colonel Bradford Loo, Bruce McLelland, and Lieutenant Colonel Steven Wells for their cooperation in providing data on participants in the Army's downsizing program and on policy changes.

Also I would like to thank Peter Greenston and Abraham Nelson of ARI and Roy Nord of the Internal Revenue Service and Edward Schmitz of the Navy Recruiting Command (both formerly of ARI) for many helpful comments and suggestions. They bear no responsibility for the remaining faults.

AN ANALYSIS OF PERSONAL DISCOUNT RATES: EVIDENCE FROM SURVEY DATA

EXECUTIVE SUMMARY

Requirement:

The U.S. Army must be able to design compensation programs for early separation of personnel to meet downsizing goals. The value of the Personal Discount Rate (PDR) is one assumption policymakers make when attempting to estimate how much an annuity is worth to a soldier. Accurate estimates of PDRs are a necessary input in forecasting participation rates in exit programs and in meeting end strength requirements.

Procedure:

Survey responses concerning exit options were analyzed to determine the preferred dollar amount of exit bonuses. The relevant items were presented as part of the 1991/1992 Survey of Total Army Military Personal (STAMP). The sample selected was a stratified random sample of the total Army. Findings from cross-tabulations and generalized least squares method of regression were weighted to reflect true population proportions of respondents. The PDR was calculated from these items and compared with the PDR in earlier studies.

Findings:

1. Survey estimates of the PDR were revealed to decrease with years of service and age. Yet the program discount rate (which equates the present values of the lump sum and annuity exit options) increases with years of service. This disparity between discount rates over time leads to a strong preference for the Selective Service Bonus (lump sum) option among junior and mid-career personnel.

2. Results of the research confirm most of the findings of earlier studies with respect to the influence of personal characteristics. They demonstrate that open-ended responses can be employed to elicit a continuum of PDRs.

3. Validity tests performed by obtaining information on actual exit bonus decisions made by soldiers who previously completed STAMP were generally favorable.

Utilization of Findings:

Policymakers can construct a more efficient exit bonus program by considering personal finance conditions soldiers face. The PDR assumptions implicit in the exit program design should be taken account of when projecting participation rates in such programs. The PDR reported in this paper may also be applied to Annualized Cost of Leaving Models (ACOL-2), which estimate the probability of continuing a military career.

AN ANALYSIS OF PERSONAL DISCOUNT RATES: EVIDENCE FROM SURVEY DATA

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AN ANALYSIS OF PERSONAL DISCOUNT RATES: EVIDENCE FROM SURVEY DATA

Introduction

During Fiscal Year 1992 the Army began reducing the number of active duty personnel as part of post-Cold War efforts to cut defense spending. To induce mid-career personnel (those with 6-19 years of service) to leave the Army before retirement, two financial options were offered. The most popular of the two, Selective Separation Benefit (SSB), is a lump sum payment equal to 15% of annual base pay multiplied by the number of years of service. The other option, Voluntary Separation Incentive (VSI), is a yearly payment equal to 2.5% of annual base pay multiplied by the number of years of service to be received for twice the number of years of service. When the present values of these options are compared using a 7% discount rate, the value of the VSI is significantly higher than the SSB.[1] While 7% is an appropriate rate of return for evaluating personal investments, this figure is likely to be lower than the average soldiers' personal discount rate (PDR). The PDR is the rate revealed by a soldiers' willingness (or lack of) to forgo payment today for a guarantee of future payments.

To date, the Army has been experiencing a lopsided response in favor of SSB. In the case of Officers, 57% have chosen SSB versus 43% for VSI. Enlisted behavior is more stark, 93% opted for SSB and only 7% VSI.[2] Our findings concerning PDR explain the nature of this response.

Under a program such as VSI/SSB if individuals discount future payments at the same rate as the program discount rate (the rate that equalizes the present value of the VSI payments to SSB) then the present value of these options will be equal. Standard consumer theory predicts that individuals will be indifferent between two offers of equal value. However, we find that the program discount rate differs widely from the PDR used by soldiers in making this decision. Moreover the current structure of VSI/SSB is consistent with a PDR that increases with years of service when in fact the opposite has been found in the research reported here. The discussion that follows argues that this disparity is driving the strong preference for SSB.

After a preliminary section on discounting, previous research is reviewed. The instrument used to gather the data, the Survey of Total Army Militarv Personnel (STAMP), is discussed with particular attention given to the pertinent questionnaire items. An empirical section follows where PDRs are estimated

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[1]This comparison for all grades and years of service was published in Army Times, December 9, 1991.

[2]These rates are based on FY92 program participation for Enlisted, FY92 and 1ST Quarter FY93 for Officers.

from the survey data and modeled using demographic correlates. The object of this analysis is first, to identify factors that have an impact on the PDR and then demonstrate its role in designing a program like VSI/SSB. In the penultimate section we discuss the correspondence of soldiers' actual decisions with their stated intentions in STAMP. The final section contains conclusions and implications for the early separation incentive programs.

The Decision Problem

Analyses of intertemporal choice hinge on assumptions made concerning the rate at which individuals discount future earnings and consumption. The PDR is an interest rate at which the individual discounts future *income*. This rate may be thought of as one that would arise in a competitive market for personal loans. The nature of the PDR will be described further below.

The time rate of preference, the rate at which individuals discount future *consumption*, is a related but different concept from the PDR. Olson and Bailey (1981) describe two conditions that cause an individual to prefer consumption today over future consumption. When an individual is facing a shortage of a good in the current period, she will naturally choose to consume more today. Commonly referred to as a cash or budget constraint, a restricted income will generate a positive personal discount rate automatically. Second, since future consumption is temporally removed, the desire to realize it is reduced commensurately and it is less preferred than current consumption. Both of these conditions imply a positive time rate of preference.

