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A Model of Reenlistment Decisions of Army National Guardsmen

Burke K. Burright, David W. Grissmer, Zahava D. Doering



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🗁 An econometric model of reenlistment decisions for Army National Guardsmen is developed using data collected from 2976 SUE Veys. The surveys were administered to Guardsmen with less than 8 years of service who were making a reenlistment decision during 1979. The results of the model shows that a 10 percent increase in reserve pay would bring only a 2 percent increase Since almost all in reenlistment rates. Guardsmen are moonlighters, higher civilian job wage levels and hours worked bring lower reenlistment rates. Demographic composition and education level significantly affect recalistment rates. Other things equal, women, blacks, and those who do not complete high school have higher reenlistment rates than their counterparts. Overall, the model predicts that reenlistment rates will more than double after 1978, thanks to a favorable demographic composition and the absence of draft motivated reservists. (See also R-2864-MBAL and R-2865-MBAL.)

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A Model of Reenlistment Decisions of Army National Guardsmen

Burke K. Burright, David W. Grissmer, Zahava D. Doering

October 1982

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PREFACE

This report presents an econometric model of reenlistment decisions made by Army National Guardsmen. It was prepared as part of Rand's Manpower, Mobilization, and Readiness Program, sponsored by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics)--OASD (MRA&L). The Rand program seeks to develop broad strategies and specific solutions for dealing with present and future defense manpower problems. The research was conducted for the Office of Reserve Affairs under Task Orders 79-III-1, 80-III-1, and 81-III-1, Reserve Forces Manpower. The reenlistment model was constructed from survey data collected during the 1978 Selected Reserve Reenlistment Bonus Test. The test, initiated as part of an effort to stem a severe decline in Army Selected Reserve strength, consisted of offering a bonus to reservists with less than eight years of service who faced a reenlistment decision in 1978. The Rand Corporation helped to design the test, monitored its implementation in the Army Reserve and National Guard, evaluated the effects of the bonus offer, and developed an econometric model of the reenlistment decision.

This raport, the third of five publications documenting the Rand analyses of the 1978 Selected Reserve Reenlistment Bonus Test, models the reenlistment decision and summarizes the factors underlying a reservist's decision to separate or reanlist. <u>The 1978 Selected Reserve</u> <u>Reenlistment Bonus Test: Executive Summary</u>, R-2864-MRAL, April 1982, summarizes this and the second report, <u>The Design</u>, <u>Administration</u>, <u>and</u>

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Evaluation of the 1978 Reenlistment Bonus Test, R-2865-MRAL, July 1982, which describes the effect of the bonus on reenlistment. Data Bases for the 1978 Selected Reserve Reenlistment Bonus Test, N-1826-MRAL, forthcoming, contains the technical documentation for the data bases used for all the analyses. <u>A Follow-up of Participants in the 1978</u> Selected Reserve Reenlistment Bonus Test, N-1880-MRAL, forthcoming, analyzes the attrition of the test sample 3-1/2 years after the test began.

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SUMMARY

Fellowing termination of the draft in January 1973, the number of enlisted personnel in the Army Selected Reserve components--the Army Reserve and Army National Guard--declined for four successive years. Reserve ranks, which stood at 638,000 in June 1973, numbered only 527,000 in September 1978. Although this decline was later reversed, it raised serious concerns in the mid-1970s about the viability of the Selected Reserve in the All-Volunteer Force (AVF).

Under the total force policy, the success of the AVF depends on a strong reserve supporting a smaller, less rapidly expandable active force. The failure of the Selected Reserve to meet strength goals, it was believed, might endanger the entire AVF concept. Such drastic solutions as a return to the draft were proposed in Congress, because at the time the decline was not understood and the effect of various policies to boost strength was not known. In particular, the relationship between reserve pay and reserve force manning has never been established. One hypothesis held that the effect of pay raises on reservists had been overestimated by AVF planners, and it was suggested that the measurement of pay effects might help to explain the decline and provide the basis for the formulation of policies to restore strength. If in a test reservists responded well to higher pay, monetary incentives would be used as the primary means of rebuilding reserve strength. If reservists responded poorly, other, possibly less expensive, solutions could be sought before a commitment was made to pay incentives.

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This report describes the results of an experiment that in fact helped to explain the decline of reserve strength and provided a basis for estimating the costs and effectiveness of pay incentives to reverse that decline. The research was undertaken in response to a 1977 congressional authorization of \$5 million to evaluate the effect of a bonus on reenlistment in the Army National Guard and Army Reserve. In carrying out this experiment, Rand collected survey data from individual reservists who were deciding whether to reenlist. Thus, in addition to evaluating the effectiveness of a reenlistment bonus, Rand developed a model to test hypotheses concerning a reservist's motivation for remaining in service or separating.

The Rand research sought both to determine the influence of reserve pay on reenlistment decisions and to test a model of reservists as moonlighters. Moonlighting labor market theory suggests that certain characteristics of the primary job--wages and hours worked--affect moonlighting decisions. It predicts that higher primary job wages and longer working hours will deter moonlighting. In addition to reserve pay and civilian job wages and hours, Rand also analyzed the effect on reenlistments of both demographic and reserve job characteristics.

Data on reserve behavior were obtained from 2876 surveys returned by Army National Guardsmen who made a reenlistment decision during 1978. These guardsmen constituted part of the control group for the 1978 Selected Reserve Reenlistment Bonus Test. They had enlisted mainly between 1970 and 1975. The 1978 reenlistment decision was either a first reenlistment decision after the completion of an initial 3- or 6-year term or a second reenlistment decision after a 1-year first

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reenlistment contract. All guardsmen in the sample were <u>nonprior</u> <u>service personnel</u>; that is, none had served in the active force before joining the National Guard. They came from seven states--Idaho, lowa, New York, North Carolina, Pennsylvania, South Carolina, and Washington--states chosen as representative of the nation as a whole on the basis of economic and National Guard retention characteristics.

Reserve pay increases proved to affect rotention much less than predicted during the planning of the All-Volunteer Force. Whereas the Gates Commission had assumed elasticities of 2.0 for draft-motivated first termers, .8 for first termers not motivated by the draft, and .3 for members with 6 to 10 years of service, we found an elasticity of .18 for a group of reservists divided roughly equally among the three groups. We found also that reserve pay added only an average of 7 percent to our sample reservists' average annual after-tax income. Although the typical reserve pay of those in the sampla was \$1400, the net annual amount after deducting the costs of participation, lost civilian pay, and taxes was only \$725.

Since the financial incentive had been adopted as the primary means of attracting an all-volunteer force, the finding that the pay increase influenced retention less than expected accounted for part of the significant manning decline of the Selected Reserve after the draft ended. Stabilizing reserve strength in the AVF would have required much larger pay incentives.

Other things equal, higher levels of civilian wages and hours worked resulted in statistically significant lower reenlistment rates. A 10 percent change in civilian wages or hours worked brings a 2 or 3 percent change, respectively, in reenlistment rates. While the

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direction and significance of these variables confirm the hypothesis that reservists behave as predicted by the moonlighting model, the magnitude of the effects is very small and several other variables in our model have more weight and higher elasticities than the moonlighting variables. This suggests that the reserve reenlistment decision is more complex than the simple decision suggested by moonlighting labor theory and that certain assumptions inherent in moonlighting labor theory may hold only weakly for reservists.

Reserve reenlistment decisions depend more on variables describing the uniqueness of the reserve job or the characteristics and previous experience of the potential reenlistee than on variables identified by moonlighting labor market theory. For instance, the unique requirement of reserve service for occasional full-time participation (annual training, etc.) usually involves absence from civilian work, thus making reserve participation dependent on the civilian employer's acquiescence. We found this dependence to be highly significant in the reenlistment decision. The efforts of the reserve community to enlist employer support appear to be directed at an important problem. Employer attitudes matter when reenlistment decisions are considered.

The previous military experience and circumstances of original enlistment proved important determinants of reenlistment. Individuals with low draft lottery numbers who enlisted in the reserve to avoid being drafted into the active force reenlisted at much lower rates than volunteer enlistees. This finding lolps explain the relatively low reenlistment rates in the Army Reserve components through 1978, the last year in which draft-motivated personnel were making first-term reenlistment decisions. The reserve will experience a substantial increase in first-term reenlistment rates under the volunteer system.

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Other things equal, promotion to a higher pay grade strongly influences the decision to reenlist. Guardsmen and reservists who achieved higher pay grades reenlisted at significantly higher rates than those who did not. Part of this effect may be accounted for by selfselection; part is probably due to the status that comes with higher positions. Membership in voluntary and fraternal organizations-including the reserve--also provides a kind of status.

Other things equal, personnel in combat jobs reenlist at slightly lower rates than those in noncombat jobs. This difference probably reflects the risk and other characteristics of combat jobs, the nontransferability of skills, and the poorer future promotion prospects associated with combat units.

Finally, the demographic composition and education of the reenlisting cohort significantly affect reenlistment. Other things equal, older reservists reenlist at much higher levels than younger reservists. Given that most reservists cite family and employer conflict as the main reasons for leaving the reserve, the higher retention rate of older reservists probably reflects an increase in stability between enlistment and reenlistment. A typical younger reservist in our sample enlisted at the age of 20 and made the reenlistment decision at 27, by which time he may have taken a job, married, and had children; such a reservist would be less likely to reenlist.

Other things equal, women, blacks, and those who did not complete high school reenlist at higher rates than their counterparts. The differences probably reflect somewhat poorer and more uncertain future

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economic prospects. This finding points to even higher volunteer era reenlistment rates, as cohorts approaching reenlistment will contain more women and blacks and somewhat older, less-educated personnel.

Our research led to the following conclusions:

- AVF reserve reenlistments will more than double after 1978
 because (1) volunteers will replace draft-motivated enlistees,
 who usually do not reenlist, and (2) these volunteers will be
 more likely, on the basis of social and economic
 characteristics, to reenlist.
- Pay increases will only marginally raise reenlistment rates above this volunteer level.
- o The higher retention rates after 1978 will eventually create a surplus of career reservists, a surplus that will, in turn, allow larger reserve force size, greater selectivity, and/or fewer prior service enlistments.

Our empirical results confirmed almost all of the hypotheses concerning the significance and signs of variables derived from moonlighting labor market theory. However, they also showed that reserve reenlistment decisions are not very sensitive to these variables. Explaining reserve reenlistment decisions requires--in addition to moonlighting variables--factors that capture certain unique aspects of the reserve job. Among these factors are the requirement for occasional full-time participation, certain qualitative aspects of reserve service, and reserve benefits. Additional work is needed to extend moonlighting theory to include these factors and to develop empirical models with better measures of these variables.

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I. INTRODUCTION

THE SELECTED RESERVE IN THE ALL-VOLUNTEER FORCE

An installing

The success of the All-Volunteer Force (AVF) under the total force policy depends on a strong reserve supporting a smaller, less rapidly expandable active force. The Army Selected Reserve thus assumes i larger share of the defense burden than it had carried under the draft. Following the termination of the draft in 1973, however, the number of enlisted personnel in the Army Selected Reserve components--the Army Reserve and the Arm, Mational Guard- declined for 4 successive years. Reserve ranks, which stood at 638,000 in June 1973, numbered only 527,000 in September 1978. The failure of the Selected Reserve to meet strength levels, it was feared, might endanger the entire AVF concept.

Manning the selected reserve had been relatively easy during the draft. Many young men holding low draft lottery numbers had enlisted in the reserve to avoid being drafted into the active service. Reserve units even had queues waiting to join. When the draft ended, however, reserve units had been forced to compete in the local civilian labor market for volunteers. For many units, the local labor market had failed to provide enough volunteers, and reserve manning had steadily fallen to below authorized strength, ultimately triggering congressional recommendations for a return to the draft.

Such drastic solutions as a return to the draft had been proposed because, at the time, neither the reasons for the Selected Reserve's decline nor the effect of various policy changes on reserve enlistments and reenlistments had been measured. It was suggested, however, that with the institution of the volunteer system, reserve strength--unlike

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active Army strength--had fallen, because the AVF planners had overestimated the effect of reserve pay increases.

The Gates Commission, which planned the transition to the AVF, had recommended raising entry level pay for both active duty personnel and reservists to levels calculated to attract enough volunteers to replace draftees and draft-motivated enlistees. These calculations were supported by research, conducted in the 1960s, which quantified supply effects and predicted that pay raises for the active force would effectively increase both enlistments and reenlistments.[1] Pay elasticities of 1.25 for active force enlistments and of 2.8 for firstterm reenlistments were assumed. Similar research was not available, however, to support estimates for the reserve forces.

Members of the Gates Commission, while recognizing that a key difference existed in the labor markets from which individuals were recruited for the active and reserve forces (namely, the full-time vs. secondary or moonlighting labor market), nevertheless assumed that reservists would respond almost as well as active force personnel to higher enlistment pay. Lacking data on which to bese enlistment pay elasticities, they assumed an upper bound of 1.25, as for active force enlistment, and a lower bound of 0.8. Based on a 1968 survey, they estimated reserve reenlistment pay elasticities for three groups: 2.0 for draft-motivated first termers with 4 to 6 years of service, .8 for volunteer first termers with 4 to 6 years of service, and .3 for reservists with 6 to 10 years of service. These retention elasticities were significantly lower than those estimated for the active force.

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^[1] See Alan E. Fechter, "Army Enlistments," and Gary R. Nolson, "Army Reenlistments," in <u>Studies</u> <u>Prepared for the President's Commission</u> on an <u>All-Volunteer Armed Force</u>, U.S. Government Printing Office, Washington, D.C., November 1970.

Because the original pay elacticities were not based on behavioral data or on a sound theory of reserve participation, their validity was questioned. Some manpower specialists believed that actual elasticities might be much lower than those assumed. In fact, the Gates Commission had recommended caution in their reserve planning:

Analysis of the Reserve problem, however, suffers seriously from a lack of data. Even though special care was taken to provide against error of estimation, the assessments of what is required to maintain an All-Volunteer Force are much more tenuous than for the Active Force. . . Given the uncertainty which surrounds projections of Reserve enlistments and losses, further steps beyond the recommended pay increase may be necessary. Any further steps should await the results of experience with higher pay during the first few years.[2]

Had the commission's assumptions concerning pay been accurate, the strength of both the active and reserve forces should have reached or exceeded the predicted AVF levels, since junior enlisted personnel in both forces benefited from pay increases that exceeded the commission's recommendations. Any shortages would likely have shown up first in Army strength levels, because youth prefer the Army least of all the armed services, while it has the greatest demand for manpower. The 1971 and 1972 pay increases had close to the predicted effect on active Army accessions, and enlisted strength did not decline. [3] They apparently

[2] <u>Report of the President's Commission on an All-Volunteer Armed</u> Force, U.S. Government Printing Office, Washington, D.C., 1970.

[3] Several measurements of the effect of pay 'ncreases have been made since 1972. For a review of enlistment studies, use Alan E. Fechter, "Review of the Literature: Some Methodological Issues," in Dorothy M. Amey. Alan E. Fechter, Daniel F. Huck, and Kenneth D. Midlam, <u>Econometric Models of Armed Forces Enlistment Levels</u>, General Research Corporation, McLean, Virginia, October 1976. For a review of reenlistment studies, see Winston K. Chow and J. Michael Polich, <u>Models</u> of the First-Term Reenlistment Decision, The Rand Corporation, R-2468-MRAL, September 1980.

See also David W. Grissmer, "The Supply of Enlisted Volunteers in the Post-Draft Environment: An Analysis Based on Monthly Data, 1970-1975,"

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had a smaller effect than predicted on reserve enlistments and reenlistments. The effect could not be measured, however, because of the lack of good data at the time of the 1971 and 1972 pay increases.

The effectiveness of pay in attracting reservists was questioned again in 1977, when programs to reverse the reserve strength decline were considered. A reliable measurement of the effect of pay would determine the kind of policies needed to rebuild reserve strength. If in a test reservists responded well to higher pay, this could serve as the primary incentive for rebuilding reserve strength. If they responded onl; weakly, other, less expensive solutions might be sought before a commitment was made to increase pay incentives.

In 1972, Rostker and Shishko sought to explain the moonlighting behavior of Air Force reservists.[4] Their theory portrayed the moonlighting decision as a trade-off between leisure time and income from a second job. They identified several important economic variables in a moonlighting decision, including the wages and hours of the primary job and wages of the secondary job. Empirical estimation of civilian moonlighting decisions confirmed the direction and importance of these variables. Moonlighting was less frequent among those whose primary job was characterized by high wages and long hours.

[4] Robert Shishko and Bernard Rostker, "The Economics of Multiple Job Holding," <u>American Economic Review</u>, Vol. 66, No. 3, June 1976, adapted from Rostker and Shishko, <u>Air Reserve Personnel Study</u>: <u>Volume</u> <u>II. The Air Reserve Forces and the Economics of Secondary Labor Market</u> <u>Participation</u>, The Rand Corporation, R-1254-PR, August 1973.

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in Richard V. L. Cooper (ed.), <u>Defense Manpower Policy</u>: <u>Presentations</u> from the 1976 <u>Rand Conference on Defense Manpower</u>, The Rand Corporation, R-2396-ARPA, December 1978; Richard V. L. Cooper, <u>Military Manpower and</u> the <u>All-Volunteer Force</u>, The Rand Corporation, R-1450-ARPA, September 1977; and Richard L. Fernandez, <u>Forecasting Enlisted Supply</u>: <u>Projections for 1979-1990</u>, The Rand Corporation, N-1297-MRAL, September 1979.

Rostker and Shishko's most important finding for reserve compensation policy was that a 10 percent increase in secondary wages would result in a 9 percent increase in the probability of moonlighting. If civilian moonlighting decisions and reserve participation decisions are analogous, then reserve pay elasticities around 1.0 would seem reasonable. This estimate, in fact, was not dissimilar to the assumption made by the Gates Commission in evaluating enlistment and retention effects.