Both the PDR and the time rate of preference rationalize a preference for current consumption. In this context the two can be reconciled if the assumption is made that VSI/SSB payments are spent as they are received. The problem is then reduced to discounting future consumption only. Implications are the same regardless of which measure we attribute intertemporal substitution.

The Personal Discount Rate

The nature of the PDR is usually motivated via the present value calculation of finance. In order to compare a sum of money with a stream of payments (annuity) a rate of return must be factored into the latter. If the annual market rate of interest is 10%, then a consumer would be indifferent between $1 today and $1.10 a year from now since

$$\$1.10 = \$1(1+.10).$$

In the general form, multiple payments over time are accommodated by the exponent t:

$$PV = A(1+.10)^t$$

where PV, A, and t designate the present value, annual payment, and number of time periods, respectively.

Alternatively the present value of a dollar to be paid one year from now is

$$\$.91=\frac{\$1.00}{(1+.10)}.$$

Finally, the present value of an annuity (A) to be paid for T periods is

$$PV=\sum_{t=1}^{T}\frac{A}{(1+r)^t}.$$

The term (1+r) in the above summation is the discount *factor.* Since the discount factor is greater than one, payments that are temporally more distant (corresponding to larger values of t) are worth less today; e.g., the present value of a dollar to be paid 20 years from now (t=20,i=.10) is roughly 15 cents.

Investors regularly conduct this evaluation to compare the returns of various financial securities. That today's dollar is worth more than the present value of next period's dollar, is the result of a positive nominal rate of return. The nominal rate of return on an asset is composed of two parts: the real rate of return (r), and inflation (π). The former is determined by the return on capital and the latter by changes in the price level. The above rate is consistent with for example, r = .05, π = .05, or any combination where r + π = .10. Market rates of return are those currently being paid on financial securities.

Most often PDRs will be greater than the nominal rate of interest. This is because the market for personal loans does not meet the assumption of perfect capital markets, i.e., that everyone can borrow against future earnings and money is lent and borrowed at the same rate. In reality borrowers pay a higher rate than individuals receive on their savings. Among individuals we expect PDRs to vary for at least two reasons: discrimination in the credit markets, and reputations (good or bad) of individuals with established credit histories. Additionally we must take market conditions into consideration.

If the supply of loans is limited[3], some individuals may not be able to obtain credit at any rate of interest. The literature on credit rationing (Stiglitz and Weiss, 1981) deals explicitly with this condition.

Previous Research

Articles on intertemporal choice are found in journals of economics, psychology, and management science. Most of the empirical research cited has been conducted during periods of higher inflation than we currently enjoy. While all these papers are relevant, we focus in particular on those by Black (1983) and Nord and Schmitz (1985), since these papers analyze the use of financial incentives to renegotiate military contracts. Following Nord and Schmitz we highlight approaches for determining values for PDRs.

The market rate approach developed by Friedman (1957) rests heavily on micro economic theory. Friedman is well known for his theory of lifetime consumption. He motivates the Permanent Income Hypothesis by positing that consumers act to smooth consumption over their life based on their expected lifetime earnings. In addition to the perfect capital markets assumption mentioned above, the theory assumes goods can be always be divided into smaller portions. If an individual's PDR is higher (lower) than the market rate of interest she will be a net borrower (saver). Friedman estimates the PDR to be 30%. The use of these models is primarily heuristic, yet they provide guidance in the specification process.

A second group of articles is implicit rate studies. An example of this group is Hausman (1979) in which data on purchases of air conditioners of different energy efficiencies were collected. More efficient air conditioners sell at a higher price but yield savings in lower energy bills over their life. Hausman uses the price versus efficiency trade-off to determine the rate at which people discount future savings from energy bills. His estimates of the PDR range from 10% to 39%. Though the analysis is completely rigorous, one has to question the applicability of a PDR determined from purchasing an air conditioner to life in general.

Recent experimental tests (Benzion et al. 1989) found significant differences in PDRs with respect to whether or not a

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[3]One restriction on the amount of personal loans stems from the international agreement on bank capital requirements reached in Basel, Switzerland. See Richard Breeden and William Isaac, "Thank Basel for Credit Crunch" Wall Street Journal, Nov. 4 1992 p. A14. Empirical evidence has been reported by Furlong (1992).

person is receiving money or making a payment. After fixing a sum of money and a payment schedule the researchers conducted experiments to determine the PDR in four different transactions: expediting a payment, delaying a payment, expediting a receipt, and delaying a receipt. The third case (C in the paper) is comparable to VSI/SSB. Benzion et al. found differences between gains and losses. Thus one should be cautious when applying a discount rate determined by making a payment (like buying an air conditioner) to a decision involving receiving payment. The results revealed PDRs in the range of 9-38% depending on the amount and the time lag involved. The four time delays were 6 months, 1, 2, and 4 years, and higher PDRs were associated with shorter lags. In the evidence presented below, junior personnel - who are eligible for a shorter payment stream - exhibit higher discount rates than senior personnel.

In a study based on actual career decisions, Cylke et al. (1982) estimate PDRs from the differential impact on Navy reenlistments from a policy change of paying bonuses as lump sums as opposed to annuities. PDRs in their study range from 16% to 20%. (Note: the policy studied was financial incentives to keep personnel *in* the Navy.)

The last group is the direct assessment studies. This approach uses surveys with specific items designed to elicit a person's PDR (Black (1983) and Nord & Schmitz (1985)). In these studies questions with implicit discount rates were posed. The range of the respondent's discount rate is then determined. For example, if a respondent refused an offer with an implied rate of 10% but accepted one with an implied rate of 15%, her PDR was determined to lie on the interval of 10-15%.

1991/1992 Survey of Total Army Military Personnel

The Instrument

STAMP was mailed to roughly 51,000 soldiers (21,000 active duty and 30,000 reserve) during the month of December 1991. The survey questions encompassed a wide range of issues. Several sections dealt with specific issues such as Operation Desert Shield/Storm, downsizing, women in combat, and voluntary separation. The remainder of the survey contained standard queries regarding leadership, training, stress, etc.

The Sample

STAMP was sent to all components of the Army (Regular Army, Army Reserve, National Guard, and activated individual ready reserves). A stratified random sample was drawn, over-sampling (among others) women, nurses, special forces, and activated reservists. The results presented below are based on

responses received from roughly half of the active duty personnel that were surveyed.[4] Table 1 gives descriptive statistics of the sample respondents.[5]

Items of Interest

Two sets of questions were asked concerning voluntary separation. Appendices A and B are facsimiles of the officer version of these questions, responses to selected items are reported in Appendix C. As in the other direct assessment studies, individuals were asked whether or not they would accept a specific offer. Items 217a-d were designed in accordance with proposed policy.[6]

Table 1

Sample Respondent Characteristics

	OFFICERS %	ENLISTED %
Male	87.2	88.6
Female	12.8	11.4
White	83.2	58.9
Black	11.3	31.7
Hispanic	3.4	4.6
Other	2.0	4.7
Avg. Age (years)	35.4	28.0

Unlike previous surveys, STAMP respondents were also given the opportunity to name their own separation plan payments. The open-ended responses from items 215a-d generated a range from which the exact value of an individual's PDR can be derived.

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[4]The response rates were 60% for Officers and 41% for Enlisted personnel. All statistical analyses were weighted to correct for sample stratification. The sample drawn represents over 40 different types of personnel: selected by demographic and career characteristics. This extreme stratification was used to mitigate the effects of non-response. Hence, zero non-response was assumed.

[5]Hispanic ethnicity is taken from personnel records. If the survey item for Hispanic ethnicity had been used the percentage Hispanic would have doubled to approximately the census rate.

[6]Questions 217A-B were designed in late 1991 in accordance with projected compensation packages for early separation. These items were based on FY91 pay tables and the lump sum listed in 217A is 20% of annual base pay times years of service. The actual offer was based on FY92 pay which reflected a 4% pay raise and a lump sum of only 15% of annual base pay times years of service.

Empirical Analysis

Revealed PDR From STAMP

The simple present value equation (1) shows how the PDR is calculated from STAMP. A detailed explanation of present value and circumstances particular to the early separation program is given in Appendix D. For the analyses presented here, the PDR was determined using items 215B (hypothetical SSB) and 215D (hypothetical VSI).[7]

$$SSB = VSI/PDR - VSI/PDR*e^{-PDRt}. \qquad (1)$$

Given SSB, VSI, and t the PDR can be approximated using Newton-Raphsons method on (1). The estimated mean PDR was 15.9% for Officers and 24.4% for Enlisted personnel. Table 2 gives the STAMP estimates of PDRs by gender and race. Enlisted personnel exhibit higher PDRs than officers in all categories, which makes sense if more education increases access to credit. Differences within Officers and Enlisted groupings suggest the existence of perceived discrimination in credit markets. The PDR for females averages approximately 5 percentage points higher than males; a similar difference exists between blacks and whites.

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[7]The PDR presented were generated from STAMP items 215B & 215D, since both included retirement benefits and 215D is indexed for inflation. Using item 215A (no retirement benefits) resulted in discount rates 4 to 5 percent lower. Using item 215C (no indexation) resulted in discount rates 2 to 3 percent higher. These results held for both officers and enlisted personnel.

Table 2

Mean Personal Discount Rates of Soldiers by Demographic Category

	Overall	Male	Female	White	Black	Hisp.	Other
Officer	.159	.154	.202	.150	.208	.171	.218
	(.101)	(.100)	(.066)	(.087)	(.099)	(.081)	(.130)
Enlisted	.244	.237	.308	.229	.271	.189	.274
	(.121)	(.132)	(.085)	(.114)	(.135)	(.069)	(.132)

Note: Standard deviations are in parentheses.

The chief finding of this study is that observed PDRs decrease with years of service yet current separation programs are consistent with PDRs that increase with years of service. Figure 1 shows an overlay of the smooth logarithmic path of the discount rate (implied by existing policy) with the PDRs observed from STAMP. A wide disparity covering junior years coincides with the definite preference for SSB. This result is direct consequence of program design. Currently VSI/SSB payments are a constant fraction of basic pay (see appendix D). In equation (1) above, this amounts to fixing SSB and VSI to constant values and varying t with years of service. To satisfy (1), PDRs are forced to increase with years of service and thus age. The upshot is that the current program is designed as if junior personnel discount at lower rates than do senior personnel when in fact the opposite is observed.

To check the foregoing implications we examine records of 5155 Officers who elected to take VSI or SSB during FY 1992 and 1st Quarter FY 1993.[8] Table 3 shows the relative participation in VSI/SSB by gender and race. An Officer's Year Group is the year in which he or she began active duty. Older officers are shown separately in the two columns on the right of Table 3. Note the preference for SSB across all subgroups in the first two columns. According to economic theory as well as evidence from STAMP (in Figure 1 officer PDRs are well below that of the program in later years) VSI should be the preference of senior personnel. The expected preference reversal occurs for officers of both sexes and for whites. That blacks continue to prefer SSB can, along with a revealed PDR that is higher than average, be viewed as evidence of restricted access to credit markets. Though women

[8]Enlisted data is ignored since over 90% took SSB not enough variation remains to be examined.