In 1977, a congressionally authorized test of reenlistment bonuses for the Army National Guard and Army Reserve provided the opportunity to study the reserve menlistment decision. Although Congress sought mainly to determine the effect of bonuses on reserve reenlistment, the bonus experiment presented the opportunity to collect data and test a broad range of hypotheses concerning reserve reenlistment behavior: for instance, the effect of raising reserve pay on retention and tha relationship between participation in the reserve and the reservist's civilian job and labor force status.

Data to support a model of reserve participation were collected on a survey instrument administered to bonus test participants--members of the Army Reserve and Army National Guard who were making a reenlistment decision in 1978. The survey was administered at some time during the 3 months preceding the end of the reservist's term of service (ETS). Participants were later tracked to determine whether they had separated or reenlisted.

This report describes the analysis of this survey data and develops an economic model of the reserve retention decision which quantitatively

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estimates the effect on reenlistment rates of reserve pay, civilian and military job characteristics, family and demographic characteristics, and military background. The remainder of this section describes the design, administration, and results of the 1978 Selected Reserve Reenlistment Bonu: Test. Section II presents a rudimentary theory of reserve population, and Section III categorizes a population sample, drawn from the 1978 bonus test, in terms of variables identified as important in the retention decision. Section IV gives the results of our estimated model, and Section V tenders the policy implications of these results.

THE 1978 SELECTED RESERVE REENLISTMENT BONUS TEST[5]

In fall 1977, Congress appropriated \$5 million to test reenlistment bonuses in the Army National Guard and Army Reserve. The authorization bill specified not only the total test authorization, but also the amount, form, and timing of bonus payments to be tested, and the eligibility requirements for bonus recipients. Bonuses of \$1800 were offered for a 6-year reenlistment and \$900 for a 3-year reenlistment, one-half (\$900 or \$450) to be paid at the time of reenlistment and the remaining amount in \$150 installments at the completion of each obligated year of service. A repayment clause obligated a reservist who failed to complete the reenlistment contract to return a portion of the bonus payment. Reservists committing themselves for fewer than 3 years were not eligible.

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^[5] For a more detailed description of the experimental design and results of the test, see David W. Grissmer, Zahava D. Doering, and Jane Sachar, <u>The Design</u>, <u>Administration</u>, <u>and Evaluation of the 1978</u> <u>Reenlistment Bonus Test</u>, The Rand Corporation, R-2865-MRAL, July 1982.

The bill specified several further eligibility requirements: Only reservists with fewer than 10 years (later cut for budgetary reasons by were eligible.[6] Finally, only reservists whose term of service ended

reenlistment decision after serving an initial 6-year term or those who

four Army Reserve regions. Each state or region was matched with one in matched closely to national characteristics so that the results could be

^[6] This provision eliminated over one-half the reservists who met rationale for this exclusion was based on differences in retention rates

^[7] The sample of eligible reservists contained 15 percent who had

Table 1

DISTRIBUTION OF ANALYTIC POPULATION IN BONUS AND CONTROL AREAS, BY COMPONENT

Bonus Area Pa	No. of articipant	ts Control Area H	No. of Participants
United	l States A	Army National Guard	
Kansas	641	Iowa	835
New Jersey	1081	New IOTK	1722
Michigan	972	Pennsylvania	1096
Georgia	/32	North Carolina	1084
North Dakota	277	Idano	297
Oregon	639	Washington	432
West Virginia ^a	0	South Carolina	911
Total	4342	Total	6952
Uni	ted State	es Army Reserve	
94th ARCOM ^b and 76th Training Division ^b Connecticut Maine Massachusetts New Hampshire Rhode Island Vermont	845	79th ARCOM ^b and 99th ARCOM ^b Pennsylvania Ohio West Virginia	1748
96th ARCOM ^C Colorado Idaho Montana New Mexico Utah Wyoming	478	89th ARCOM ^C Kansas North Dakota Nebraska South Dakota	437
205 Infantry Brigade ^d Iowa Minnesota Wisconsin	177	157 Infantry Brigade Pennsylvania	b 213
187 Infantry Brigade ^b Massachusetts	121		
Total	1621	Total	2398

^aWest Virginia withdrew before the test began.

^bPart of the First Army. ^CPart of the Sixth Army.

^dPart of the Fifth Army.

Approximately 15,000 reservists in the test and control regions met the eligibility conditions and constituted the experimental sample. Of these, almost 75 percent were in the National Guard. Guardsmen predominated over Army reservists, first, because Congress had allocated \$3 million to the Guard and only \$2 million to the Army Reserve to conduct the test, and second, the Army Reserve has higher retention rates than the Guard, so that fewer Army reservists could participate even if budget allocations were equal.

The reenlistment decision of each of the approximately 15,000 reservists in the sample was monitored. These administrative data were combined with demographic and military background information collected from computerized personnel files to evaluate the effect of the honus by a statistical comparison of behavior in bonus and control areas. The information from the computerized files was used to control for small differences in the composition of the test and control groups.

As a by-product of the bonus analysis, the effects of certain demographic and military background variables were also measured. Ideally, data from the survey instrument[8]--which contained more detailed demographic and military background variables, as well as variables on reserve compensation, civilian labor force, and employer characteristics--would also have been combined in this analysis and the effects of these variables obtained simultaneously with the bonus effect. However, survey responses were received from less than onehalf of the sample, and those returning surveys were not representative of the entire sample.

[8] The survey administrative procedures and survey instrument are described in Appendixes B and C.

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Because less than half the sample returned completed questionnaires, the data were analyzed in two parts. The first analysis, essentially a bonus program evaluation, used data from personnel records and administrative test data from all participants to evaluate the effects of the bonus and of the limited set of demographic and military background characteristics available from personnel files.[9] The second analysis, presented in this report, used survey data from an unbiased subset of test participants to estimate a more complex model of reserve retention behavior.

RESERVE PAY ELASTICITY AND THE 1978 BONUS TEST RESULTS

The bonus evaluation did not unambiguously settle the important question of the responsiveness of reservists to monetary incentives. The bonus increased reenlistment rates from 38.4 percent to 40.6 percent, representing a 5 percent increase, a much smaller effect than expected. That expectation, however, was based on a simple present value calculation and an assumed reserve pay elasticity.[10] The bonus raised reserve gross income during the 3- or 6-year terms by between 20 and 25 percent. Based on an assumed secondary or moonlighting wage elasticity of 1.0,[11] an increase in reenlistment rates of 20 to 25 percent had been predicted.

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^[9] This analysis was reported in David W. Grissmer, Zahava D. Doering, and Jane Sachar, <u>The Design</u>, <u>Administration</u>, <u>and Evaluation of</u> <u>the 1978 Reenlistment Bonus Test</u>, The Rand Corporation, R-2865-MRAL, July 1982.

^[10] See Appendix A.

^[11] The reserve reenlistment pay elasticity had not previously been measured. However, Shishko and Rostker measured the secondary wage elasticity for civilian moonlighting job decisions at close to 1.0.

Three possible explanations of the small bonus effect were considered. First, the value of the reserve pay elasticity may be much lower than 1.0, perhaps because the decision to take a civilian moonlighting job may differ from the decision to enlist or reenlist in the reserve.

Second, the bonus evaluation itself may have been flawed. For example, recollistment decisions in control areas may have been affected by the anticipation of a future bonus; that is, the 1978 bonus test may have heightened expectations of members of the control group for bonuses in succeeding years. This effect may have led to an underestimation of the bonus effect.

Third, a pay raise and bonus may differ essentially, and the assumptions used in the simple model translating a bonus into an effective pay raise may have been wrong. The bonus was expected to bring a smaller response than a pay raise because of (1) the requirement to accept a longer term of commitment and (2) the temporary nature of the bonus. Because a bonus is paid only during the term of service in which it is accepted, it does not represent a permanent pay increase, nor does it enter into the reserve base pay used to calculate future pay increases and retirement pay levels.

The reserve pay elasticity therefore had to be measured so that the bonus results could be interpreted. A low measured pay elasticity would have supported the bonus measurement and the hypothesis of a generally low responsiveness of reservists to monetary incentives. A high measured pay elasticity would have indicated either a flawed bonus measurement or a basic difference in bonus payments and pay raises.

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A THEORY OF RESERVE PARTICIPATION II.

This section develops a simple model of the reserve reenlistment decision. The model draws from a model of civilian moonlighting behavior to identify factors that may relate to the reservist's decision

decision. The model draws from a model of civilian moonlighting behavior to identify factors that may relate to the reservist's decision and suggests how they are likely to influence that decision. Factors that ast reserve participation spart from moonlighting are also discussed.
A SIMPLE MODEL BASED ON CIVILIAN MOONLIGHTING THEORY
Because the reserve offers limited working hours, it attracts moonlighters (seen and women with full-time jobs) rather than those who want to work only part time. Nore than 93 percent of the reservists in the 1978 reanlistment bonus test were moonlighting, while less than 7 percent were working only part time (see Table 2). Reservists work a total of 204 hours a year, [1] much less than the average of 960 hours a Table 2 PRIMARY ACTIVITY EURING THE MONTH OF THE REENLISTMENT DECISION

 Activity
 Percentage

 Full-time work
 2.2 Unseptived

 Motivition
 2.3 Education

 Activity
 Percentage

 Full-time work
 2.3 Education

 Chieve
 0.3 Other

 Outer
 0.3 Other

 Total
 100.0

Activity	Percentage	
Full-time work	91.1	
Part-time work	2.2	
Unemployed	2.9	
Education	2.2	
Housekeeping	0.9	
Other	0.7	
Total	100.0	

year worked by part-time jobholders, [2] or the median of 700 hours a year worked by moonlighters on second jobs. [3] Thus, someone who wanted to work only part time clearly would be better off with a civilian job-unless significant differences existed between civilian and reserve wages and benefits.

Although the typical civilian second job offers the moonlighter the opportunity to earn more money, individual taste and differences in civilian and reserve monetary and nonmonetary benefits may make the reserve job more attractive. For this reason, the reserve job may compete better in the moonlighting labor market than in the part-time labor market. Like a primary job, a second or part-time job involves both monetary and nonmonetary benefits and costs. Just as a person considers the entire package of benefits and costs when deciding on his primary job, he also considers the entire package in considering a second job.

While recognizing that reserve participation involves an entire package of benefits and costs, we start with a simplified model of the reenlistment decision involving only two elements of the package: reserve pay and time costs. Deferring our discussion of the entire reserve package until later allows us to build on the standard model of the civilian moonlighting decision and to focus on the interaction between the reservist's civilian and reserve jobs. We examine first the

a single weekend; annual training requires 14 days of full-time work, usually for 2 consecutive weeks during the summer.

[2] <u>Employment and Earnings</u>, Vol. 26, No. 5, May 1979, Table A-27.
 [3] <u>Multiple Jobholders in May 1978</u>, U.S. Department of Labor,
 Bureau of Labor Statistics, Special Labor Force Report 221, Table I.

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effects of changes in four variables: reserve pay, reserve participation time requirements, primary job pay, and primary job time requirements.

Assumptions of the Model

Our model of the reserve reenlistment decision is based on the assumptions that reserve participation constitutes a second job, represents a choice between distinct alternatives, and involves oneway reversibility. The assumption is also made, but later dropped, that the reservist knows exactly his civilian job hours and earnings.

<u>A Second Job</u>. As shown in Table 2 (above), 93 percent of the reservists in our sample worked either full or part time; only 3.8 percent engaged in activities outside the labor force, such as going to whool or keeping house. We therefore analyze the reenlistment decision

terms of the choice of continuing to hold a second job. This means that we must account for how the attributes of the reservist's primary job - fect his reenlistment decision.

<u>A Choice Between Alternatives</u>. Reservists must sign a reenlistment contract for a minimum term of 1 year. Thus, in reenlisting, the reservist commits himself to devoting a specific amount of his time to reserve participation for at least the next year. In facing the reenlistment decision, he must either accept or reject that commitment. In short, he must decide between two discrete alternatives.[4]

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^[4] Looking at the reenlistment decision as a choice between alternatives distinguishes this study from Shishko and Rostker's analysis of the supply of second job labor. They assumed that a person must work a fixed amount of time on his primary job, but that he may work the amount of time that he prefers on a second job. These assumptions focus the analysis on how much time the individual chooses to work on his second job and permit the use of calculus. In analyzing the choice as one between alternatives, we cannot use calculus to construct our model but we must fall back on geometric methods.

<u>One-Way Reversibility</u>. Most second or part-time jobs, being transitory, do not involve long-term labor contracts. In contrast, the reserve requires a commitment for at least 1 year. Without this commitment, the idea of both the availability of the reserve for rapid mobilization and of the reenlistment decision itself loses meaning. But, if a reservist chooses not to reenlist, he does not automatically preclude future reserve participation; he is simply indicating that he does not consider committing himself to another year of reserve participation to be in his best interest <u>at that time</u>. We can therefore focus on the current costs and rewards of reserve participation as key determinants of the reservist's decision.

<u>Certainty</u>. We also assume at first that our representative reservist knows how much money he will earn from his civilian job during the next enlistment period, how many hours he will spend on his civilian job, how much money he will net from reserve participation, and how much additional time reserve participation will require. After we develop the basic model, we will drop the assumption of certainty about civilian job hours and earnings.

Factors Affecting the Basic Reenlistment Decision

Our initial characterization of the basic reenlistment decision is depicted in Fig. 1. The reservist's entire available time during the year is indicated along the horizontal axis. He devotes a part of his time to his civilian job; we assume that he must work a fixed number of hours on that job. He also spends time on reserve activities. Part of the time spent on reserve activities might be offset by a reduction in the time that he would have to spend on his civilian job; another part

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We assume that the reservist's well-being depends on his money earnings and leisure time. The indifference curves in Fig. 1 indicate all the combinations of money income and leisure time that could make the reservist equally well off. The farther the curve from the origin, the higher the level of well-being. An indifference curve sloping downward to the right indicates that a reservist is slways ready to sacrifice some amount of total earnings for another increment in leisure time. It is also clear that if the reservist's well-being remains unchanged, he would give up less income for each successive increase in leisure time; in other words, the subjective value for the reservist of an additional hour of leisure time falls as his hours of leisure time increase.

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Our representative reservist faces a simple choice. As he completes his term, he is at point R in Fig. 1; if he reenlists, he remains there. If he separates, he moves to point C, where he earns less total income but has more leisure time. Our reservist will choose the alternative that makes him better off; as the diagram is drawn, he will be better off if he reenlists. But, had the structure of the reservist's preferences been such that point C was associated with a higher indifference curve than point R, the reservist would have been better off separating.

<u>Net Reserve Pay</u>. The effect of a decrease in net reserve pay on our representative reservist's choice is shown in Fig. 2.[6] Such a

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^[6] The figures are drawn on the assumption that the reservist earns less per hour from reserve participation than from his primary job. Although a few reservists in our sample might earn more per hour, this does not make any difference for most of the model's implications; only those stemming from changes in hours spent on the primary job would matter. When we take up this change, we will point out the difficulties.



Fig. 2 -- Effect of lower net reserve pay on reenlistment choice

decrease would occur, for example, if his employer stopped granting him leave with pay to ettend summer camp. It would also occur over time if reserve pay failed to keep up with inflation. In this case, the representative reservist would have to choose between R* and C. With the reduction in net reserve pay, he would be better off at point C, which would mean separating. His net reserve pay would no longer suffice to keep him in the reserve.

The reduction in net reserve pay implicit in the shift from R to R* is sufficient for our representative reservist to decide to leave.

Other reservists would decide that while they were not as well off as they had been, they were still better off in than out of the reserve. Whether a reservist decided to remain or to leave would depend on how many hours he had to spend on his civilian job, how much his civilian job paid, and how much extra time he had to spend on reserve activities. His response to lower pay would depend also on how much he valued earnings over leisure: Each reservist values earnings and leisure in his own subjective way.

As long as reservists value both more income and more leisure, none who would have separated before net reserve pay was reduced will remain after it has occurred. If the reservist is better off separating when net reserve pay is higher, he will still be better off separating when it is lower. So, it is impossible for a reduction in net reserve pay to lead to an increase in reenlistments; it must always lead to a decline. Our simple model leads to a clear initial hypothesis: The relationship between net reserve pay and the fraction of reservists that reenlist is positive.

<u>Net Reserve Time</u>. Figure 3 illustrates the effect of a net increase in the time required for reserve participation on our representative reservist's decision. In reality, there are few "pure" net increases or decreases in reserve time; most occur along with some other change. One example of a pure increase in reserve time results from an employer's illegal decision not to grant summer military camp leave with full pay. Such a change would force the reservist to use vacation time to attend summer camp; summer camp attendance would thus increase his annual work time, but his total money income would not fall.

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Fig. 3 -- Effect of greater net reserve time on reenlistment choice

As Fig. 3 is drawn, such an increase in net reserve time would be enough to cause our representative reservist to decide to separate. But, a net increase in reserve participation time would not persuade anyone who already had decided to separate to remain. A net increase in reserve participation time would lead only to the decision to separate. Again, we have a clear initial hypothesis regarding the direction of the relationship.

<u>Civilian Wage Rate</u>. The reservist's civilian job wage rate also affects his reserve participation. One outcome of an increase in civilian earnings is portrayed in Fig. 4. The initial effect of the wage increase is to shift points R and C upward by the amount of the



Fig. 4 -- Effect of higher civilian wage rate on reenlistment choice

annual earning increase. The reservist would now have to choose between R^* and C^* . As Fig. 4 is drawn, he would be better off at point C^* and would separate. To remain in the reserve after the increase in his civilian wage rate, the reservist would have had to receive a substantial increase in net reserve pay.[7] Of course, even with a

[7] At point C*, our representative reservist still values his last day of leisure time at less than his civilian wage rate. This is civilian wage increase, some reservists would still feel that they were better off in the reserve and would reenlist. As long as both higher earnings and more leisure time are desired, however, none who would have separated at a lower wage rate would remain with a higher one. The next section, therefore, will deal with the strength of the negative relationship between the civilian wage rate and the proportion of reservists choosing to reenlist.