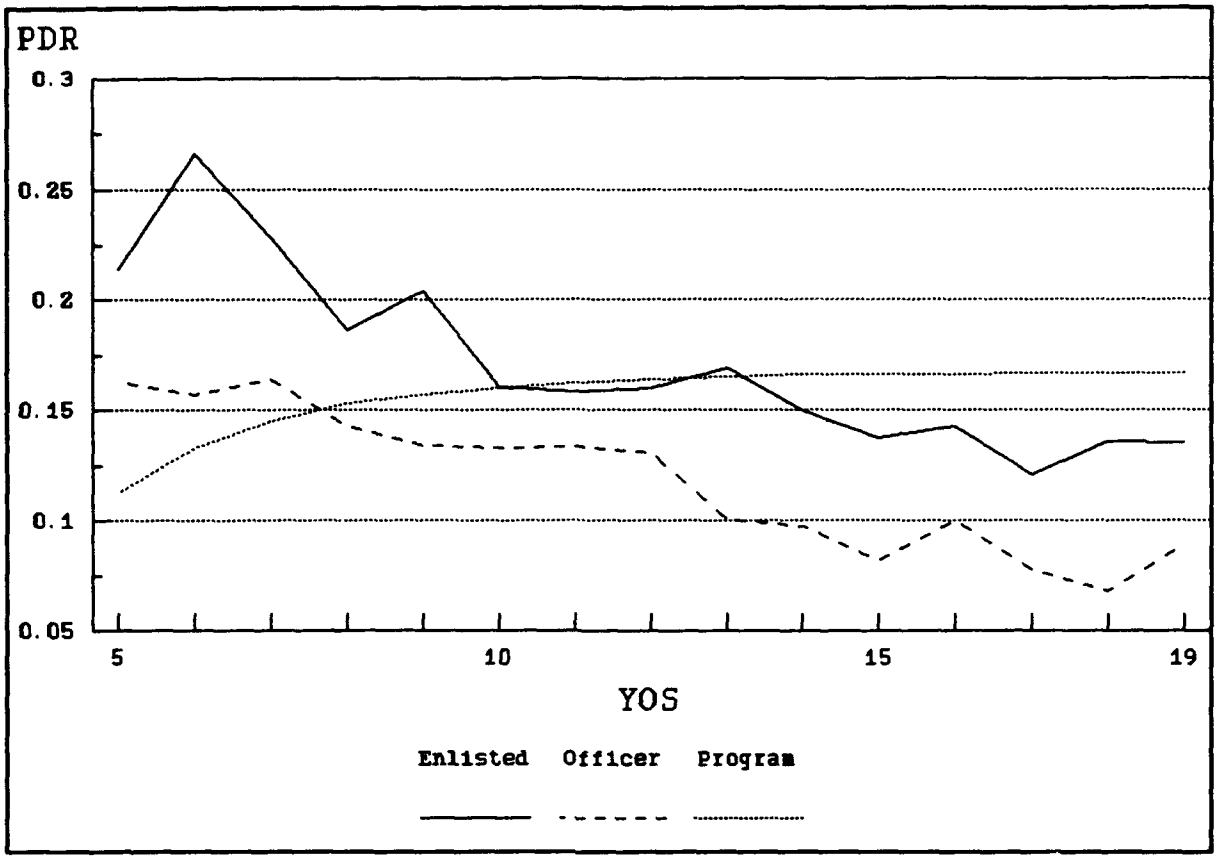

Figure 1. Revealed versus Program Discount Rates

exhibited PDRs close to that of blacks, their revealed preference for exit options mirrored that of white male officers. The small number (16) of Hispanics precludes inference in their case.

Table 3

Participation in VSI/SSB by Gender and Race (Officers)

	All Officers		Year Group prior to 1980	
Group	SSB%	VSI%	SSB%	VSI%
Male	58.3	41.7	38.5	61.6
Female	59.0	41.0	31.4	68.6
White	56.5	43.4	34.9	65.1
Black	67.1	37.9	56.5	43.5
Hispanic	57.9	42.1	50.0	50.0
Other	61.2	38.8	34.8	65.2

The overall relation is shown by Figure 2. Note that preference for SSB increases with rising PDRs. From Figure 1 we see that Officers with eight years of service (YOS) or more (corresponding to Year Groups 1982 and before) should prefer VSI over SSB. However, with reference to Figure 2, this preference reversal does not occur until 11 YOS or Year Group 1979. This discrepancy can be attributed to other variables (aside from a discounted present value calculation) that affect the decision as well as error in measuring the PDR.

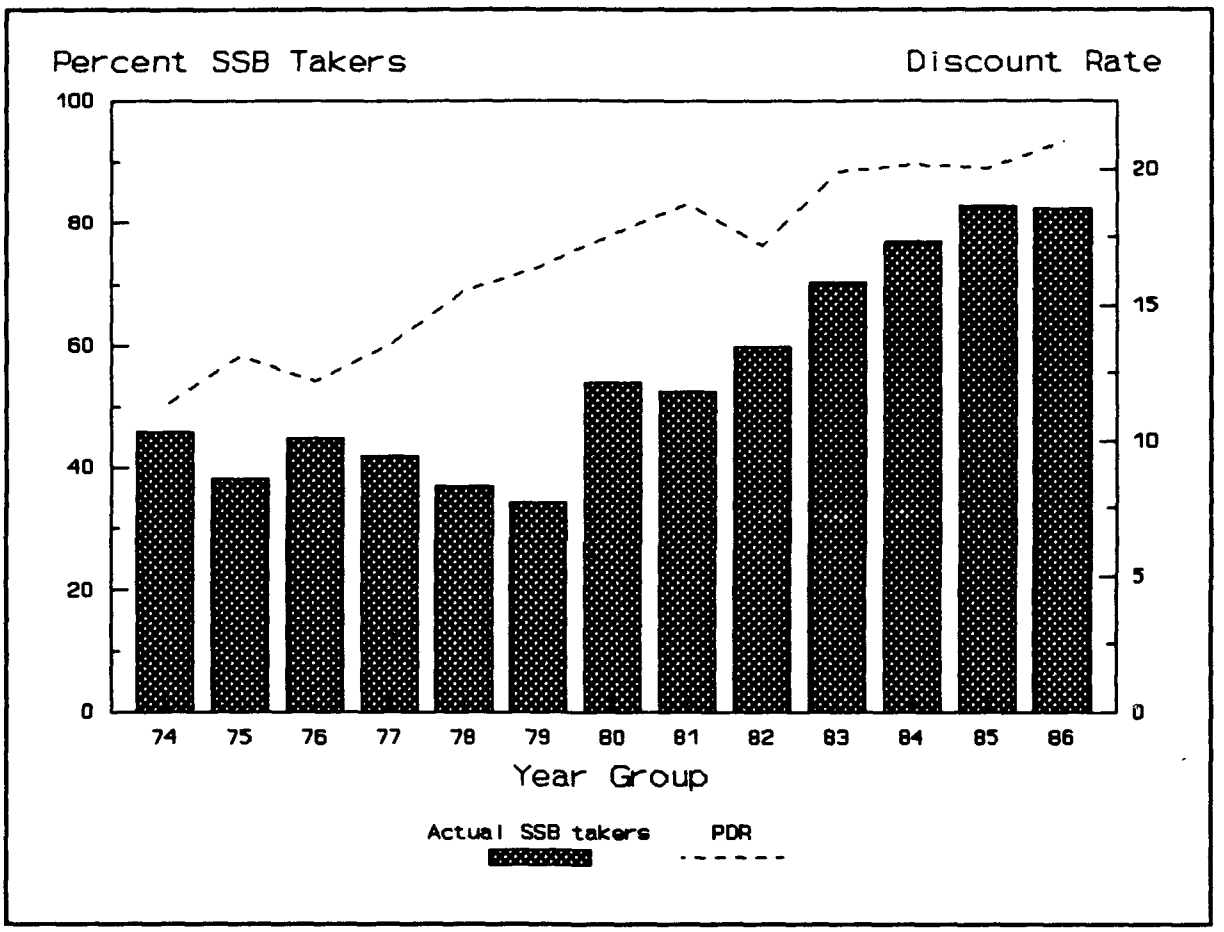

Figure 2. Preference for SSB by year group

Method and Estimation

Earlier direct assessment studies (Black, 1983 and Nord & Schmitz, 1985) were based on categorical responses to survey questions. Hence, qualitative or limited dependent variable models were employed to estimate PDRs. These estimates were in turn tested in regressions against career and personal characteristics. In this study we test revealed PDRs against

similar career and personal characteristics. Table 4 presents results for enlisted personnel from STAMP as well as the previous two studies for comparison. The sample stratification mentioned above generates heteroscedastic data. For example, since women were over-sampled the error terms for all women in the sample will be correlated, thus violating the classical assumption of random errors. To correct for this we used the weighted least squares method of regression, where the weight on an observation is the person's selection ratio.

$$w_i PDR_i = w_i \beta_0 + w_i \beta_j \mathbf{X}_i + w_i \epsilon_i \quad (2)$$

where w_i is the weight assigned to each observation, $\mathbf{X}_i$ is a vector of regressors and $E(\epsilon_i^2) = \sigma_i^2$ (heteroscedasticity).[9]

Findings

Regression coefficients of STAMP analyses agreed in large part with earlier findings. Results are similar for enlisted personnel (Table 4) and officers (Table 5). Blacks and Hispanics have higher PDRs. Career soldiers (High YOS and Years remaining) have lower PDRs than the mean. A major difference from other studies is with respect to women. Women sampled in STAMP had higher PDRs than men whereas the converse was true in earlier samples.[10] Nord and Schmitz posited that the negative relation in their results could be due to a narrowing of earnings differential between women and men. Though this has in fact been happening, disparities remain in credit markets and a positive coefficient seems more plausible.

Item Validity

Comparing actual data with STAMP responses we found 195 enlisted and 296 officers that actually took either SSB or VSI and returned the survey.[11] Given stated intentions and actual behavior concerning VSI/SSB for this sub-group we can gauge the validity of these STAMP items. The *validity* of a question is a

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[9]See Kmenta (1986) chapter 8 for a detailed explanation.

[10]Though Gilman 1976 found women to have higher PDR.

[11]These observations represent 10.4 percent of enlisted respondents and 11.8 percent of officer respondents - based on the adjusted sample size reported in Appendix C. We assume that the individuals for whom we received data on actual decisions represent a random sample of the Army and thus the adjusted sample size is the appropriate one to use for comparison.