<u>Civilian Job Hours</u>. Figure 5 shows what would happen if our representative reservist had to work overtime or if his hours were reduced. Longer hours would shift his alternatives from R to R* and from C to C*. As Fig. 5 is drawn, he would be better off at C* and would separate. With longer hours on his civilian job and with a higher civilian income, the reservist would find that the extra income he received from reserve participation would no longer be worth the leisure time that he had to give up. Other reservists might continue to value the extra income more than the leisure time that they would give up; they would reenlist. No one who would have separated when his civilian job required less time will remain when it requires more.[8] So, we expect a negative relationship between time required on the civilian job and the propensity to reenlist.

represented in Fig. 4 by the indifference curve cutting the wage line from below point C*. Had the civilian job wage increase been even larger, the indifference curve would have cut the wage line from above. Then, the reservist would not take any additional work at a wage rate at or below his civilian job wage rate.

[8] If the implicit wage rate earned from reserve participation is higher than the wage rate earned on the primary job, one can construct cases in which a reservist who would have left the reserve with shorter hours on the primary job decided to reenlist with longer hours. For this result to occur, working more hours at the lower wage rate paid on his primary job must make the reservist worse off.

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Fig. 5 -- Effect of longer civilian job hours on reenlistment choice

The Reservist's Uncertainty. We have assumed until now that our representative reservist knows exactly (1) how much time his civilian job will demand, (2) how much time a reserve commitment will require, (3) how much his civilian job will pay in the next year, and (4) how much he will earn from reserve participation. Some reservists can, in fact, predict their future time requirements and money earnings accurately; others must deal with much uncertainty in making their reenlistment decisions. The reservist may not know, for instance, how much he will earn from civilian employment in the next year or how many hours he will devote to it. In terms of the above diagrams, Fig. 1

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shows his "normal" civilian job situation and Fig. 5 reflects the situation when he works overtime on that job; together, the two figures imply that he would choose to reenlist if the normal situation prevailed but would choose to separate if offered overtime all the time. So, the propensity of a reservist to reenlist is likely to relate negatively to how frequently he is offered overtime work on his regular job.[9]

Our uncertainty analysis applies also to unemployment. In terms of the two figures, unemployment means that both civilian job time and earnings are zero; reserve participation provides the person's only carnings when he does not have a civilian job. Our argument in the preceding paragraph implies that a reservist who fears the loss of his civilian job would be more likely to reenlist. In other words, it suggests that a reservist reenlists to provide a hedge against future unemployment.[10]

OTHER DETERMINANTS OF THE REENLISTMENT DECISION

Our model so far describes how the reservist's civilian job may affect his reenlistment decision, but it overlooks the several aspects of reserve participation that set it apart from other second jobs. We must therefore consider the additional factors that are likely to affect the reservist's reenlistment decision.

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^[9] The argument in this paragraph does not depend on a higher wage rate for overtime; higher overtime pay would, of course, reinforce the effect.

^[10] The argument for reserve participation as a hedge against unemployment, which does not require a change in reserve time or pay, is reinforced by a second mechanism. As well as providing a permanent parttime job, reserve participation may also provide a temporary full-time job in the form of a return to active duty to receive additional training or to perform other special duties. The possibility of going on active duty provides another hedge against unemployment.

The Uniqueness of Reserve Participation as a Second Job

Parallels to reserve participation do not come easily to mind. Membership in a volunteer fire department or veteran organizations offers some of the same subjective aspects as reserve participation, but neither provides monetary compensation. At least five aspects of reserve participation set it apart from other second jobs and voluntary activities.

First, reservists must periodically spend full time on the reserve job. This full-time requirement, which often conflicts directly with primary job requirements, involves several aspects of training. Annual training requires 14 days of full-time work during the summer. Reservists who have had no active duty experience must train full time for at least 4 months. Advancement may also involve specialized, fulltime training. Finally, reserve service may require full-time duty during threats to national security and call-ups for civil emergencies.

For reservists employed full time, full-time reserve duty means the interruption of the civilian job and the substitution of military for civilian earnings. This full-time obligation may conflict with the civilian employer's requirements and the reservist's civilian career aspirations. This obligation does not necessarily represent a cost to reservists, however, when it provides full-time employment to unemployed reservists and training useful on civilian jobs.

Second, the reservist must legally commit himself to at least 1 year and up to 6 years of service. In contrast, second jobs in the civilian economy usually do not require an employment contract specifying length of employment. For some reservists, such contracts

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may provide secondary job security; for others, they represent an opportunity cost associated with reserve participation.

Third, reserve participation provides fringe benefits not offered by most second jobs in the civilian economy. Reservists obtain health, life insurance, education, tax, and pension benefits and may qualify for a cost-of-living-adjusted pension at the age of 60 after 20 years of satisfactory service.[11] Current education benefits pay for tuition and fees up to a lifetim3 total of \$1500. Reservists also may use post and service exchanges while on annual training.

Fourth, the reserve job may provide nonpecuniary rewards. The work itself often offers special equipment, training, and environments, as well as a feeling of comraderie and a sense of team accomplishment. Reserve participation seems to provide some of the same kinds of subjective rewards as membership in fraternal or service organizations.

Fifth, the quite inflexible reserve work schedule differs from the schedules of most moonlighting jobs. This inflexibility includes both the number of hours worked and the work schedule. Reservists are paid for either 8 or 16 hours per month, and no opportunity exists for increasing paid hours. These hours are usually scheduled on weekends, and drill attendance is mandatory with little flexibility for alternative work schedules. Annual training requires the interruption of full-time civilian employment with little flexibility to satisfy civilian employer scheduling concerns.

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^[11] A reservist must accumulate 50 points annually to achieve a year of satisfactory service. Reservists get 1 point for each day of annual training and each drill attended. In addition, 15 points are given annually for unit membership. Perfect attendance would merit 77 points. Pension payments are tied directly to total points accumulated.

The Reservist's Personal Situation

12.1

Our model of the reenlistment decision allows us to focus on and understand better some key determinants of the decision. The simplicity of the model, however, forces us to abstract from other important considerations. Here we focus on factors that are not included in our analytic model but that may affect a reservist's reenlistment decision.

The Reserve Military Role. Reserve participation does not provide the same experience for everyone. Reservists have different military jobs; some military jobs are less enjoyable or more dangerous than others. Also, a reserve unit constitutes a complex set of social relationships. Within a unit, reservists not only have different jobs but also different status. Both the nature of the reservist's military job and his status within the unit may affect his subjective satisfaction from participation and so, his propensity to reenlist. We will therefore include variables in our empirical analysis that reflect job context and rank.

<u>Civilian Job Attributes</u>. We portrayed the reservist's civilian job above as a simple exchange of his time for his employer's money. It is, of course, much more than that. His civilian job, like his reserve job, involves nonmonetary aspects that affect his well-being and safety. Some aspects of the reservist's civilian job do, and some do not, affect his reenlistment decision. Such aspects as the extent to which reserve participation conflicts with civilian work schedules, reduces the reservist's promotion potential, and irritates employers are likely to have a significant effect. We have tried to capture the interaction between reservist and employer with an attitudinal variable and civilian employer characteristics.

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<u>Working Spouse</u>. Our simple model focused on the individual reservist, without taking into account the possibility that he may be married and that his spouse may have a job. A spouse's working may affect a reservist's resentistment decision to the extent that it increases family income, requires a redistribution of household responsibilities; and raises the family's marginal tax rate, thereby reducing the reservist's after-tax earnings.

<u>Changes in Situation Since Last Reserve Participation Choice</u>. One fact distinguishes the members of our sample: Each has faced at least one prior reserve participation decision and decided that participation was in his best interest. Each one's decision to participate stemmed from the interactions of his preferences and the circumstances under which he made his last decision, that is, his choice situation. So, the reservists in our sample reflect, in part, the frequency with which different king of choice situations occurred in the past.

The choice situation that confronted a reservist in the more distant past may have differed from the one confronting him in 1978. For some in our sample, the alternative to working in a civilian job and participating in the reserve had been being drafted for active military duty. About 35 perce of our survey respondents had joined the reserve to avoid the draft. So, we must account for draft-motivated individuals among our survey respondents.

Moreover, the reserves its in our sample were from 1 to 6 years removed from their last participation decision. The longer the interval, the more likely the change in their choice situations as a result of outside events. An example is a change of employer. Some

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outside events increase the attractiveness of reserve participation; others diminish it. Analysis cannot tell us whether the cumulative effect of outside even's on the choice situation is positive, neutral, or negative, or whether the absolute size of the cumulative effect increases as the interval lengthens. We know, however, that if there is a cumulative effect, it will change results through its influence on the composition of survey respondents and that we must take its effect into account.

Reservist's Personal and Locational Characteristics. The reservists in our sample differ with respect to age, race, sex, marital status, household size, location of residence, and many other personal characteristics. Such differences may or may not relate to their reenlistment decisions. A difference would be considered relevant if it systematically related either to a reservist's preference for leisure time and money earnings or to unobserved aspects of his choice situations. For example, we argued above that reservists who were more likely to lose their civilian jobs would be more inclined to reenlist. While we cannot observe directly the probability that a reservist is going to lose his civilian job, we can observe personal characteristics that might systematically relate to the probability. This argument suggests that blacks, women, high school dropouts, and members of other groups with high unemployment rates would be more likely to reenlist.

Such clear notions about how most personal and locational characteristic. might affect reenlistment decisions are not available. Economic science can say little about differences due to systematic differences in preferences. We must therefore wait for the empirical analysis in Section IV to tell us whether a particular personal and

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locational characteristic affects reenlistment decisions. We have pinpointed here several elements of the reservist's reenlistment choice set that are likely to be important to his decision. In Section IV we attempt to determine how important each is to his decision. Before we get to that issue, however, we see in Section III how some key elements vary within our sample population.

III. CHARACTERIZATION OF THE RESERVE SAMPLE IN TERMS OF THE FACTORS AFFECTING THE BASIC REENLISTMENT CHOICE

This section characterizes our sample of reservists in terms of both the factors included in our simple model and the other determinants of the reenlistment decision identified in Section II. It should be noted that the members of this sample differed from typical Army selected reservists in that the bonus test included only reservists who had no prior active service, less than 8 years in the reserve, and a reenlistment decision in 1978.

NET RESERVE PAY

A reservist's nominal yearly pay depends on his pay grade, his years of service, his marital status, his unit's number of authorized drills, and the length of his annual training. For example, a married reservist in pay grade E4, with 3 years of service, would have nominally received \$1183 in 1978 if his unit was authorized 48 drills and he attended 14 days of annual training; a reservist in E6 with 6 years of service would have nominally received \$1533. Drill pay represents a little more than 70 percent of gross annual pay; pay for annual training accounts for the rest.

Because a reservist may lose income from his civilian job when he attends annual training, the amount that he actually nets from reserve participation may be much less than his nominal pay. Net reserve pay equals nominal reserve pay only when (1) the reservist's employer allows him leave with full pay to attend annual training, (2) the reservist's employer does not allow leave to attend annual training and reservist must use regular paid vacation time, [1] or (3) the reservist does not

[1] Although employers have a legal obligation to provide military leave for annual training, our survey showed that 9.2 percent of

have a job during the training period. Net reserve earnings are less than nominal reserve pay if the employer allows leave without pay or pays only the difference between the reservist's civilian pay and his military pay.

Figure 6 gives the percentage of survey respondents subject to each kind of employer leave policy. This distribution of leave policy leads to a kind of natural pay experiment in which--other things equal--reservists are divided into three groups having different levels



Fig. 6 -- Distribution of survey respondents by employer leave policy

reservists in the sample did not receive military leave for annual training.

of net pay determined by whether their employer provides full, partial, or no pay for summer training. The difference in net annual pay between full and no civilian pay depends on the civilian wage level, but for typical reservists amounts to over \$500, or roughly 60 percent of average net reserve pay.

Figure 7 shows a distribution of net annual reserve pay.[2] Those making less than \$700, for the most part, earn no civilian pay at



Fig. 7 -- Distribution of survey respondents by net annual reserve pay

[2] The data summarized in Fig. 7 contain an adjustment for differences in the cost of living among areas. This adjustment represents our attempt to express each reservist's net reserve pay in dollars of constant purchasing power so as to come even closer to the notion of net reserve pay used in the analytic section. In fact, all the variables expressed in monetary terms in this study have been adjusted for differences in the cost of living among areas. (See Appendix E.)

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summer camp; those making between \$700 and \$1100 receive partial pay; and those receiving above \$1100 receive full pay.

NET RESERVE TIME

The concept of net reserve time represents the incremental work time that a reservist must put in during a year because he belongs to the Army Reserve or National Guard. It includes, for all reservists, the time devoted to traveling to and participating in monthly drills. For the individuals who must use vacation time to attend annual training or who are unemployed, it also includes summer camp time: If a reservist cannot offset his summer camp time by reducing his civilian job time, his net time cost of reserve participation is larger.

Figure 8 contains a distribution of net reserve time in terms of days per year. More than 70 percent of the reservists providing usable data put in an additional 22 to 26 workdays because they belonged to the Army Reserve or the National Guard; there is relatively little variation among reservists in terms of their net reserve time. Most of the reservists in this bracket (1) belonged to units that held 48 drills per year and (2) received leave to attend annual training; the others belonged to units that held 24 drills per year and were not given leave to attend training or were not employed. The remainder of the reservists were found at the extremes of the distribution. Those devoting less than 16 days per year to reserve participation were in 24-drills-per-year units and received leave to attend summer camp. Those who put in more than 34 days were in 48-drills-per-year units and did not receive leave or did not hold a civilian job.

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Fig. 8 -- Distribution of survey respondents by net reserve time (days per year) spent in reserve activities

CIVILIAN WAGE RATE

Percent

Our model of the reenlistment decision indicates that the wage rate of the reservist's civilian job affects reserve participation. We hypothesized that the higher the reservist's civilian wage, the less likely his reenlistment. Figure 9 shows the distribution of gross (pretax) hourly earnings for employed reservists. While the reservists' 1977 hourly earnings covered a wide range, more than 50 percent earned between \$4.50 and \$7.50, corresponding to annual earnings of \$9,000 to \$15,000.



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Fig. 9 -- Distribution of survey respondents by civilian hourly earnings

Table 3 compares reservists' annual earnings with those of like groups in the U.S. population. Reservists who were employed full time earned somewhat more than the average. The differences are most striking for blacks. The comparisons draw into question the notion of reservists as people with poor earning opportunities in the civilian economy.

Table 3

COMPARISON OF 1977 EARNINGS OF U.S. POPULATION AND SURVEY RESPONDENTS^a

	Mean Earnings	
	U.S. Population ^b	Survey Respondents
Males		
White	\$13,535	\$14,978
	$(120)^{d}$	(137)
Black	10,717	13,617
	(322)	(707)
Females		
White	9,555	9,945
	(74)	(360)
Black	9,178	9,816
	(220)	(564)

SOURCES: U.S. Bureau of the Census, <u>Current Population</u> <u>Reports</u>, Series P-60, No. 118, "Money Income in 1977 of Families and Persons in the United States," U.S. Government Printing Office, Washington, D.C., 1979, Table 48; and tabulation of Rand survey returns.

^aThe U.S. population data, collected in March 1978, include 25- to 29-year old full-time workers; age is defined as age at last birthday. For the survey respondents, age is defined as 1 year less than age at 1978 date of end of term of service.

^bTotal money earnings of year-round, full-time workers.

^CAnnual earnings from primary job of full-time workers. See Appendix C for a description of how this variable is computed.

dNumbers in parentheses represent standard errors.

CIVILIAN JOB TIME

Our model identifies civilian job time as another determinant of the reenlistment decision. Figure 10 provides a distribution of the hours usually worked per week by employed reservists. More than half of the employed reservists worked around 40 hours a week, and only a small

fraction worked less than 38 hours a week. About 30 percent worked from 43 to 52 hours a week; a little over 10 percent of the survey population put in longer hours.

FREQUENCY OF OVERTIME

We saw above that reservists might have to make reenlistment decisions in the face of uncertainty about some aspects of their civilian jobs. An important job-related uncertainty involves the availability of overtime work. Table 4 indicates that three-quarters of the reservists were certain about the availability to them of overtime; for them either it was available every week or it was never available.



Fig. 10 -- Distribution of survey respondents by hours worked per week in civilian job

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Table 4

AVAILABILITY OF OVERTIME AS PERCEIVED BY RESPONDENTS^a

Frequency	Percentage	
Every week	32.1	
Every two weeks	7.5	
Every month	7.3	
Every two months	11.1	
Never	41.9	

^aSurveys with necessary information: 90.9 percent.

Another quarter of the respondents, in making their reenlistment decision, had to deal with some uncortainty about how frequently they would be offered overtime work.

RESERVE ROLE

 Whether or not a reservist likes his reserve job affects the probability of his reenlisting. Two aspects of the reservist's military job are considered in this study: the nature of the job--32 percent of those surveyed had combat jobs; and the reservist's pay grade--four out of five of those providing useful surveys were E4s or E5s (see Table 5).

EMPLOYER'S ATTITUDE

We noted above the employer's attitude toward reserve participation as a qualitative aspect of the reservist's civilian job. Although this factor may be important to the reservist's reenlistment decision, it

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Table 5

PERCENTAGE OF RESERVISTS IN EACH PAY GRADE

Pay Grade	Percentage
E3 and below	4.4
E4 E5	36.2 46.4
E6 and above	13.0

could not be included in our simple model. Table 6 shows that about 45 percent of the reservists who responded saw their employers' attitude as positive; only 19 percent saw their employers' attitude as negative.

Table 6

EMPLOYERS' ATTITUDES TOWARD RESERVE PARTICIPATION AS PERCEIVED BY RESERVISTS

Percentage	
20.7	
24.2	
36.4	
12.7	
6.3	

WORKING SPOUSE

A working spouse may affect the reservist's reenlistment decision, on the one hand, by providing additional family income, and on the other hand, by creating a situation in which the reservist may have to devote more time to home activities. As can be seen from Table 7, slightly more than half the currently married reservists who answered the appropriate question had a working spouse.