Table 4

Regression Coefficients of Three Studies of Personal Discount Rate Analysis (Enlisted Personnel)

	STAMP	Black	Nord & Schmitz
Intercept	.2620**	.1552**	.0125**
Female	.0510**	-.0059**	-.0152**
Black	.0475**	.0126**	.0079*
Hispanic	.0258	.0046	.0243**
Sep/Div	-.0428**	.0104**	NA
Married	-.0171	NA	.0053**
Income	NA	.0000	NA
LoGrade	.0615**	NA	.0137**
Tech OCC	.0116	-.0063**	NA
NHS	.0009	.0094**	NA
GED	-.0004	.0058**	NA
NHS/GED	NA	NA	.0049
College	-.0062	.0029**	NA
Degree	-.0393	.0002	NA
Homeowner	NA	.0004	NA
YOS	-.0047**	-.0014**	NA
Remaining Service	-.0005	-.0013**	NA
Leaving	.0328**	NA	.0131**
Debt	NA	-.0024*	NA
Assets	NA	-.0136**	NA
Knowledge of retirement	NA	.0004**	NA
Adj R^2	.088		
F-statistic	17.6		

* - significant at the .05 level
** - significant at the .01 level
NA - not available

Note: Variable definitions are provided in appendix D. Nord and Schmitz and Black estimated logit models so coefficients are not directly comparable. Goodness-of-fit statistics were not reported in the results of these models.

measure of how well it elicits the desired information. According to their STAMP answers, 87% of both groups said they would take one (or several) of the hypothetical offers (items 217a-d). However, when the criteria are made more stringent, e.g., the number of actual SSB takers that said they would take the proposed SSB (217a) and declined the proposed VSI (217b), there is less agreement. Roughly 45% of enlisted personnel and 60% of officers responses met this standard. Yet, as is obvious

Table 5

Regression Coefficients of Personal Discount Rate Analysis (Officer)

	STAMP	Black
Intercept	.2929**	.1254**
Female	.0294**	.0015
Black	.0484**	.0137**
Hispanic	.0419**	.0123*
Age	-.0022**	NA
Sep/Div	.0210*	.0130**
Married	.0078	NA
Income	NA	.0003*
LoGrade	.0057**	NA
College	NA	.0042
Grad.Degree	NA	.0020
Homeowner	NA	.0006
YOS	-.0054**	-.0013**
Remaining Service	-.0021**	-.0010**
Debt	NA	.0026
Assets	NA	-.0051*
Knowledge of retirement	NA	.0003*
Adj R^2	.122	
F-statistic	51.2	

* - significant at the .05 level
** - significant at the .01 level
NA - not available

Note: Variable definitions are provided in appendix D. Nord and Schmitz did not analyze officer data.

in Appendix B, items 217a-d are not exclusive of each other. In reality only one selection can be made. Hence we regard 87% agreement in general as evidence that survey responses were forthright.

Conclusions

When designing a program that involves intertemporal choice, policymakers would do well by considering influences on such a choice. That 93% of enlisted personnel chose SSB is not surprising given our estimates of their PDR. The current separation program can be made more efficient depending on how the Army wishes to allocate costs. On the one hand, total cost can be reduced and the downsizing goals achieved by eliminating VSI. If the Captains and Majors who chose VSI in FY 1992 took

SSB instead, the Army would have saved over $900 million.[12] On the other hand, if the Army would like to spread program costs over several years, then VSI should be redesigned so its rate of return more closely follows PDRs reported here and in earlier studies.

An example of a VSI payment schedule that would elicit a more balanced response is presented below. Using the current SSB criteria (.15 of base pay * YOS) a hypothetical annuity (RVSI) was determined using PDRs similar to the values reported in this study. Table 6 below shows the actual offer (VSI) compared to RVSI for an E-6 by YOS.

Table 6

Comparison of Current VSI Schedule with Hypothetical Improvements

YOS	VSI	RVSI	CHANGE
6	2623	3266	0.25
8	3623	4089	0.13
10	4695	5031	0.07
12	5925	6148	0.04
14	7129	7291	0.02
16	8411	8516	0.01
18	9607	9706	0.01

Note that RVSI > VSI for all YOS yet the difference decreases over time. This shows that under current policy the most disparity between the present values of SSB and VSI is found for junior personnel.

The results of this study are intended to provide policy-makers with insight for more efficient use of separation programs, while meeting end-strength requirements and presenting soldiers with a fair offer.

[12]This figure is based on the choices of 1331 Captains and 613 Majors and represents the difference between the SSB and the present value of their VSI discounted at 7 percent. The sum is reported for illustrative purposes only. Undoubtedly some percentage of these officers would have either separated involuntarily or been allowed to remain in the Army.

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212. **Does the Army's Health Promotion/Fit to Win program:**
- ◯ Support unit readiness
- ◯ Have no relationship to unit readiness
- ◯ Get in the way of unit readiness

213. **At your installation which of the following are affected by the installation's Health Promotion/Fit to Win program? Mark all that apply.**
- ◯ Don't know → **GO TO QUESTION 214**

- ◯ Soldiers
- ◯ Dependents
- ◯ Army civilian employees
- ◯ Retirees
- ◯ None of the above, no installation program

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214. **Have you completed...**
- ◯ ...less than 6 years of service
- ◯ ...20 or more years of service → **GO TO PAGE 23**
- ◯ ...6-19 years of service

At the current time an individual who retires with 20 years of service receives a lifetime pension and continuation of military benefits (health care, commissaries, and PX). The amount of the pension at 20 years is 2.5% of base pay for each year of service (e.g., $17,878 for a Warrant Officer (CW4), $24,876 for a Lieutenant Colonel, and $27,504 for a Colonel retiring at 20 years in 1991). These pensions are also adjusted by Congress annually to reflect cost of living changes.

During the drawdown, certain individuals might be able to leave voluntarily and receive either a lump sum or a series of annual payments instead of staying until 20 years and earning regular retirement pay and benefits. An incentive like this would offer less than a regular retirement but more than an involuntary separation. If an incentive like this were offered, it would only be allowed for a limited time and would not be a permanent option available to military personnel. The questions below focus on whether you would be willing to voluntarily leave and receive payments instead of staying until 20 years of service.