PERSONAL CHARACTERISTICS

Personal characteristics can serve as proxy variables for missing economic variables and personnel taste. One such characteristic is age. Table 8 shows the age distribution of the survey respondents at the end of their term in 1978. Some 84 percent of the respondents were between 24 and 31 years old; almost two-thirds were between 24 and 27 years old. Because the survey focused on a narrow cross section of reservists, the results presented in Section IV cannot be generalized to other groups of

Table 7

EMPLOYMENT STATUS OF SPOUSE OF CURKENTLY MARRIED RESERVISTS^a

Employment Status	Percentage	
Working full time	39.8	
Working part time	13.0	
Not working	48.2	

^aSurveys with necessary information: 88.7 percent

Table 8

AGE OF SURVEY RESPONDENTS AT 1978 END OF TERM OF SERVICE

Age	Percentage	
20 to 23	7.8	
24 to 27	63.6	
28 to 31	21.2	
32 to 35	3.7	
36 to 39	2.6	
40 and over	1.1	

reservists; they do not necessarily hold for either younger, less experienced reservists or older, more experienced ones.

The demographic characteristics of the sample (see Table 9) show a high proportion of married reservists and a relatively low percentage of women and blacks. However, almost all of our sample of reenlistees entered the reserve prior to 1975; since then, the proportion of both

Table 9

INDIVIDUAL CHARACTERISTICS OF SURVEY RESPONDENTS

Characteristic	Percentage	
Black	6	
Female	11	
Currently married	75	
Not a high-school graduate	11	
College graduate	21	

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women and blacks has risen. The high proportion of college graduates in the enlisted ranks--nearly one-third--represents young men who enlisted in the reserve to escape active duty in 1972, the last year of the draft.[3]

[3] Over three-fourths of 1972 enlistees had low lottery numbers, indicating probable draft motivation. See the lottery analysis, Appendix E, in David W. Grissmer, Zahava D. Doering, and Jane Sachar, <u>The Design, Administration, and Evaluation of the 1978 Selected Reserve</u> <u>Reenlistment Bonus Test</u>, The Rand Corporation, R-2865-MRAL, July 1982.

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IV. A MODEL OF THE ARMY NATIONAL GUARD REENLISTMENT DECISION

This section presents a statistical model of the reservist's reenlistment decision that will enable us to predict the probability of reenlistment. The model will be used to estimate the relative importance of the characteristics described in Section II and to derive parameters that can predict the effect of policy changes on reenlistment rates.

The statistical model uses 2867 survey responses collected from National Guard personnel in the control areas of the 1978 Selected Reserve Renelistment Bonus Test. Our reenlistment model was estimated on this sample rather than on the entire experimental sample because statistical comparisons of the populations returning and not returning surveys showed significant bias in the total sample but none in the Guard sample.[1] These statistical tests thus removed to a great extent problems often associated with estimates using survey data--namely, explicit bias due to survey nonresponse or an unknown bias due to lack of data for comparison between respondents and nonrespondents.[2]

[2] While the use of only the Guard/Control survey responses avoided survey response bias problems, it meant accepting two limitations on the analysis of the survey data. First, it precluded estimating with the survey data alone the effects of the bonus availability and of reserve component on reenlistment decisions. Second, it forced us to consider only the reenlistment decision and not the length of term chosen; without the incentive of a bonus to reenlist for a longer period, most guardsmen simply extended for one more year. These two questions were analyzed, however, using the administrative and

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^[1] These statistical comparisons were made possible by linking social security numbers given on survey forms with those on the enlisted parsonnel records of all reservists in the original experimental sample. We could thus determine who did and who did not return a survey. Appendix D contains an analysis of bias introduced by the failure to respond to the survey for the full experimental sample. Comparisons of the reenlistment model estimated on the total experimental population and the National Guard control population are also presented.

DEFINING AND ESTIMATING THE MODEL

The decision to reenlist in the reserve is defined by a dichotomous variable assuming the value of one for reenlistment and zero for separation. The conditional logistic regression (logit) model is an appropriate choice for the functional form since it restricts the value of the dependent variable to zero and one. This model relates the reenlistment decision of the ith individual, Y, to a vector of characteristics for that individual, x_i . The assumed relationship is:

$$Y_i = p(x_i) + \varepsilon_i$$
,

where

$$p(x_{i}) = P[Y_{i} = 1 | x_{i}] = \frac{1}{1 + e^{-(\beta_{0} + \beta_{1}x_{i1} + \beta_{2}x_{i2} + \dots + \beta_{k}x_{ik})}$$

k denotes the number of characteristics measured for individual i, and β_0 , β_1 . . ., β_k are the parameters of the model to be estimated.

The model was estimated using both maximum likelihood estimators (MLE) and the discriminant function technique. The two methods yielded essentially the same estimates. The MLE estimates are presented here.

Table 10 describes the variables [3] used in the model and Table 11

personnel data collected in the experiment. See David W. Grissmer, Zahava D. Doering, and Jane Sachar, <u>The Design</u>, <u>Administration</u>, <u>and</u> <u>Evaluation of the 1978 Selected Reserve Reenlistment Bonus Test</u>, The Rand Corporation, R-2865-MRAL, July 1982.

[3] Appendix E contains the variable definitions from the survey questions. Missing data were handled by assigning a dummy indicator variable that assumes a value of one for missing data and of zero for available data (see Appendix F).

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Table 10

DEFINITIONS OF MODEL VARIABLES

	Reserve Pay and Time
Annual act drill and camp pay (ANDSCP) Not reserve time (NRT)	Annual act reserve pay adjusted to cost of living Net annual reserve time
	Reserve Experience
Pay grade E3 or below (PG3) Pay grade E5 (PG5) Pay grade E6 (PG6) Pay grade E7 or above (PG7) Combat job (COMMUS) Years of pervice (YOS)	Indicator variable = 1 when pay grade is E1 to E3 = 1 when pay grade is E5 = 1 when pay grade is E5 = 1 when pay grade is E7 or above = 1 for combat military occupational specialty (NOS) Total years of service in Army Reserve or Maticual Guard
	Alod Reperve Freiurences
Draft motivation (IEA) Prior reenlistment (PA)	<pre>= 1 if reservist enlisted to avoid draft = 1 if reservist had previously recalisted at least once</pre>
Ci	villen Work Environment
Free time (FT) Civilian hourly wage (CANR) Availability of paid overtime (WFOA) Must use vacation (ESCP) Employer's attitude (IA) Federal government employment (FG) State/local government employment (SG) Middle-sized-firm employment (NSPR) Small-firm employment (SPR) Self-employed (SE) Spouse's annual sarnings (SAE)	Reservist's leigure time Civilian hourly wage rate adjusted to cost of living Number of weaks per year reservist can earn overtime = 1 when employer does not allow military leave for annual training Percaived employer attitude toward reserve job on scale of 1 (least negative) to 5 (most negative) = 1 when reservist is employed by U.S. government = 1 when reservist is employed by state or local government = 1 when reservist is employed by firm of 100 to 500 employees = 1 when reservist is employed by firm of less them 100 employees = 1 when reservist is self-employed Earnings of spouse in 1977 Wridual Characteristics
Jex (SEX) Race (ALACE) Rage (AGE) Married (NS) Monber in household (NIH) Not high-school greduate (NHSD) College greduate (CG) Reg fiddle-sized urben area (NC) Small urben area (SC) bural area (NU) Suburban area (SUB) 1978/1977 local inflation factor (RIF)	 1 if reservist is female 1 if reservist is black Age of reservist is black Age of reservist is married Number of people in reservist's household 1 if reservist did not graduate from high school 1 if reservist graduated from college gional Characteristics 1 when reservist lives in city of 50,000 to 250,000 1 when reservist lives in city of lass than 50,000 1 when reservist lives in suburb of large city Ratio of 1978 to 1977 local inflation factor

Table COEFFICIENTS OF THE REENL	11	
COEFFICIENTS OF THE REENL	TOTALT REALENS	
	TATURAL DECISION MODE	SL.
Variables	Coefficient	t-Ratio
Reserve pay and time		
Annual net drill and camp pay	0.230×10^{-3}	1.66
Net reserve time	-0.470×10^{-3}	-0.04
Aserve experience		
Pay grade E3 or below	-0.561	-2.45
Pay grade E5	0.708	7.22
Pay grade E6	0.113×10	6.88
Pay grade 5/ or above	0.293×10	2.72
Years of service	-0.341	-3.70
		-3,43
Revealed reserve preference	-0 607	4 76
Prior reenligtment	-0.879	7.05
CJV111an Work environment	0 092 - 1072	2.05
Civilian hourly wage	-0.753×10^{-1}	-3.69
Availability of paid overtime	-0.441×10^{-2}	-2.08
Must use vacation	-0.301	-1.28
Employer's attitude	-0.249	-5.90
Federal government employment	-0.601×10^{-1}	-0.23
State/local government employment	0.307	1.59
Middle-sized-firm employment	0.862×10^{-1}	0.61
Small-firm employment	0.204	1.73
Sell-employed Shouge's annual servings	-0.247 -0.882 x 10 ⁻⁵	-1.01
Spude a summer carmings		-0.07
Individual characteristics	0 600	0 0 7
Bace: black	0.070 0.109 y 10	2.J/ \$ 00
	0.655×10^{-1}	4.77
Married	-0.851×10^{-2}	-0.07
Number in household	0.576×10^{-1}	1.54
Not high-school graduate	0.207	0.51
College graduate	-0.499	-3.74
Regional characteristics		
Middle-sized urban area	-0.708×10^{-1}	-0.46
Small urban area	-0.109	-0.69
Rural area	-0.851×10^{-1}	-0.52
Suburban area	0.107	0.72
TAIQITALL TOCAT INITATION LACTOL	0.125 x 10	0.32

Table 11

CONTINUED

Variables	Coefficient	t-Ratio
Missing value indicator		
variables (MVIV)		
Annual net drill and camp pay	-0.206	-0.83
Net reserve time	0.387	0.58
Draft motivation	-0.209	-0.26
Prior reenlistment	0.281	0.33
Free time	0.885	1.89
Civilian hourly wage	-0.557	-2.64
Availability of paid overtime	-0.384	-1.65
Must use vacation	-0.152	-0.52
Employer's attitude	-0.976	-3.30
Kind of employer	0.761	2.89
Spouse's income	-0.335	-1.73
Married	-0.202	1.98
Number in household	-0.202	-1.14
Education	-0.329	-1.59
Residential area	0.101	0.17
Intercept	-0.272 x 10	-0.75
Number of observations	2876	
Chi-squared	780.53	

the results of the model estimation. We now briefly describe the overall results and then discuss in more detail the results for each variable.

The coefficients of the model were usually consistent with the expectations of moonlighting labor market theory. In particular, other things equal, reenlistment rates tended to rise with net reserve income and to fall with higher civilian hourly wage rates and longer civilian hours. Mcreover, the coefficients of the variables associated with the civilian job wages and hours worked were all significant at the 5 percent level of confidence or lower, and the reserve income variable was significant at the 10 percent level. The estimated model provides important verification of the hypothesis that reservists behave somewhat similarly to civilian moonlighters in their consideration of factors important in the second job decision.

The results also showed consistency with expectation on variables associated with military characteristics, experience, and taste. Other things equal, reenlistment rates rose with higher pay grades and fell with combat military occupation specialties. All coefficients associated with the pay grade and occupational specialty variables were significant at the 2 percent level of confidence or better. Two highly significant variables (.1 percent level) measured taste for reserve participation through the circumstances of previous reserve participation decisions. As expected, reservists who held low lottery numbers at enlistment reenlisted at significantly lower than average rates, while those who had already reenlisted once reenlisted at higher than average rates.

The effect of demographic factors also generally followed expectations. Reservists with uncertain or poor future labor market prospects generally reenlisted at higher rates. Thus, other things equal, females, blacks, and less educated individuals reenlisted more frequently than their counterparts. These coefficients were significant at better than a 1 percent level, except for the sex variable, which was significant at the 5 percent level. Other things equal, being married did not affect participation, but reservists from larger families had somewhat higher reenlistment rates. Finally, other things equal, older

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reservists reenlisted at a significantly higher rate than younger reservists.

The most significant variable associated with employer and job characteristics was the attitude of the reservist's employer toward reserve participation. Once this attitude and other job characteristics (wage, hours worked, overtime, etc.) were controlled, retention rates depended only weakly on the type of employer. Retention rates were slightly higher for reservists working for small private employers and state or local governments. Self-employed reservists reenlisted at lower rates.

Other things equal (including cost-of-living differences), the size of the community in which the reservists lived did not significantly affect the reenlistment decision. All variables reflecting the community size were statistically insignificant.

ANALYZING THE RESULTS

We turn next to the responsiveness of reenlistment rates to changes in demographic, economic, and reserve policy variables. In calculating responsiveness, we treat the dependent variable as continuous[4] and the independent variables as either continuous or dichotomous. When the independent variable can change continuously, we use an elasticity measure, an elasticity being the proportional change in the independent

^[4] The more rigorous method of calculating changes in the dependent variable resulting from changes in the independent variable for dichotomous logit estimation is to estimate the average reenlistment probabilities across the sample under two values of a particular independent variable. This procedure is expensive when the sample and the number of respondent variables to be evaluated are large. We have used an approximation that is accurate as long as the value of the dependent variable is between .2 and .8. Since the average reenlistment rate is .5 for our survey sample, the approximation is adequate for this model.

variable divided by the proportional change in the dependent variable. We use the slightly different but parallel concept of proportional change to deal with dichotomous conditions. A proportional change associated with a zero/one variable is defined as the change in the dependent variable resulting from the change from zero to one divided by the mean value of the dependent variable.

For the continuous independent variable, elasticity is calculated as

$$\frac{\overline{D}}{\overline{D}}$$
, $\overline{\overline{D}}$,

and for the zero/one independent variable, proportional change is calculated as

where

 $\frac{\partial D}{\partial I}$ is the instantaneous rate of change in the dependent variable, D, with respect to the independent variable, I

- ΔD is the change in the dependent variable associated with a change in status
- **D** is the mean value of the dependent variable for the experimental population
- is the mean value of an independent variable for the appropriate survey population.

Reserve Pay and Time Requirements

The analysis in Section II suggested that net reserve pay and net reserve time play a key role in a reservist's reenlistment decision. But, gross reserve pay and total reserve time are set through public policy, and while they are important determinants of net pay and net time, respectively, they are not the only determinants. After reviewing the effects of changes in net reserve pay and time costs, we relate the net changes to gross changes.

<u>Annual Net Drill and Camp Pay</u>. The possibility of estimating a reserve pay elasticity had been a major reason for collecting survey data during the experiment. In Table 12, we find the elasticity of the reenlistment rate with respect to net reserve pay to be 0.12. In other words, higher annual net drill and summer camp pay had a positive but small impact on reenlistments.

Table 12

ELASTICITIES OF THE REENLISTMENT RATE WITH REGARD TO NET RESERVE PAY AND TIME COSTS (Guard/Control Sample)

	Elasticity ^a
Annual net drill and training pay (pay grade unchanged)	ь 0.12
Net reserve time	-0.01

^aElasticities are evaluated at the mean reenlistment rate.

^bEased on a coefficient significant at less than the 10 percent level.

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For the policymaker setting gross pay levels, our results may be expressed in terms of a gross pay elasticity by simply substituting average gross pay for average net pay in the elasticity expression. [5] The average annual net drill and camp pay for the individuals in our sample was \$871; average gross drill and summer camp pay was \$1300. Therefore, the elasticity of the reenlistment rate with respect to gross annual drill and summer camp pay is 0.18.

Reservists did not appear to be very responsive to increases in reserve pay, in part because reserve income constituted a quite small

[5] To show why we can substitute gross pay for net annual pay, we define the relevant expressions below. Let

- R stand for the reenlistment rate
- N stand for mean net annual reserve pay (N \equiv G L*)
- G stand for mean gross annual pay
- L* stand for mean lost income from civilian job (assumed constant)

 $\frac{d\mathbf{R}}{d\mathbf{G}} = \frac{\mathbf{G}}{\mathbf{R}}$ stand for elasticity of the reenlistment rate with respect $\frac{d\mathbf{R}}{d\mathbf{G}} = \frac{\mathbf{R}}{\mathbf{R}}$ to average gross annual reserve pay

 $\frac{dR}{dN}\frac{N}{R}$ stand for elasticity of the reenlistment rate with respect to average net annual reserve pay.

Now, noting that dN = dG since L* is constant,

 $\frac{d\mathbf{R}}{d\mathbf{N}}\frac{\mathbf{N}}{\mathbf{R}} \equiv \frac{d\mathbf{R}}{d\mathbf{G}}\frac{\mathbf{N}}{\mathbf{R}} \equiv \frac{d\mathbf{R}}{d\mathbf{G}}\frac{\mathbf{G}}{\mathbf{R}}\frac{\mathbf{N}}{\mathbf{G}} ,$

which implies for elasticities evaluated as sample means that

$$\frac{d\mathbf{R}}{d\mathbf{G}}\frac{\mathbf{G}}{\mathbf{R}} = \left(\frac{d\mathbf{R}}{d\mathbf{N}}\frac{\mathbf{N}}{\mathbf{R}}\right)\frac{\mathbf{G}}{\mathbf{N}} \ .$$

proportion of their income. For the typical reservist in our sample, the net annual after-tax reserve income represented only 7 percent of total annual after-tax income. Our analysis shows that a 25 percent increase in reserve pay would raise total family income by 2 percent and that reenlistment rates would change from 38.4 to 40.1 percent. Clearly, large changes in reserve pay would be required to markedly affect both family income and retention rates.

While reserve income is a small component of total family income, the time and other potential costs of reserve participation may at times seriously conflict with civilian job and/or family activities. For reservists with such conflicts, small increases in reserve pay are unlikely to alter a decision not to reenlist. Since such conflicts constitute the most frequently cited reasons for leaving the reserve (see Table 13), a small pay elasticity is not surprising.

<u>Net Reserve Time</u>. Our discussion of the reenlistment decision in Section II suggests that we must consider not only the pay earned by attending monthly drills and summer camp but also the time costs of attending. Just as we noted above the incremental increase in a reservist's income resulting from his participation, we note here the incremental time resulting from participation. Based on survey data (see Table 12, above), we estimated net reserve time elasticity at -0.01, indicating that differences in net reserve time had a negative but negligible effect on reenlistment. The absence of a strong effect, however, may be due to the small degree of variation in the sample.

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Table 13

REASONS FOR LEAVING GIVEN BY SEPARATING RESERVISTS RETURNING 1978 BONUS TEST SURVEYS

Reason	Percentage
Conflict with family on leisure time	31.6
Conflict with civilian job	30.8
General dislike of military	11.4
Dislike of unit's training practice	7.1
Not eligible for 1978 reenlistment bonus	4.5
Moving to take a new job	2.9
Insufficient pay	2.0
Disagreement with personnel and pay policies	1.9
Job transfer	1,9
Distance to reserve unit	1.7
Conflict with education	1.7
Fear of call-up or mobilization	.8
Extra income not needed	.6
Health	.6
Not eligible to reenlist	.5

The Reserve Role

As we pointed out in Section II, how much a reservist enjoys participating in the reserve may hinge on his military job, his status in his unit, and other factors. Here we look at how differences in nonmonetary aspects of participation affect the propensity to reenlist. The lack of data limited our ability to examine all of the ways in which differences in the qualitative aspects of participation affect reservists' reenlistment decisions. Our analysis focuses on only two aspects: rank and type of military job.

<u>Pay Grade</u>.[6] According to Table 14, reservists with higher rank showed a much greater propensity to reenlist. Moreover, this result is

^[6] A statistical test (described in Appendix G) indicated that a reservist's pay grade has a strong effect on his reenlistment decisions-an effect that extends beyond the increase in net reserve pay. We therefore included the pay grade variables in our base equation.

statistically highly significant. We must interpret this result carefully, however, because it is not clear that a simple, causal relationship runs directly from pay grade to reenlistment probability. A reservist who greatly enjoys reserve participation, for example, may put more effort into reserve activities and so be promoted more rapidly. In this case, he might reenlist only because he enjoys participating, but we would observe a positive association between rank and reenlistment. Furthermore, reservists who have decided early in their term not to reenlist for reasons other than promotion opportunity may not work for promotion, or the unit commander may not consider them for promotion.

Table 14

PROPORTIONAL CHANGES^a IN THE REENLISTMENT RATE RESULTING FROM CHANGES IN RESERVE ROLE (Guard/Control Sample)

Role Change	Proportional Change
Promotion from E4 to E5	0.45 ^b
Promotion from E5 to E6	0.29 ^b
Change from combat to non- combat MOS	0.21 ^b

^aThe proportional change is defined as the change in the reenlistment rate due to the change in role, ΔR , divided by a mean reenlistment rate, R, that is, $\Delta R/R$. It is evaluated at the mean reenlistment rate for the experimental population's Guard/Control subsample.

^bBased on a coefficient that is significant at less than the 1 percent level.

Thus, a proportional increase in promotion opportunity would not necessarily achieve as high a retention response as indicated here. For this reason, increasing the number of higher pay grades in a unit may not increase reenlistments as much as our estimates would suggest. Nevertheless, even though part of the measured impact of promotion may be attributable to other factors, promotion ranks high among variables that influence retention.

<u>Combat vs. Noncombat Jobs</u>. The last result in Table 14 says that reservists with noncombat jobs are more likely to reenlist than those with combat jobs. Our survey data did not permit us to discover what aspects of combat jobs discourage reenlistments. Among the explanations may be the nontransferability of the training, the smaller opportunity for promotion since the grade structure for combat units is lower than that for most other reserve units, and finally, the greater risk inherent in the combat job.

The Civilian Job

A reservist's decision to reenlist is directly related to his civilian job. As we saw in Section II, his primary job in the civilian economy interacts with his commitment to the National Guard in a number of ways. We first deal with those explicitly set cut in the simple decision analysis of Section II: the reservist's civilian wage rate and hours worked. We then introduce uncertainty about the frequency of future overtime into the discussion. Finally, we look at some qualitative characteristics of the civilian job.

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Table 15 suggests how variations in wage rates and hours worked alter reenlistment propensities.

The Civilian Wage Rate. This variable represents the reservist's hourly wage rate in 1977; it has been adjurted (see Appendix E) to take into account regional differences in the cost of living so that the wage rates reflect dollars with the same purchasing power. Our empirical results suggest that the higher the reservist's civilian wage rate, the less likely he is to reenlist, thus confirming the conclusions from our analysis of the reservist's reenlistment decision in Section II. The effect of higher wage rates was small, however; an elasticity of -0.21 means that a 25 percent increase in the real wage rate would lower the average propensity to reenlist by only 2 percentage points.

<u>Hours Worked per Week</u>. This variable reflects the number of hours that a reservist usually works on his civilian job. We theorized in

Table 15

REENLISTMENT RATE ELASTICITIES^a WITH RESPECT TO CIVILIAN WAGE RATES AND HOURS WORKED (Guard/Control Sample)

	Clasticity
Civilian wage rate	-0.21 ^b
Hours worked per week	-0.26 ^b

^aElasticities are evaluated at the mean reenlistment rate for the experimental population's Guard/Control subsample and at the means of the Guard/Control survey population.

^DBased on a coefficient significant at less than the 1 percent level.

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Section II that the more time an individual worked on his regular civilian job, the less likely he would be to participate in the reserve. Our empirical results support this contention, but again the impact is small; a 20 percent increase in hours worked per week would depress the propensity to reenlist by only 2 percentage points.

Uncertainty about the Availability of Paid Overtime. The variable describing the availability of paid overtime reflects the reservist's estimate of the number of weeks per year that he can make extra money by working overtime; it can take on values ranging from 0 to 52. The more frequently a reservist can work overtime for pay, the more frequently earning extra zoney and fulfilling his reserve commitment conflict. In terms of forgone income, the cost of continued reserve participation may be much higher for a reservist who can work overtime frequently than for one who can never work overtime. Our empirical result, given in Table 16, suggests that the availability of paid overtime has a negative but small impact on a reservist's propensity to reenlist, again confirming the direction of the effect predicted in Section II.

<u>Kind of Employer</u>. Table 17 summarizes statistical conclusions about how the kind of employer affects reenl'stments. These results should be interpreted with care. They are estimates of differential effects relative to a large private firm, and they reflect residual effects of different kinds of employment after the effects of the other variables discussed in this section have been accounted for. These results thus reflect unobserved factors that vary systematically with the kind of employer; scheduling flexibility and longer summer vacations are examples.

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Table 16

ELASTICITY^a OF THE REENLISTMENT RATE WITH RESPECT TO FREQUENCY OF OVERTIME (Guard/Control Sample)

	Elasticity
Weeks of paid overtime available	
per year	-0.06 ^b
^a Elasticities are evaluated at	the mean

reenlistment rate for the experimental population's Guard/Control subsample and at the means of the Guard/Control survey population.

^bBased on a coefficient significant at less than the 5 percent level.

Table 17

PROPORTIONAL CHANGES^a IN THE REENLISTMENT RATE ASSOCIATED WITH DIFFERENT KINDS OF EMPLOYERS (Guard/Control Sample)

	Proportional Change
Change from private firm with over 500 employees to:	
Middle-sized firm (109 to 500 employees)	0.05
Small firm (less than 100 employees) Self-employed Federal government State and local government	0.12 ^b -0.15 -0.04 0.19

^aThe proportional change is defined as the change in the reenlistment resulting from the difference in indicated preference. ΔR , divided by a mean reenlistment rate, R, that is, $\Delta R/R$. It is evaluated at the mean reenlistment rate for the experimental population's Guard/Control subsample.

^bBased on a coefficient that is significant at the 10 percent level.

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Our results suggest that employees of small private firms and of state and local governments may be more likely to reenlist than employees of large private firms. The result for small private firms must be qualified by our discussion below of the relationship between small firm size and employer's negative attitude toward reserve participation; it says that a reservist employed by a small firm is more likely to reenlist than one employed by large firms, providing that the two firms had the same attitude towards reserve participation. The result for state and local governments may reflect the effect of the long summer vacations enjoyed by teachers; long summer vacations make summer camp attendance easier. Self-employed individuals may be less likely to reenlist than individuals employed by large private firms. There appears to be little difference in the propensity to reenlist between reservists employed by middle-sized private firms or by the federal government and those employed by large private firms.

<u>Employer's Attitude</u>. The survey questioned each reservist on his employer's attitude toward his reserve participation. The reservist was asked to assign one of five rankings ranging from "very favorable" (1) to "very unfavorable" (5). Because the responses to this survey item reflect reservists' subjective impressions, we must use the responses with care. We do not know, for example, how reservists interpreted the survey item-one might view an employer's behavior as reflecting a favorable attitude while another might interpret the same behavior as reflecting an unfavorable attitude.

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A reservist who sees his employer's attitude toward his reserve participation as positive is more likely to reenlist than a reservist who sees his employer's attitude as negative. This result is clear from Table 11 (above) when we recognize that more negative perceptions have higher index values.[7] So, the issue is not whether a reservist's perception of his employer's attitude influences his reenlistment decision but how this result should be interpreted. We find a strong relationship even though we are accounting for most important objective job characteristics, including the employer's annual training leave policy. What remains are less tangible considerations like the willingness of the reservist's immediate supervisor to accommodate participation by permitting some flexibility in work hours and the effect of continued participation on the reservist's chances for promotion. Thus, we may interpret reservists' responses to this item as reflecting their perceptions of such considerations.

Employer's Annual Training Leave Policy. This variable indicates whother the reservist's employer requires vacation time be used to attend summer camp. Although the forced use of vacation time is illegal, 9 percent of the survey respondents indicated that they had to use vacation time. Our results indicate that when reservists had to use their own vacation time to attend summer camp, the proportional change in the reenlistment rate was -0.07; this result, however, is not statistically significant.

[7] Employer's attitude was not included in Table 17 since the meaning of an elasticity is not clear when the independent variable is ordinal and subjective.

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At some point in the past, everyone in our sample decided to join the National Guard. The decision to join implies that the circumstances under which the choice was made--as well as the tastes for money and leisure time--were such that participation in the National Guard was in the best interest of each when he made the decision. As time goes on, however, the circumstances surrounding the original enlistment decision may change considerably. Three variables characterize previous decisions: initial enlistment alternative, previous reenlistment, and years of service.

Initial Enlistment Alternative: Civilian vs. Military Life. The aspe t of a reservist's choice situation that perhaps changes the most over time is the nature of the alternative to military participation. Many in our National Guard sample first enlisted in 1972, the last year of the draft, and faced a first-term reenlistment decision in 1978. Thirty-eight percent of the guardsmen in our sample had joined the National Guard to avoid being drafted for active duty; the remainder of the sample could have remained civilians. As they faced reenlistment decisions 6 years later, however, all had the option of returning to civilian life. So, other things equal more of the guardsmen who faced an active duty alternative when they made their last participation decision could be expected to drop out. Our empirical results are consistent with this notion. The proportional change given in Table 18 for the active-duty alternative suggests that many individuals who preferred National Guard participation when the alternative was active military duty no longer preferred participation when the alternative was civilian life.

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Table 18

PROPORTIONAL CHANGES^a AND ELASTICITY^b OF THE REENLISTMENT RATE WITH RESPECT TO LAST DECISION VARIABLES (Guard/Control Sample)

Comparison	Proportional Change
Original enlistment alternative: civilian life vs. active duty	-0.38 ^C
Last decision: reenlistment vs. enlistment	0.55 ^C
Variable	Elasticity
Years of service	-0.32 ^C

^aThe proportional change is defined as the change in the reenlistment rate due to the change in role, ΔR , divided by a mean reenlistment rate, R, that is, $\Delta R/R$. It is evaluated at the mean reenlistment rate of the experimental population's Guard/Control subsample.

^bElasticities are evaluated at the mean reenlistment rate of the experimental population's Guard/Control subsample and at the means of the Guard/Control survey population.

^CBased on a coefficient that is significant at less than the 1 percent level.

<u>First-Term or Subsequent Reenlistment</u>. The guardsmen in our sample differed in the number of previous reenlistment decisions made. Many were completing an initial 3- or 6-year enlistment and were facing a first-term reenlistment decision; others had reenlisted at least once. Reenlistment rates generally rise with the number of reenlistment decisions made. Self-selection explains part of this phenomenon. Enlistees enter the reserve uncertain about their taste for military service. During the first term, the taste for service is formed through experience. Those who dislike military service leave at the first reenlistment opportunity. Those who remain generally have a greater taste for military service. Thus, other things equal, second-term reservists reenlist at higher rates than first-term reservists. Table 18 shows a significantly lower retention rate for first-term reenlistment decisions than for subsequent decisions.

Years of Service. For reservists past their first term, retention rates usually rise with years of service (YOS) up to 20 years. This phenomenon reflects, in addition to self-selection, the pull of the reserve retirement system. The system provides full vesting after 20 years of satisfactory service. Although benefits are not paid until the reservist reaches the age of 60, the value of the pension is substantial relative to the reserve income base. The pull of the system affects first-term reservists least and those with 19 years of service most. Based on these considerations, one would expect higher retention with more years of service.

Another factor--namely, the number of years since the last participation decision--may work in the other direction. Guardsmen in the sample differed as to the number of years since they last faced a decision about reserve participation. First termers in the group had enlisted for 3 or 6 years; others had already reenlisted for a 1-year term. The elements affecting a reservist's choice change, and they change more as the interval since the last decision increases. A situation that led to a positive participation decision 6 years earlier is likely to have changed more than a situation that led to a positive

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participation decision only a year earlier. One cannot say beforehand, however, whether the cumulative effect of changes over time increases, decreases, or leaves unchanged a person's propensity to reenlist.

The negative sign of the estimated coefficient on the years of service variable implies that for the first termers in this sample, changes in choice situation since the last decision were cumulative and discouraged reenlistment. In ordinary terms, this simply means that events such as marriage, the birth of children, or job changes, more of which are likely to take place in 6 years than in 3 years, tend to lower retention rates for 6-year enlistees.

RESERVISTS' PERSONAL CHARACTERISTICS

Our findings regarding the links between reservists' characteristics and their propensity to reenlist is summarized in Table 19. The findings support two major conclusions. First, the older a reservist is when he reaches the reenlistment decision point, the more likely he is to reenlist. Second, women, blacks, and the less educated reenlist at higher rates.

Two key changes that occur as a reservist gets older help to explain his increasing propensity to reenlist. First, a reservist who accumulates 20 years of satisfactory service can start to draw a pension when he reaches 60. The older a reservist is when he comes up for reenlistment, the larger these pension benefits are likely to loom in his decision. Second, an older reservist probably has a more stable civilian life and is less likely to experience the major problems that discourage continued participation. Many reservists in the bonus experiment joined the reserve in their late teens or early 20s. Major changes such as taking a new job, getting married, and becoming a parent

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Table 19

ELASTICITIES^a AND PROPORTIONAL CHANGES^b OF THE REENLISTMENT RATE WITH RESPECT TO INDIVIDUAL CHARACTERISTICS (Guard/Control)

Variable	Elasticity
Age	1.10 ^C
Number in household	0.11
Spouse's annual earnings	-0.01
Comparisons	Proportional Change
Sex: female/male	0.43 ^d
Race: black/other ^e	0.68 ^d
Marital status: married/other ^f	-0.01
Not a high-school graduate/ high-school graduate	0.13
College graduate/not a college graduate	-0.31 ^d

^aElasticities are evaluated at the mean reenlistment rate of the experimental population's Guard/Control subsample and at the means of the Guard/Control survey population.

^bThe proportional change is defined as the change in the reenlistment rate due to the change in role, ΔR , divided by a mean reenlistment rate, R, that is, $\Delta R/R$. It is evaluated at the mean reenlistment rate of the experimental population's Guard/Control subsample.

^CBased on a coefficient that is significant at less than the 1 percent level.

d Based on a coefficient that is significant at less than the 5 percent level.

e"Other" includes whites.

f"Other" includes single, separated, divorced, and widowed.

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that occur frequently in the lives of men and women in their early and mid-20s make continued participation difficult. These changes occur less often as reservists grow older.

This relationship between age and reenlistment rates requires a major qualification since, as we said earlier, our survey sample reflected a very narrow age range; most of the individuals in our sample are in their middle and late 20s. Our results should be seen as reflecting only the behavior of reservists in that age range.

Table 19 shows also that women, blacks, and the less well educated tend to reenlist at higher rates. In Section II, we indicated that reserve participation may be seen as a way of hedging against future unemployment or poor economic prospects. Women, blacks, and the less well educated have the poorest economic prospects in our society. Our coefficient estimates for these variables suggest that reserve service may provide a hedge against future adverse job market contingencies and that a reservist may be more likely to reenlist if he sees his civilian economic prospects as uncertain.

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V. CONCLUSION

FINDINGS OF THE STUDY

A simple model of the reservist's reenlistment decision based on moonlighting labor market theory was presented in Section II. This model pointed to five variables that influence the reenlistment decision: net reserve pay, net required days of reserve service, civilian wage rate, number of hours worked on the civilian job, and frequency of overtime opportunities on the civilian job. The theory predicted that higher net reserve wages and fewer net reserve days would increase reenlistment rates. It also predicted that higher civilian wages, longer civilian hours, and more frequent overtime opportunities would decrease reenlistment rates.

The estimated model in Section IV shows that the coefficients of the five variables have the predicted sign and that four of the five are statistically significant. Our empirical results thus confirm the moonlighting model as an accurate description of reenlistment decisions. But they also show that reenlistment decisions are not very sensitive to the five variables. Other factors also seem to be at work. The reserve reenlistment decision, then, is more complex than the simple decision suggested by moonlighting labor market theory.

To explain the low sensitivity of reserve reenlistment to the moonlighting variables, we suggest that the qualitative aspects of reserve participation influence the reservist's decision. All jobs-full-time and part-time--have qualitative aspects that directly affect a worker's subjective well-being. These qualitative aspects are not

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usually included in moonlighting labor market theory. If the qualitative aspects of reserve participation are more important to reservists than their money earnings and time costs, then their reenlistment decisions will not be very sensitive to changes in the standard moonlighting variables. So, our empirical results are consistent with the notion that reservists value the qualitative aspects of participation. In a sense, reserve participation may provide a unique combination of a second job and a leisure time activity.