215. A. **What is the amount of a one-time, lump sum payment that you would accept for voluntarily leaving the service today, passing up all your credit towards an active duty retirement? Such a payment would be taxed as ordinary income. Assume that military retiree benefits would not be included.**

$ ___ ___ ___ **THOUSANDS**

B. **What if the offer was the same as in question A except that it also included military retiree benefits (medical, PX, and commissary)? What is the amount of a one-time, lump sum payment that you would accept for voluntarily leaving the service today?**

$ ___ ___ ___ **THOUSANDS**

C. **What if the offer was for annual payments unlike the one-time lump sum payment in Question B? What is the amount of an annual payment that you would accept for voluntarily leaving the service today? Payments would begin immediately and continue annually over your lifetime; they would be taxed as ordinary income and would not be adjusted for inflation. Military retiree benefits would be included.**

$ ___ ___ **THOUSANDS**

D. **What if the offer was the same as in question C except that it also included annual adjustments for increases in the cost of living? What is the amount of an annual payment that you would accept for voluntarily leaving the service today?**

$ ___ ___ **THOUSANDS**

216. If a single lump sum payment, such as that described in A or B of the previous question, were offered, would you prefer to stretch out the payments over several years for tax or other reasons? I would prefer. . .

- ◯ A one time payment when I leave
- ◯ 2 equal payments over 2 years
- ◯ 3 equal payments over 3 years
- ◯ 4 equal payments over 4 years
- ◯ 5 equal payments over 5 years
- ◯ To stretch out the payments for more than 5 years

217. Below are described 4 specific voluntary separation plans. Please indicate whether you would be willing to voluntarily leave under each of these plans.

A. The first plan would provide a one-time lump sum payment equal to 20% of your current annual base pay for each year of service you have completed. *For example, an individual with 10 years of service would receive a payment equal to twice (.2 X 10 = 2 times) their current annual base pay, and an individual with 15 years of service would receive three (.2 X 15 = 3) times their annual base pay. The table below shows the amount of the payment for several combinations of paygrade and years of service. No other benefits would be provided.*

	YOS 8	YOS 10	YOS 12	YOS 14	YOS 16
O-4	$54,444	$72,698	$92,137	$112,402	$134,093
O-3	$52,572	$69,271	$87,238	$104,278	$119,174
W-3	$40,452	$53,510	$66,321	$79,824	$93,946
W-2	$36,789	$47,729	$59,374	$71,659	$84,776

Would you voluntarily leave the service now for this offer?
◯ Yes ◯ No

B. The second plan would provide annual payments rather than a one-time lump sum. *The payments would be made for twice the number of years of service. The payments would be based on the current retirement formula of .025 X years of service X current annual base pay. The table below shows the annual payments under this plan for different combinations of paygrade and years of service. No cost-of-living or other benefits would be provided under this plan.*

	YOS 8	YOS 10	YOS 12	YOS 14	YOS 16
O-4	$6,805	$9,087	$11,517	$14,050	$16,762
O-3	$6,571	$8,659	$10,905	$13,035	$14,897
W-3	$5,057	$6,689	$8,290	$9,978	$11,743
W-2	$4,599	$5,966	$7,442	$8,957	$10,597

Would you voluntarily leave the service now for this offer?
◯ Yes ◯ No

C. The third plan would provide an immediate lump sum plus an annuity beginning at age 65. *The lump sum would be equal to 10% of current base pay for each year of service. The annuity at age 65 would be .025 X years of service X current annual pay, adjusted for cost of living changes between retirement and age 65. Under this plan, the lump sum would be one-half that provided under Plan A above, and the annual payments beginning at age 65 would be the same as under Plan B, plus cost-of-living adjustments. The annuity would continue to be adjusted for cost-of-living like military retirement and the plan would include military retiree benefits starting at age 65.*
Would you voluntarily leave the service now for this offer?

◯ Yes ◯ No

D. The fourth plan would provide annual payments beginning immediately after separation and continuing for life. *The payments would be based on the current retirement formula of .025 X years of service X current annual base pay, and would include annual cost-of-living adjustments. This plan would include full military retiree benefits (medical, commissary, PX). (Examples of the initial annual payments under this plan are shown in Part B above.)*
Would you voluntarily leave the service now for this offer?

◯ Yes ◯ No

218. If an incentive program were offered, how long would you need to decide whether or not to apply for early retirement? Mark only one.

- ◯ 1 month
- ◯ 2 months
- ◯ 3 months
- ◯ 4 months
- ◯ 5 months
- ◯ 6 months or more

219. If you did apply, and the Army approved your application, how long would you need after approval before separating from the Army? Mark only one.

- ◯ 1 month
- ◯ 2 months
- ◯ 3 months
- ◯ 4 months
- ◯ 5 months
- ◯ 6 months or more

220. If an early retirement incentive program were offered, please indicate what your spouse would prefer:

◯ Not Applicable → **GO TO PAGE 23**

A. My spouse would be more likely than I would to prefer leaving the Army now.
◯ Yes ◯ No

B. My spouse would place more value on military retirement benefits as part of the offer than I would.
◯ Yes ◯ No

C. My spouse would be more likely than I would to prefer remaining in the Army until normal retirement.
◯ Yes ◯ No

221. If you had the opportunity to choose between a lump sum payment, of the amount you indicated in question 215 B (military retirement benefits included) and an annuity of the amount you indicated in your answer to 215 D (including benefits and cost-of-living adjustments) which alternative would your spouse favor?

- ◯ A one-time lump sum payment
- ◯ Payments over time
- ◯ Don't know

Appendix C

	Officers	Enlisted
Sample Size	4257	3383
Adjusted Effective Sample Size	2341	1854

Sample size lists the actual number survey respondents with 6-19 years of service. Adjusted effective sample size reflects the result of weighting for stratification and adjusting for finite population correction.