We found that reserve reenlistment decisions depend on variables that describe the unique characteristics of the reserve job. For example, military grade is an indication of a reservist's status in his unit. We found that a reservist's grade (after controlling for pay differences in position) significantly affected his reenlistment decision. Although part of this effect may be due to a reverse dependence (individuals not planning to reenlist may not work for promotion), it is consistent with the notion that status in a reserve unit plays an important part in the decision to reenlist. We also found that reservists in noncombat jobs are more likely to reenlist than those in combat jobs.

Unique aspects of the reserve job also lend importance to certain aspects of the reservist's civilian job. For example, the reserve job occasionally requires full-time participation (annual training), which may conflict with civilian work time. This creates an interdependence between the civilian employer's attitudes and policies and reserve participation. We found reenlistment decisions to depend importantly on employer attitudes and policies.

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Previous military experience and the circumstances of original enlistment were important determinants of reenlistment. Individuals who enlisted in the reserve to avoid being drafted into the active force reenlisted at much lower rates than "volunteer" enlistees. This finding helps to explain the relatively low reenlistment rates experienced by the Army Reserve components through 1978 (the last year in which draftmotivated reservists were making first-term reserve reenlistment decisions). With these draft-motivated reservists gone from service, the Army Reserve components are experiencing a substantial increase in first-term reenlistment rates.

Finally, the demographic composition and education of the reenlisting cohort significantly affected reenlistment. Females, blacks, and those with less education reenlisted at higher rates. This finding is consistent with the notion that reserve participation may serve as a hedge against unemployment. Also, older reservists reenlisted at higher rates than younger reservists--thanks either to the increased value of retirement income or to a more stable civilian and family life.

IMPLICATIONS

Reserve reenlistment rates will more than double in the volunteer era (after 1978), owing both to the absence of reservists who enlisted to escape the draft and to changes in the characteristics of reservists enlisting in the volunteer era. Cohorts approaching reenlistment in the volunteer era will contain more female, black, older, and less educated reservists. This increated in retention rates will allow reserve policymakers more selectivity in filling career billets and should improve the quality of career reserve personnel.

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Reserve manpower policymakers appear to have little leverage in raising reenlistment rates through pay increases. A 10 percent pay increase would bring only a 2 percent increase in reenlistment rates. Indeed, reserve retention appears to be relatively insensitive to most economic factors tested.[1]

Civilian employers have a great influence on reenlistment decisions. Their attitudes and policies affect reenlistment decisions in many ways. The efforts of the reserve community to improve those attitudes and policies and to enlist the support of employers appear to be directed at an important problem.

^[1] One important qualifier to this conclusion is the possible effect of reserve retirement. Since this study dealt primarily with younger reservists with a narrow range of years of service, we did not include the value of retirement benefits in the analysis. However, the retirement system makes reserve participation unique among moonlighting jobs. After 20 years of satisfactory service, a reservist is vested in a cost-of-living adjusted retirement plan which begins payment when he reaches the age of 60. The level of payment depends primarily on the grade level at service termination and the total number of days served (including active duty time). Further studies that include a range of individuals with varying years of service are needed to evaluate this effect.

<page-header> The designing of the bonus experiment required an estimate of the retention rate expected from the offering of the bonus. This calculation determined partly how widely the bonus could be offered and still meet the overall budgetary constraints set by Congress. The retention rate in the presence of the bonus was calculated by converting the bonus to an equivalent pay raise and applyin in assumed elasticity

Retention rates without the bonus, assumed to differ for firstterm and career reservists, were estimated as follows: in the National Guard, 23 percent for first termers and 56 percent for reservists with 6 and 7 years of service; in the Army Reserve, 27 percent and 58 percent.

To predict the effect on retention of the bonus, the gain in annual reserve income for a reenlistee was estimated using a present value

$$\frac{G}{100} = \frac{900 + \sum_{i=1}^{6} \frac{W_B}{(1+d)^i}}{\sum_{i=1}^{6} \frac{W_0}{(1+d)^i}}$$



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rates by 24 percent. This assumption was slightly higher than both the Gates Commission assumptions applied to our sample and measurements of civilian moonlighting pay elasticities. The more liberal assumption was used so as to decrease the risk of budget overruns. The estimated reenlistment rates that would thus result from the bonus are shown below, alongside the historical reenlistment rates:

		Historical Rate	Bonus Rate
For the	National Guard		
First	term	23%	29%
6 and	7 years of service	56%	69%
For the	Army Reserve		
First	term	27%	34%
6 and	7 years of service	58%	72%

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Appendix B

DESCRIPTION OF DATA SOURCES AND ANALYTIC FILE

The major analyses described in this report were based on survey data collected during the 1978 Selected Reserve Reenlistment Bonus Test. The model presented in the report is based on the surveys returned by National Guard personnel in experimental control areas. Our analysis of survey response bias indicated that different modes of survey administration and the presence of different incentives (bonus) caused survey response bias in the total experimental sample. This subsample was used for model estimation because the procedures for survey administration were uniform in the National Guard and the reanlistment options and pay offered were the same to all individuals in control areas. The sample used for the model was a subset of the analytic population of about 15,300 defined for Rand's evaluation of the 1978 bonus test. The information about these reservists originated from several sources, including eligibility lists, administrative personnel records, and a monthly reporting system, as well as from the survey questionnaires. This appendix identifies these data sources and describes the procedures and assumptions used in creating and maintaining the data bases associated with the bonus test.

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DATA SOURCES

To administer, monitor, and evaluate the bonus test, a set of data requirements were identified in the planning of the test. The sources of these data are described below. A more detailed discussion of the survey associated with the bonus test is found in Appendix C.

Initial Eligibility Rosters (IER)

Before the test was initiated, each component produced official lists, by unit, of individuals who met the eligibility criteria in both bonus and control areas. An official roster was created from these individual lists for the purpose of monitoring the experiment. When aggregated to the unit level, the IERs were used by Rand as a distribution list for the survey questionnaires and by individual units as survey sample lists.

Reserve Personnel Master Files (RPMF)

The IER contained only a limited amount of information about each reservist; to supplement these data, Rand obtained a copy of each individual's Reserve Personnel Master File (RPMF) record. The RPMF data served two purposes. First, as elaborated below, by linking the IER and RPMF at the individual level, we were able to verify whether or not an individual was eligible for the bonus. Second, we used the RPMF for evaluating the bonus test. Characteristics such as race, education, and marital status were hypothesized as possible explanatory variables for the reenlistment decision. The RPMF was the most logical and complete source from which to obtain this individual level information.

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Monthly Status Reports

By the 15th day of each month, each unit participating in the experiment submitted a report containing the reenlistment decision of each bonus-eligible reservist who had reached the end of his term of service (ETS) in the preceding month; for example, for individuals with ETS dates in March, a report was to nave been submitted by April 15. These reports listed individuals who either separated or reenlisted and, for those who reenlisted, the length of the term selected. These monthly status reports enabled us to provide ODASD (Reserve Affairs) with timely information about reenlistments and to monitor the information-gathering process closely.

Survey Questionnaires

Data to model the process by which individuals decided whether or not to reenlist were collected by means of a self-administered questionnaire. The questionnaire was distributed to all individuals listed on the IERs as part of the processing related to reenlistment or separation. The questionnaire collected information on military experience, demographic background, family resources, labor-force experience, and factors related to the reenlistment or separation decision.

THE ADMINISTRATIVE FILE

Rand monitored the bonus test and collected the reenlistment information by creating and continuously updating an administrative file. This file was created by merging the IER information with the RPMF by means of individual Social Security numbers. Reservists who

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Appendix C

SUMMARY OF SURVEY DESIGN, QUESTIONNAIRE CONTENTS, AND ADMINISTRATIVE PROCEDURES

To study the reenlistment decision process, we collected data by means of a survey. In the course of the experiment, 6018 individuals returned a self-administered questionnaire to Rand. This appendix describes the survey design, the sample, the contents of the questionnaire, the data collection methods, and the procedures used in data reduction. A copy of the questionnaire is included at the end of this appendix.

CONCEPTUAL FRAMEWORK

The primary goal of the survey was to collect information on the factors underlying a reservist's decision either to separate from or to reenlist in the Army Reserve or National Guard. Since the survey was conducted in conjunction with the 1978 Selected Reserve Reenlistment Bonus Test, we designed the questionnaire to provide data with which to assess the role of the bonus offer in either a separation or reenlistment decision. In addition, since little is known about the demographic composition of the reserve, we used the survey to develop a descriptive data base about the individuals selected for the experiment. To achieve these goals, we had to administer the survey questionnaire to reservists in both bonus and control areas so as to obtain data about the factors that enter into a separation or reenlistment decision both with and without a bonus offer.

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Our general approach to designing the questionnaire was influenced by various economic, sociological, and psychological perspectives on the behavior of reservists making choices among occupational alternatives, including the moonlighting theory. We included in the questionnaire items that had been used in previous research, for example, labor force experience, as well as those that would allow testing more speculative hypotheses, such as that regarding employer attitudes towards reserve participation.

Rand analysts, as well as MRA&L staff members working on a broad range of reserve-related problems, provided input to the survey design. After all the data requirements were identified, past data collection methods and formats for such data were reviewed. The questionnaire was then drafted and pretests conducted with a representative sample from each of the reserve components. After additional reviews and revisions, the final questionnaire was prepared.

QUESTIONNAIRE CONTENTS

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The final questionnaire contained five sections, each of which collected information in a specific substantive area. The first section, <u>Military Experience</u>, collected basic data, including the date of entry, pay grade, current military occupational specialty, number of drills paid for in the past year, and distance to drill location. Section II, <u>Reenlistment/Extension Decision</u>, contained a subjective evaluation of the role of various economic, military, social, and personal factors related to the reservist's decision either to separate from the reserves or to reenlist or extend the term of service. Several questions in this section, asked only of reservists in the bonus areas, dealt with the role of the bonus offer in the decision.

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Section III, <u>Individual Characteristics</u>, focused on basic demographic facts such as sex, birth date, marital status at both entry and interview, and education. Section IV, <u>Labor Force Experience</u>, asked for the type of employment status information generally collected by the Bureau of the Census. The reservist's occupation and industry, hours of work, pay level, and availability of overtime were ascertained. Also included were items about the attitude and policy of the respondent's employer toward the reserve. The last section, <u>Family Kesources</u>, summarized total family income for 1977 and estimated household assets and debts. The last item on the questionnaire asked for the individual's Social Security number, to be used in linking the survey date to other date collected in the experiment.

SURVEY SAMPLE

Before the bonus test was initiated, each component produced official lists, by unit, in both bonus and control areas, of each reservist who met the bonus eligibility criteria. A copy of each list, called the Initial Sligibility Roster (IER), was sent to ODASD (Reserve Affairs) for the purposes of monitoring the experiment; a second copy was retained at the unit level. In bonus-area units, reservists on the list were offered the bonus and given a copy of the survey questionnaire. Their reenlistment decisions reported to ODASD (Reserve Affaits) on a regular basis. In control areas, the IERs were used as a sample list for the survey and as a basis for reporting individual reenlistment decisions. The sample for the survey, then, was defined to consist of all individuals whose names appeared on the IERs prior to the test and any who were added in the course of the program.

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ADMINISTRATIVE PROCEDURES

This was our first experience with administering military surveys, and the time for developing and fielding the survey was extremely short (2 to 3 months). The administrative procedures were developed after consideration of the survey pretest experience, the practices in reserve units, the administrative requirements of the experiment, and the cost of survey administration and processing.

The technical coordination of the survey was the responsibility of the Rand-DoD Survey Group, a research effort sponsored by OASD (MRA&L). The data were collected by component-specific administrative units, coordinated by a component primary point-of-contact (PPOC). To insure intercomponent comparability, the Rand group reviewed and coordinated all instructions, notices, and letters sent by the PPOC.

In the Army Reserve, it was decided to deal directly with each of the units containing bonus-eligible individuals. The unit was responsible for distributing and collecting survey materials. In the National Guard, PPOCs at the state headquarters of each state with bonuseligible individuals distributed and collected survey materials from units. Rand was responsible for the initial mailing of materials to both components--either directly to Army Reserve units or to National Guard state headquarters. The operational data collection procedures for each administrative unit were the following:

 Rani mailed materials either to the National Guard state headquarters or to Army Reserve unit commanders.

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- o The administrative units provided a questionnaire to each reservist whose name appeared on the IER during his or her retention counseling session, together with a letter explaining the intent of the study and an envelope in which a completed questionnaire was to be sealed.
- o The administrative unit collected sealed questionnaires, and returned them to The Rand Corporation every month at the same time as reenlistment decisions were reported to ODASD (Reserve Affairs).

The administrative instructions for the survey suggested that the individual responsible for survey administration at the unit level maintain a record of reservists who had been given the survey form. Specifically, the instructions suggested that the IER be used as a survey accounting form--for example, that checks be placed on the roster indicating that a survey form and accompanying envelope had been distributed and collected. Unfortunately, we did not require that copies of the annotated IERs be sent to Rand at the end of the experiment. This oversight meant that no data existed with which to distinguish between nonreceipt of a questionnaire by a specific respondent listed on the IER and nonreturn of a questionnaire from a respondent who actually received a form. The two possibilities are analytically quite different. The former means that the reservist had no opportunity to participate for administrative ressons; the latter represents a conscious decision not to do so.

The nature of the reserve population and the organizational structure of units may have led to the failure of some reservists to

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receive questionnaires. For example, some reservists--especially those who had decided to separate--may not have attended a retention counseling session. Also, if a unit underwent a turnover in administrative personnel, the requirements for survey administration may not have been transferred to the new personnel.

The lack of systematic reporting from the units about both monreceipt and nonresponse makes a clear interpretation of the response rates difficult. Our experience has shown that future surveys of this population will require closer monitoring of the fieldwork and greater attention to a survey-reporting system.

DATA PROCESSING OF RETURNED QUESTIONNAIRES

Prior to data entry, each questionnaire was manually edited by Rand staff using a set of question-specific instructions.

Questionnaires were prepared for data entry by checking them for legibility, assigning missing-value and other audit codes, zero-filling numeric fields, rounding time and income entries, etc. Numeric codes were assigned to open-ended entries such as state names, wonths, occupations, and industries. Marginal comments were reviewed and, where appropriate, incorporated into the data.

After the data were entered on magnetic tape, the file was checked using two sets of "data cleaning" specifications. The first set involved range and legitimate value checks that compared the response to each item against all allowed values. The second set checked logical relationships between variables. Discrepancies and inconsistencies that could not be resolved by manually checking the questionnaires were flagged on the file. These special flags, associated with each variable, were used to determine whether or not a variable was usable;

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after a variable was selected, the flags were used for excluding specific records from an analysis. The data were then linked to the administrative file, as described in Appendix B.

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THE RAND CORPORATION SELECTED RESERVE REENLISTMENT BONUE TEST PROGRAM STUDY

You have been asked to perticipate in a study being conducted by The Rand Corporation about the Solocted Reserve Reservicement Bonus Test Program.

Please answer oil the questions as completely as you can. When you have finished the questionnaire, check through it so be sure you have provided all the questions that pertain to you. Then pleas the questionnaire in the envelope provided. Stall the envelope and it will be immediately forwarded to The Rand Corporation.

PROTECTION OF PRIVACY

Public Low \$3.578, entitled the Privacy Act of 1974, requires that all individuals be informed of the purposes and uses to be made of the information that is collected.

AUTHORITY: Public Law \$5-70 and \$5-111

FURFORE: The information obtained in the survey will be used to evaluate the effectiveness of resultement barrues in the Army Reserve Components and to describe the characteristics of the current reserve population.

UBES: The information will be used for research and analysis purposes only. The Rand Corporation under contract to the Reserve Compensation System Study Group OASD(MRABL), has the primary research and analysis responsibility.

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EFFECTS OF NON-DISCLOBURE: Participation in the survey is voluntary. No panalty will be imposed for failure to respond to any particular questions.

	INSTRUCTIONS
READ EACH QUESTION CAREFULL	Υ.
CIRCLE THE NUMBER OF THE ONE FOLLOW ANY INSTRUCTIONS NEXT YOU TO GO TO ANOTHER QUESTIN	ANSWER THAT MOST CLOSELY FITS YOU AND T T <u>T THE NUMBER YOU CIRCLED</u> , WHICH TELL DN.
1. ARE YOU CURRENTLY IN THE	E ARML'D SERVICES?
	Ym
	No 2 🌩 ANSWER 0. 2
SOMETIMES YOU WILL BE ASKED T ENTER YOUR NUMBER ON THE LIP THE APPROPRIATE SET OF CODE N	FO <u>ENTER A NUMBER OR TO CIRCLE A SET OF CODE NUMBERS.</u> NE. IF YOU DON'T REMEMBER OR HAVE NO NUMBER, CIRCLE NUMBERS.
Example: 1. WHAT IS YOUR SELECTIVE SI	ERVICE LOTTERY NUMBER?
	Lottery number
	Do not remember
	Does not apply, no lottery number

MILPERCEN Survey Control No.: DAPC-MSF-8-77-45

	DO NOT WRITE IN
1. ENTER TODAY'S DATE.	TWISTAG
Menth / /	22-26/
2. ENTER THE STATE WHERE YOUR GUARD/RESERVE UNIT IS LOCATED.	
State	27-28/
3. WHEN DID YOU FIRST ENTER MILITARY SERVICE (assive or reserve)? Enter date on your initial contrast.	
Month / /	29-34/
4. WAS YOUR INITIAL CONTRACT FOR:	
(Circle only one)	
2 years	35/
4 years	
5 years 5 6 years 6	
E. WHAT IS YOUR SELECTIVE SERVICE LOTTERY NUMBER?	
Lattery symbols	
Do not rémember	36-38/
Do not remember	36-38/
Do not remember	36-38/
Do not remember	
Do not remember	
Do not remember	
Do not remember	36-38/
Do not remember	36-38/
Do not remember	36-38/
Do not remember	36-38/
Do not remember	36-38/

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CARD 01

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	n va stragt i Status (Status) El La Status		CARD 02	DO NOT WRITE IN
	17.	HOW MANY MINUTES DOES IT USUALL MONTHLY GUARD/RESERVE DRILLS?	Y TAKE YOU TO GET FROM YOUR HOME TO YOUR	THIS SPACE
		e Alexandre de la Carlo de La Sal	Number of minutes	13-15/
	18.	WITHIN THE PAST 2 YEARS, HOW MAN' EMERGENCY CALLUP?	Y DAYS HAVE YOU SERVED IN A MOBILIZATION OR	
			Number of days Does not apply, never served in cellup 000	16-18/
4. 	19.	DID THIS SERVICE IN MOBILIZATION O OVERALL ANNUAL INCOME?	R CALLUP CAUSE YOU TO HAVE A GAIN OR LOSS IN	-
			(Circle only one) Does not apply, never served in callup0 Income gain	19/
	20.	BELOW IS A LIST OF BENEFITS AVAILA YOU USED OR DO YOU CURRENTLY U	ABLE IN THE GUARD/RESERVE. WHICH OF THESE HAVE SE?	
			Tax advantage for State income 1 Medical Benefits 2 Educational Benefits 3 Injury/Qeath Benefits 4 Group Insurance 5 Free License plates 6 Post/Base Exchange (PX) 7 Other (plasse specify) 7	20-28/
. ·			8 None of the above	
	21.	II. REENL WHAT IS THE 1978 EXPIRATION DATE	ISTMENT/EXTENSION DECISION OF YOUR TERM OF SERVICE (ETS)?	
			Month // Yeer	29-34/
	22.	ARE YOU REENLISTING OR EXTENDIN	G IN THE GUARD/RESERVE AT THIS TIME? (Circle only one) Yes, 1 year	35/
			Tes, 3 years	

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•		Very Important	Moderately important	Somewhat Important	Slightly important	Not at all important	
	Was not aligible to reanlist		2	3	4	5	36-5
	Moving to take a new job	1	2	3	4	5	
	Moving, job transfer to another area	1 4	2	3	4	5	
	Distanté to guard/reserve unit	1	2	3	4	5	
	Collupe/mobilizations	1	.	3	a 📕	5	
	Conflict with educational program	1	2	3	`4	5	
	Health	• 1	2	3	1 - 4	5	
	Conflict with civilian job	1	2	3	41	5	1
	contrict with family or leisure time	1	2	3	4	5	1
	Constal distile of military	Ι.	2	3	4	5	
	Insufficient pay	1	2	3	- 4	6	1
	rest eligible for 1978 reenlistment bonus	1	2	2	4	5 .	
		1	2	3	4	6	
	Dislike unit's training practice	1	2	3	4	5	
	r	Was not Moving 1 Moving, Distance	() eligible to ree to take a new j job transfer to to quant/ree	Circle only on nlist job a mother area we wait	•) 	01 02 03	51-5
		Was not Moving 1 Moving, Distance Callupe/ Conflict Health Conflict Conflict Conflict General Insuffici Not eligi Extra in	(C eligible to ree to take a new job transfer to to guard/rese mobilizations with educatio with civilian j with family o distike of mili ent pay	Circle only on nlist	e)	01 02 03 04 05 05 07 09 09 10 11 12 13	51-5
 i.	HOW DO YOU PLAN TO REPLACE THE I	Was not Moving 1 Moving, Distance Callupa/ Conflict Conflict Conflict Conflict General Insuffici Not eligi Extra in Dislika u Diagree	((eligible to ree to take a new job transfer to to guard/rese mobilizations with educatio with civilian j with family o distike of mili ent pay	Circle only on nist	e)	01 02 03 04 05 05 07 08 09 10 11 12 13 14 15	51-5 N?

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(0. 45.0 3)	
TO BE ANSWERED BY EVERYONE 30. SIX MONTHS AGO, HOW DID YOU FEEL ABOUT REENLISTMENT OR EXTENSION IN THE	DO NOT WRITE IN THIS SPACE
	13/
 Probably reenlist	
31. HOW MUCH INFLUENCE DID EACH OF THE FOLLOWING PEOPLE HAVE ON YOUR REENLISTMENT DECISION? Answer for each item.	4
A greatQuitedeala bitSomeA jittleNot at allGirlfriend/wife, boyfriend/husband12345Parents12345Unit reenlistment counselor12345Unit technician12345Unit commanding officer12345Other member of guard/reserve12345	14-19/
HI. INDIVIDUAL CHARACTERISTICS 32. WHAT IS YOUR BIRTH DATE?	-
Month Day Year	20-25/
33. ARE YOU MALE OR FEMALE? Male	26/
34. WHAT WAS YOUR MARITAL STATUS WHEN YOU FIRST ENTERED THE GUARD OR RESERVE?	1
(Circle only one) Merried	27/
35. WHAT IS YOUR CURRENT MARITAL STATUS?	-
(Circle only only) Merried 1 Logally separated 2 Divorced 3 Widowed 4 Never merried 5	28/
CARD 03	7

			, DO NOT
	38. WHAT DO YOU CONSIDER TO BE Y	our main racial or ethnic group?	WRITE IN THIS SPACE
•		(Circle enty enc)	20/
		American Indian	
		Other (please specify)	
	37. WHAT IS THE HIGHEST GRADE OR AND GOT CREDIT FOR?	YEAR OF REGULAR SCHOOL OR COLLEGE YOU EVER FINISHED	
	Highest	rada	30-31/
	SB. WHAT IS THE HIGHEBT DIPLOMA O	R DEGREE YOU HAVE?	4
		(Circle only one)	12-13/
		No high school diplome	32-337
		BA/BS (Bochelors)	
		MD/Ph.D/LLB	
	30. WHERE ARE YOU LIVING NOW?		-
		(Circle only one)	34/
		In a suburb near a large city	
		In a suburb near a medium sized city	
		On a farm or ranch	
		V. LABOR FORCE EXPERIENCE	1
	40. WHAT IS YOUR CURRENT PRIMAR	Y ACTIVITY, OTHER THAN THE GUARD/RESERVE?	1
		(Cirole only one)	25/
		Working part time	
		Fuil time student	
		Keeping house	
		•J	
		CARD 03	1

	- 95 -	
41.	ANSWER Q. 41-52 ONLY IF YOU ARE CURRENTLY WORKING. WHAT KIND OF WORK DO YOU DO? (for example: electrical engineer, earpenter, high school teacher, stack elerk,	DO NOT WRITE IN THIS SPACE
	Kind of work	3638/
42.	WHICH OF THE FOLLOWING BEST DESCRIBES YOUR EMPLOYER?	
	(Circle only one)	
	The Federal Government	39/
	Private firm with less than 100 employees	
43.	WHAT KIND OF PLACE DO YOU WORK FOR? (for example: TV and radio manufacturing, retail shoe store, etc.) Place of employment	40-42/
44.	Hours per week	43-44/
45.	HOW MUCH DO YOU USUALLY EARN AT THIS JOB BEFORE DEDUCTIONS? (Enter only one amount)	
	\$ per hour	45-46/ 47-49/
	*	50-53/
	\$per yeer	54-58/
46.	IS YOUR EMPLOYMENT COVERED BY A COLLECTIVE BARGAINING AGREEMENT BY THE UNION AND MANAGEMENT?	
	Yes	59,1
47.	IF YOU WERE TO WORK MORE HOURS THAN USUAL DURING SOME WEEK, HOW WOULD YOU BE PAID FOR THESE HOURS?	
	(Circle only one)	60/
	Not poid at all for more hours 1 At your regular rate of pay 2 At more than your regular rate of pay 3 In compensatory time 4	,
48.	HOW MANY HOURS OF OVERTIME DID YOU WORK LAST WEEK?	
48.	HOW MANY HOURS OF OVERTIFE DID YOU WORK LAST WEEK? Number of hours None 00	61-62/

ANSWER Q. 48-52 ONLY IF YOU ARE CURRENTLY WORKING HOW OFTEN IS OVERTIME AVAILABLE TO YOU? (Circle only one) Never	DO NOT WRITE IN THIS SPAC
(Cirole only one) Never	63/
Rvery week	/
Less than once a manth	
TO THE NEAREST YEAR AND MONTH, HOW LONG HAVE YOU HELD THIS JOB?	64-65
and Months	66-67
WHAT IS YOUR EMPLOYER'S OVERALL ATTITUDE YOWARDS YOUR PARTICIPATION IN THE	~
(Circle only one)	
Does not apply. I am self employed 0	08/
Very Saverable	
Neither favorable nor unfavorable	
Somewhat unfavorable 4	
Very unfavorable	
WHAT IS YOUR EMPLOYER'S LEAVE POLICY FOR YOUR ANNUAL GUARD/RESERVE TRAINING DUT' (Circle only one)	Y7
Doss not apply. 1 am self-employed 0	69/
remnits 2 weeks leave without pay	
Permits 2 weeks leave but only pays me the difference	
between my military and civilian pay	1
pay. I must use my regular vacation	
A ANSWERED BY EVERYONE. HAVE YOU EVER BEEN REFUSED EMPLOYMENT BECAUSE OF YOUR GUARD/RESERVE MEMBEDRIN	•
OR TRAINING PARTICIPATION?	70/
No 2	
IN YOUR EMPLOYMENT HAVE YOU EVER BEEN PASSED OVER OR SLOWED IN PROMOTION, DENIED OTHER BENEFITS OR DISCHARGED RECAUSE OF YOUR GUARD/RESERVE MEMBERSHIP OR TRAINING RATIONATION	
	71/
No 2	
V. FAMILY RESOURCES (Circle only one)	
ARE YOUR LIVING QUARTERS: Owned or being bought by you or so.veone	
in your household	72/
Cocupied without payment of cash rent 3	
CARD 0	3
	TO THE NEAREST YEAR AND MONTH, HOW LONG HAVE YOU HELD THIS JOB? Years

<u>.</u>		WINTE #
R,	WHAT ARE YOUR MONTHLY MORTGAGE OR RENTAL PAYMENTS?	THIS SPA
	Monthly mortgage/rental poyments	13-16,
	Does not apply, live with parents/relatives 0000	
17.	DOES YOUR MONTHLY RENTAL PAYMENT INCLUDE UTILITIES?	-
	(Circle only one)	1,7/
	Dous not apply, no rental poyments 0	111
	Yes	
	No 2	
	HOW MANY PEOPLE ARE THERE IN YOUR HOUSEHOLD?	1
	Number in household	14-19
	FOR TAX PURPOSES, HOW MANY DEPENDENTS DO YOU HAVE? Do not include yourself or your spouse.	
	Number of dependents	20/
	DOES YOUR SPOUGE HAVE A PAID JOB. EITHER PART TIME OR FULL TIME?	
	(Circle entry one)	
	Yes, full time	21/
	Yes, part time	1
	No	
	Not currently married : 4	
61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SPOUSE EARNED IN 1977?	22-26
61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SPOUSE EARNED IN 1977? Earnings of spouse Not currently merried	22-20
61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SPOUSE EARNED IN 1977? Earnings of spouse Not currently merried	22-26
61. 62.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SPOUSE EARNED IN 1977?	22-20
61. 62.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR STOUGE EARNED IN 1977?	22-26
61. 62.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SPOUSE EARNED IN 1977?	22-26
61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977?	22-20
62. 63.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977? Earnings of spouse	22-20
81. 82. 83.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977? Earnings of spouse	22-20
62.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977? Earnings of spouse	22-20
82.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977? Earnings of spouse	22-20
62.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONS, THAT YOUR SECURE EARNED IN 1977? Earnings of spouse	22-20
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61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONE, THAT YOUR SPOUSE EARNED IN 1977? Earnings of spouse	
61.	WHAT WAS THE TOTAL AMOUNT, BEFORE TAXES AND OTHER DEDUCTIONE, THAT YOUR SPOUSE Earnings of spouse Bernings of spouse Not currently married Not currently married Spouse did net work G0001 HOW MANY PERSONS IN YOUR HOUSEHOLD, INCLUDING YOURSELF AND YOUR SPOUSE EARNED ANY WAGES IN 19777 Number of wage serrors	22-2

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		Incoment	Deserved	No Chanas	
	transma from secular lab		3	9	30-
	Exercise due to least stillistion (alimony, ris.)	1 1		· 3	
	Unemployment benefits	i	ž	3	
	Time spont in school	1	2	3	
	Income from self-employment	1	2	3	
	Income from lowestments	1	2	3	
	Extraordinary innome (sale of house, insurance polic	¥.	•	•	
		i i		3	
	Transportation costs (include cur)	i	2	3	
L 1	WHAT WOULD YOU ESTIMATE YOUR TOTAL OUTST Exclude mortgage.	ANDING DESTS	TO BE AT	THIS TIME?	
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		82,000 - 84.9		4	
		\$5,000 · \$8,5			
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		\$10,000 - \$14			1
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Thank you for completing this questionnaire.

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Appendix D

SURVEY RESPONSE BIAS

The reservists in the experimental sample were chosen from a group of states and regions whose economic and population characteristics and historical reserve reenlistment rates matched the nation as a whole. As a result, the experimental sample of reservists was probably fairly representative of all nonprior service reservists with less than 8 years of service who faced a reenlistment decision in 1978. Thus, if those returning a survey are representative of the experimental sample, the model will be applicable to a similarly defined population in the entire Army Reserve and National Guard.

Of the 15,300 reservists declared eligible for the reenlistment bonus test, approximately 6000 returned usable surveys. If those returning the survey represent the entire sample--that is, if they represent a truly random selection--the coefficients of the reenlistment model estimated from survey data alone may be assumed with a high degree of confidence to contain no survey response bias. However, if the propensity to return a survey depended on either the reenlistment decision itself or on the independent variables significant in the reenlistment model, then straightforward estimation of the coefficients in the reenlistment model will lead to biased results.

If bias exists, several techniques can be used to reduce or eliminate such bias, provided information is available on individuals in the sample universe. Fortunately, the Reserve Enlisted Master Personnel record, containing extensive information on demographic and military

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characteristics, was available for all test participants. Analyzing this information in conjunction with information on the survey allowed us to determine the extent of certain kinds of survey bias by statistical testing. This appendix examines these date to determine if survey response bias is present and to describe our strategy for estimating the model to reduce or eliminate such bias.

Linking each survey record with the corresponding reserve master record from the full sample allowed a more systematic exploration of response bias. Of the 6018 surveys returned, we were able to match[1] for 5203 records the survey data and the personnel records from the original experimental sample of 15,300. Since we could analytically investigate the effects of nonresponse for this sample, we used only these surveys in our analysis.

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The low response rate encountered in this experiment (approximately 34 percent) typified wilitary surveys administered prior to the experiment. Surveys of active force members administered through service channels had yielded response rates typically between 40 and 60 percent. Reserve surveys would be expected to be somewhat lower. Lower response rates for reservists probably reflect the difficulty of administering surveys in the limited time available to reservists at drills, as well as their part-time commitment to the reserve job.

The survey response rate was not a primary consideration in the test design, since the survey was not central to the bonus evaluation. In fact, the design made survey administration exceedingly difficult. Reservists were located in over 1500 units throughout the United States.

[1] Records were matched on the basis of SSN and demographic variables.

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Some units had only a single eligible reservist. Resources were not available for administrative control of this disbursed sample through a system of monitoring individual units. Although the administrative plan .Alled for complete instructions on administration and for a roster of eligible members to be provided to each unit, the actual unit administrative performance was poor.

Survey nonresponse occurred because reservists either did not receive or did not return surveys. Nonreceipt occurred at both the unit and individual levels. Some Guard units initially may not have received survey packets, since all packets were sent first to state offices and then forwarded to units. Survey packets were sent directly to each Army Reserve unit. At the unit level, the surveys probably simply took lower administrative priority among other routine reports and personnel paperwork, so many were not given to reservists.

Administrative personnel turnover during the test accounted in part for the nonreceipt. This is illustrated by the decline in response rate over time (see Table D.1). After an initial increase in response rate in the first 3 months, response declined steadily from 50 to 20 percent. Since surveys and survey lists were distributed only at the beginning of the experiment, whereas individual end-of-term-of-service (ETS) dates were spread over 1 year, it is likely that as time went on more reservists failed to receive surveys.

Other response patterns probably reflect a combination of nonreceipt and nonreturn. Response rates among those who reenlisted were higher than for those separating (see Table D.2). This is probably explained by the greater likelihood of absence (not receiving a survey) from final drills for those separating, as well as less incentive to return surveys actually received.

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Teble	D.1
SURVEY RESPONSE I	ATTERNS BY MONTH
	Bassana Baba
ETS Month 1978	(%)
January	42.2
February	45.8
Herch	50.5
April	43.4
Ney	39.6
June	33.1
	32.3
September	28.2
October	23.7
November	20.5
December	19.7
Table	D.2
SURVEY RESPONSE PATTERNS AND BY BONUS A	BY REENLISTMENT DECIS. ND CONTROL AREA

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	Response Rate (%)			
Decision	Bonus Ares	Control Area	Total	
Separate	19.1	31.2	26.5	
Reenlist	47.3	44.0	45.3	
1-year extension	21.4	45.2	43.0	
3-year term	46.5	27.0	38.9	
6-year term	55.8	52.4	54.8	

Survey response patterns also differed in test and control areas among those separating. The response rate among those separating was higher in control areas than in bonus areas. In bonus areas, response rates were low both for those separating and those reenlisting for a single year. One explanation for these results is that a backlash effect occurred in the survey response because of both the reenlistment decision and the bonus decision. Those rejecting a bonus or separating tended to not return surveys. Another explanation is simply that some technicians in bonus areas associated the survey with the bonus, and gave surveys only to those taking the bonus.

These initial response characteristics clearly indicate model coefficients with response bias when using the full sample. In fact, little confidence in any results could be obtained unless the extent of the bias is systematically identified and eliminated. Three strategies were considered to eliminate the bias: weighting, statistical estimation incorporating the survey response equation (Heckman technique[2]), and the use of an unbiased subsample. The third was chosen, since statistical tests of survey response bias showed that a large subsample for which administrative procedures and reenlistment incentives were uniform had no response bias.