Table C1

Responses to Items 215A - 215D

	215A	215B	215C	215D
Officers				
Mean	272.41	221.24	23.84	20.95
Std Dev	211.33	187.52	14.28	13.02
Enlisted				
Mean	173.43	133.10	19.97	18.32
Std Dev	187.92	161.54	16.12	15.33

Table C2

Responses to Items 217A - 217D
(percent)

	217A	217B	217C	217D
Officers				
Yes	23.4	15.0	17.2	48.2
No	76.6	85.0	82.8	51.8
Enlisted				
Yes	39.5	18.5	23.8	52.6
No	60.5	81.5	76.2	47.4

Appendix D

Here we use the Present Value formula of continuous discounting to evaluate a soldier's options.

If a soldier were to receive a constant stream of payments (A) the present value (PV) at any time is given by;

$$PV = Ae^{-rt}$$

where:
- e - exponential function
- r - interest rate
- t - time period.

To determine the total value over a specific interval of time it is necessary to integrate this function over the period of concern. PV is replaced by LS (lump sum) hence,

$$LS=\int_0^T Ae^{-rt}=A\int_0^T e^{-rt}=\frac{-A}{e^{-rt}}\Big|_0^T$$

$$\rightarrow LS=\frac{A}{r}-\frac{A}{r}e^{-rt} \qquad \text{(A1)}$$

$$\rightarrow r=\frac{A}{LS}-\frac{A}{LS}e^{-rt}.$$

Eligible soldiers were given a choice between a lump sum (SSB) and an annuity (VSI). Note that current policy fixes the ratio between these options for any particular grade at a given career point.

where: BP - current annual base pay
YOS - years of service

plan	formula
VSI	.025*BP*YOS
SSB	.15*BP*YOS.

Rewriting A1 the path of the program discount rate (r) can easily be deduced.

$$r=\frac{VSI}{SSB}-\frac{VSI}{SSB}e^{-rt}=.167-.167e^{-rt}$$

$$\ln(r)=\ln(.167)-\ln(.167)+rt \qquad \text{(A2)}$$

$$\rightarrow \frac{\ln(r)}{r}=t.$$

The smooth logarithmic curve of the program discount rate in figure 1 is explicitly written in A2.

Appendix E

Variable List

Female	- equals 1 for females 0 for males
Black	- equals 1 for blacks 0 for all other races.
Hispanic	- equals 1 for hispanics 0 for all other races.
Sep/Div	- equals 1 if soldier was separated or divorced, 0 otherwise.
Married	- equals 1 if soldier is married.
Income	- in Black's model, the ratio of military pay (in $1,000) to family size.
Leverage	- ratio of debts to assets (as reported in ACSS)
Lograde	- equals 1 for respondents whose grade is E-4 (enlisted), O-3 (officers) or below.
Tech OCC	- equals 1 for soldiers whose career fields are considered technical i.e. electronics, communications and intelligence, electrical and mechanical repair, support and administration, and medical health. (see Mangum and Ball, 1987).
NHS	- equals 1 for soldiers who did not graduate high school.
GED	- equals 1 for soldiers who earned a high school equivalency diploma.
NHS/GED	- Nord and Schmitz combine the previous two variables.
College	- equals 1 if soldier has some college but no degree.
Degree	- equals 1 if soldier earned a college degree.
Grad. Degree	- equals 1 if soldier earned a graduate degree. (Black, 1983 only)
Homeowner	- equals 1 if soldier owns a home.
YOS	- number of years of service at the time of response.
Remaining Service	- number of years soldiers expects to stay in the Army.
Debt	- equal to 1 if the soldier indicated responsibility for non-mortgage debt in excess of $500.
Assets	- equals 1 for soldiers with any liquid assets.
Knowledge of Retirement	- Value was the difference between the respondent's estimate of the percentage of basic pay used to determine retirement pay after 26 years of service and the actual percentage (65%).
Age	- soldier age in years (STAMP officers only, NOTE: this variable is highly correlated with YOS hence we report it only for officers.)

Appendix F

The Army Career Satisfaction Survey (ACSS) conducted in 1990 contained questions concerning the dollar amount of a soldiers debts and assets. Roughly 1300 STAMP respondents also completed ACSS. By merging these records we can test an additional variable reported by Black. Whereas Black treated debts and assets as two separate variables we prefer to use the ratio of debts to assets which shows the extent to which a soldier is leveraged (i.e. holds debt). Regression results are presented in Table F1 below. Our findings are consistent with Black's. Personal discount rates are positively related (significant at the 8% level) to a soldier's proclivity to hold debt.

Table F1

Regression coefficients of Personal Discount Rate Analyses (Officers)

	STAMP	Black
Intercept	.4484**	.1254**
Female	.0285*	.0015
Black	.0234	.0137**
Hispanic	.0218	.0123*
Age	-.0052**	NA
Sep/Div	.0052	.0130**
Married	-.0125	NA
Income	NA	.0003*
LoGrade	-.0149	NA
College	NA	.0042
Grad.Degree	NA	.0020
Homeowner	NA	.0006
YOS	-.0071**	-.0013**
Remaining Service	-.0014	-.0010**
Debt	-	.0026
Assets	-	-.0051*
Leverage	.0003	NA
Knowledge of retirement	NA	.0003*
Adj R^2	.146	
F-statistic	14.4	

* - significant at the .05 level
** - significant at the .01 level
NA - not available

Note: Variable definitions are provided in Appendix E. Nord and Schmitz did not analyze officer data.