[2] James J. Heckman, "Sample Selection Bias as a Specification Error," <u>Econometrica</u> 47 (January 1979), pp. 153-161. Although extensive work was done using the Heckman technique on the full experimental sample to attempt to correct for survey bias, the results were unsuccessful. One reason is that the Heckman technique has been derived rigorously only for the situation where the dependent and independent variables can take continuous values; using it in the situation where the variables are dichotomous means stretching its applicability. As far as we know, no one has formally derived a parallel to the Heckman technique for the case of dichotomous variables.

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If nonresponse bias is present, the expected value of the coefficient of the model estimated on the survey respondent sample of 5203 would differ from the coefficient obtained on the sample of 15,300. While coefficients might vary simply because of random variation, a pattern of highly significant differences among several coefficients provides strong evidence for nonresponse bias. Although we cannot test the complete set of variables used in the model for nonresponse bias since many appear only on the survey record, we can test for the set of demographic and military characteristic variables available on the personnel tapes. Most hypotheses concerning administrative or individual nonresponse would posit differences in coefficients contained on the full sample. Thus, if these coefficients of regressions performed on these two samples show equal coefficients, most hypotheses concerning presence of nonresponse bias can be eliminated. Although these tests cannot eliminate the possibility that certain variables appearing only on the survey contain nonresponse bias, it is considerably more difficult to find a hypothesis accounting for bias on a survey variable that would not also appear in one of the demographic and military characteristic variables contained on all records.

To test this notion for a single independent variable, two regression equations were estimated on the full 15,300 sample.[3] In one equation, the estimated coefficient associated with that independent variable can take on different values for reservists who did and did not return surveys; in the second regression equation, the estimated

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^[3] Franklin M. Fisher, "Tests of Equality between Sets of Coefficients in Two Linear Regressions: An Expository Note," Econometrica 38 (March 1970), pp. 364-365.

coefficient is restricted to one value. So, the second equation embodies the notion that reservists who returned a survey and reservists who did not return one responded in the same way to changes in the independent variable; it implies that the survey population is not biased with regard to the independent variable.

We can test this notion by looking at how much of the total variations in the dependent variable cannot be explained by the two regression equations. If the second equation leaves unexplained much more of the total variance, then we can reject the idea that the coefficient's true values are equal for survey respondents and for nonrespondents; rejecting the notion implies that the samples are biased with regard to the independent variable. A statistical F-test is used to determine whether the change in unexplained variance is significant. The F-test for each of the independent variables available for the entire experimental population are given in the first column of Table D.3. Our results suggest considerable survey response bias among the total sample of survey respondents. The offer of a reenlistment bonus, the reservist's pay grade, race, combat job, and marital status proved to be sources of bias.

The results clearly imply that the presence of a bonus significantly changed the survey response pattern, either by affecting the administrative channels for survey distribution or by affecting individual members' propensity to return surveys. These results also indicate that less bias would probably exist where both special financial incentives and survey administrative modes were held constant. The surveys collected in the National Guard in experimental control areas constituted the largest subsample in which both financial

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นของและเนียงเป็นแก่ที่ 64 ในหมายสมันสีมีสีมาให้ทำได้ที่ได้ได้แน่ในประเทศไม่ทำไม่ที่ไม่ที่สามาโละที่ไม่ที่สามาร

TESTING FOR IDENTICAL RESPONSES: FULL SAMPLE VS. SUBSAMPLE

	vedut 19 cmatte	Decision 1-18019	
Variable	Full Sample ⁴	Guard/Control Subsample ^b	
Bonus available	61.98 ^C		
Pay grade	6.65 ^C	1.35	
Component	0.58		
First term	0.32	3.55	
First term/male	2.08	1.13	
Draft motivation	1.88	0.02	
Combat job	4.96 ^d	1.70	
Length of first term	0.01	2.50	
Year of birth	0.05	1.18	
Sex: female	1.56	0.51	
Race: black	9.82 ^c	1.73	
Currently married	3.92 ^d	0.17	
Number of dependents	0.60	0.23	
College graduate	0.03	0.88	
Intercept	5.20 ^d	7.66 ^C	
All variables	55.34 ^c	19.17 ^C	

^aThe F-tests have 1 and 15,102 degrees of freedom for individual variables and 13 and 15,090 degrees of freedom for all variables.

^bThe F-tests have 1 and 6840 degrees of freedom for individual variables and 13 and 6828 degrees of freedom for all variables.

^CThere is less than one chance in 100 that the true coefficients for survey respondents and nonrespondents are equal.

^aThere is less than one chance in 20 that the true coefficients for the survey respondents are equal.

incentives and survey administrative modes were similar. Similar tests for this subsample (see column 2 of Table D.3) show no survey response bias for any variable coefficient. Only the estimated intercept term for survey respondents and nonrespondents differ significantly. But, differences in the intercept can be easily adjusted

under the assumption of a choice-based sample.[4] The absence of bias in the latter case means that estimation can proceed for this subsample without reweighting.

Although the final model was estimated for the Guard/Control group, the significant results or conclusions of this report would not have changed had the full survey sample (15,300) been used. Table D.4 compares estimates from linear OLS regressions on the full sample and Guard/Control sample. As can be seen, the coefficients of the reserve wage, civilian hours worked, and civilian wage variables change little between the two samples.

[4] See James R. Hosek, An Introduction to Estimation with Choice-Based Sample Data, The Rand Corporation, P-6131, July 1979.

Table D.4

THE REENLISTMENT DECISION: COMPARISON OF RESULTS FOR THE FULL SAMPLE AND GUARD/CONTROL SUBSAMPLE USING A LINEAR MODEL

	Full Šan	ple	Guard/Control		
Variable	Coefficient	t-Ratio	Coefficient	t-Ratio	
Reserve pay and time		-	h		
Annual net drill and camp pay	0.363×10^{-7}	1.90	0.440×10^{-7}	1.70	
Net reserve time	0.245×10^{-2}	1.59	-0.549 x 10 ⁻³	-0.24	
Reserve experience	,		,		
Pay grade E3 or below	-0.886×10^{-1}	- 2.91	-0.910 x 10 ⁻¹	-2.36	
Pay grade E5	0.133	9.52	0.133	7.24	
Pay grade E6	0.232	10.53	0.217	7.04	
Pay grade E7 or above	0.297	4.40	0.449	3.35	
Component: National Guard	-0.471×10^{-1}	- 2.56	 ,		
Combat job	-0.624×10^{-1}	- 4.66	-0.651×10^{-1}	-3.74	
Years of service	-0.129×10^{-1}	- 3.60	-0.153×10^{-1}	-3.69	
Revealed reserve preferences					
Draft motivation	-0.185	-10.38	-0.125	-5.05	
Prior reenlistment	0.164	9.53	0.192	7.79	
Civilian work environment	_2		-?		
Free time	0.245×10^{-1}	1.59	0.193×10^{-1}	2.15	
Civilian hourly wage	-0.136 x 10,	- 5.51	-0.126 x 10 ⁻¹	-3.64	
Availability of paid overtime	-0.581×10^{-3}	- 1.96	-0.894×10^{-3}	-2.22	
Must use vacation	-0.703×10^{-1}	- 2.30	-0.514×10^{-1}	-1.16	
Employer's attitude	-0.418×10^{-1}	- 7.29	-0.476 x 10	-6.02	
Federal government employment	-0.676×10^{-2}	- 0.21	-0.349×10^{-2}	-0.07	
State/local government	I		o (o) 10 ^{−1}		
employment	0.489×10^{-1}	1.92	$0.604 \times 10_{-1}$	1.6/	
Middle-sized firm employment	$0.302 \times 10_{1}$	1.54	0.176×10^{-1}	0.66	
Small firm employment	0.29×10^{-2}	1.77	$0.415 \times 10_{-1}$	1.86	
Self-employed	$0.801 \times 10_{-5}$	0.25	-0.481×10^{-5}	-1.04	
Spouse's annual earnings	-0.243×10	- 1.75	-0.166 x 10	-0.72	
Individual characteristics			• • • • •		
Sex: female	0.504×10	1.94	U.144	2.83	
Race: black	0.105	0.09	$0.200 - 10^{-1}$	5.30	
Age	0.110×10^{-1}	5.70	0.120×10^{-2}	4.30	
Married	-0.138×10^{-1}	- 0.81	-0.29/ x 10_1	-0.12	
Number in household	0.118×10^{-1}	2.68	0.115×10^{-1}	1.04	
Not high-school graduate	$0.4/5 \times 10^{-1}$	2.3/	0.382×10^{-1}	1.4/	
College graduate	-0./95 X 10	- 4.04	-0.922 x 10	-3.73	
Regional characteristics	0 601 - 10-2	0 35	$-0.127 - 10^{-1}$	_0 **	
migdie-sized urban area	$0.136 - 10^{-1}$	- 0 49	-0.127×10^{-1}	-V.44 _n 49	
Small urdan area	-U.120 X 10-2	- 0.02	$-0.50T \times 10^{-1}$	-V+00 _0 4F	
Kural area	-0.401×10^{-3}	- 0.13	-0.130 X 10_j	-0.43	
Suburban area 1978/1977 local inflation	U.3/2 X IV	0.03	U.202 X IV	0.73	
factor	-0.294	- 0.57	0.197	0.26	

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Table D.4

CONTINUED

	Full Sample		Guard/Control	
Variable	Coefficient	t-Ratio	Coefficient	t-Ratio
Missing value indicator				
variables (MVIV)	-9		-1	
Annual net drill and camp pay	-0.607 x 10	-0.18	-0.254 x 10	-0.56
Net reserve time	0.789×10^{-1}	1.41	0.462×10^{-1}	0.57
Draft motivation	-0.121×10^{-1}	-0.17	-0.335×10^{-1}	-0.23
Prior reenlistment	-0.396×10^{-1}	-0.49	0.502×10^{-1}	0.32
Free time	0.194	3.16	0.180	2.06
Civilian hourly wage	-0.152 ,	-5.48	-0.102 ,	-2.64
Availability of paid overtime	-0.144×10^{-1}	-0.47	-0.751 x 10,	-1.76
Must use vacation	-0.296 x 10 ⁻¹	-0.76	-0.272×10^{-1}	-0.49
Employer's attitude	-0.132	-3.45	-0.185	-3.33
Kind of employer	0.167	4.52	0.151 ,	2.98
Spouse's income	-0.420×10^{-1}	-1.62	-0.597 x 10 ⁻¹	-1.66
Harried	0.587×10^{-1}	1.46	0.943	1.74
Number in household	-0.353×10^{-1}	-1.52	-0.378×10^{-1}	-1.13
Education	-0.437×10^{-1}	-1.59	-0.566×10^{-1}	-1.49
Residential area	-0.953×10^{-1}	-1.33	0.132×10^{-1}	0.11
Intercept	0.409	1.86	0.742×10^{-2}	0.01
Number of observations	5203		2876	
Ngan square error		0.181		0.192
R ²		0.28		0.24
F-ratio		39.14		18.92
Chi-squared		NA		NA

Appendix E

VARIABLE · DEFINITIONS

This appendix defines the variables used in the analysis and the sources of data used for these definitions.

DATA SOURCES

Lata in this analysis came from five sources. Most of the data needed to compute values for our variables came from information in reservists' responses to the 1978 Selected Reserve Reenlistment Bonus Test survey During the experiment, administrative data were also collected from participating units regarding reenlistment decisions of reserved. We supplemented this basic data source with information from the ster personnel file record for each reservist. The administrative and personnel records are described in Appendix B and the survey instrue and procedures in Appendix C. Information on actual drill and some camp pay and on urban and regional price levels was used to compute income variables.

Administrative and Survey Records

Starting with the administrative RPMF survey, we selected the records for which we had both an administrative record and survey record for eligible recipients. These selection criteria yielded 5216 records.

<u>Pay Data</u>. To calculate Guard pay, we used the pay rates effective on October 1, 1977, as shown in the <u>1978 National Guard Almanac</u>.[1]

^{[1] &}lt;u>1978</u> <u>National Guard Almanac</u>, Lt. Col. Sol Gordon and Capt. Clint Tennill, eds., Uniformed Services Almanac, Inc., P.O. Box 76, Washington, D.C., 1978, pp. 10-11.

<u>Price Level Data</u>. Our formal model calls for all the dollar-dominated variables to take into account differences in the levels of average prices facing the reservists; all the dollar-dominated variables should be expressed in dollars with the same purchasing power. A variable reflecting the proportional change in the level of average prices--an inflation rate variable--was also included as an independent variable. Thus, regional price level data were required not only to adjust dollar-dominated variables but also to calculate the inflation rate variable.

The U.S. Bureau of Labor Statistics provides annual estimates of the family income required to purchase the same market basket of goods and services in 40 metropolitan areas and nonmetropolitan urban areas in four regions; an estimate reflecting average prices for all urban areas in the United States is also provided. Estimates are made for three different "market baskets" of goods and services, said to reflect low, intermediate, and high standards of living for a family of four. The required incomes reflect prices and taxes in the autumn of each year.

Since all the income information reported on our survey instrument is for calendar 1977, we used the estimates that reflected autumn 1977 prices to calculate our regional price adjustment factors.[2] The regional price adjustment factors were calculated by dividing the income necessary to purchase the intermediate market basket in each metropolitan area or region by the income necessary to purchase the budget at average U.S. prices. This process yielded the regional price adjustment factors given in the first column of Table E.1.

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^[2] United States Department of Labor, Bureau of Labor Statistics, "Autumn 1977 Urban Family Budgets and Comparative Indexes for Selected Urban Areas" (news release), Washington, D.C., April 26, 1978.

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	Table E.1		
REGIONAL	PRICE ADJUSTMENT AND	INFLATION FACTORS	
State	Aree	Regional Price Adjustment Factor	Regional Inflation Factor
Colorado	Denver	1.00	1.10
Connections	Uther Next ford	1.90	1.13
Counseller	Other	1.00	1.10
Georgia	Atlanta Other	0.91 0.85	1.09 1.11
Idaho	A11	0.90	1.13
Iove	Cedar Rapids Other	0.98 0.92	1.09 1.11
Kanses	Kansas City	0.96	1.10
	Wichita Other	0.93 0.92	$1.11 \\ 1.11$
Maine	Portland Other	1.03 1.00	1.09 1.10
Nassachusetts	Boston Other	1.20 1.00	1.07 1.10
Nichigan	Detroit Other	1.02 0.92	1.10 1.10
Minnesota	Minneepolis-		
	St. Paul Other	1.04 0.92	1.09 1.11
Montana	A11	0.90	1.13
			1.10
Nebraska	Omeha Other	0.96 0.92	1.11

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Table E.1 -- continued

New Jersey	Northeast NJ	1.17	1.08
. .	Philedelphie	1.04	1.09
	Other	1.00	1.10
New York	New York	1.17	1.08
	Buffalo	1.07	1.07
	Other	1.00	1.10
North Carolina	Durham	0.96	1.10
	Other	1.00	1,11
North Dakota	A11	0.92	1.11
Pennsylvania	Lancaster	0.95	1.10
	Philadelphia	1.04	1.09
	Pittsburgh	0.97	1.09
	Other	1.00	1.10
Ohio	Cincinnati	0.97	1.11
	Cleveland	1.02	1.09
	Dayton	0.92	1.11
	Other	0.92	1.11
Oregon	A11	0.90	1.13
Rhode Island	A11	1.60	1.10
South Carolina	A11	0.85	1.11
Ütah	A11	0.90	1.13
Vermont	A11	1.00	1.10
Washington	Seattle-Everett	1.01	1.08
-	Other	0.90	1.13
West Virginia	Wheeling	0.97	1.09
	Other	0.85	1.11
Wisconsin	Milwaukee	1.07	1.10
	Green Bay	0.98	1.10
	Other	0.92	1.11
Wyoming	A11	0.90	1.13

The regional inflation factors were obtained by dividing the nominal income needed to purchase the intermediate budget in autumn 1978 by the nominal income needed to purchase the same intermediate budget in autumn 1977.[3] The regional inflation factors are given in the second column of Table E.1.

A regional price adjustment factor and a regional inflation factor were associated with each reservist's record on the basis of his unit's sip code. If his unit was located in one of the 40 metropolitan areas, that area's factors were associated with the reservist's record. If his unit was located outside the 40 metropolitan areas, one of the four regional sets of factors was chosen. Our method of assigning factors might have led to the wrong factors being assigned if, for example, the reservist lived far from his unit's location. We would have preferred to have used factors based on the reservist's residential location but could not do so because we did not have complete residential sip code information.

VARIABLE DEFINITIONS

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Our description of each variable includes its definition, the assumptions needed to calculate its value, and the computational procedures. We will deal with the variables under five headings: reenlistment option, civilian job, changes since last reserve participation decision, reservist's personal characteristics, and regional characteristics. Most of the information used to get values for the variables come from the survey instrument. A response to a

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^[3] U.S. Department of Labor, Bureau of Labor Statistics, "Autumn 1978 Urban Family Budgets and Comparative Indexes for Selected Urban Areas" (news release), Washington, D.C., April 29, 1979.

question; Q14 stands for the response to question 14.

The Reenlistment Option

Bonus Available. An indicator variable that takes on the value of 1 if the reservist is eligible to receive a bonus for reenlisting for 3 or 6 years.

Assumptions: None.

Computations:

- A. If the reservist is in the test group, BONUS = 1.
- B. If the reservist is in the control group, BONUS = 0.

<u>Annual Net Drill and Summer Camp Pay</u>. A reservist's annual net drill and summer camp pay equals his compensation for attending the full number of drills authorized for his unit plus a 14-day summer camp less any loss of earnings from his regular job due to attending summer camp. The annual net reserve drill and summer camp pay variable includes an adjustment by the regional price factor so that it reflects real differences in purchasing power.

Assumptions:

- A. If the pay grades given on the reserve personnel file and survey file do not agree, the pay grade on the survey is correct.
- B. The number of authorized drills is used to compute annual drill pay.
- C. Only individuals who work can lose income by attending summer camp.

D. All part-time workers are employed for a fraction of a week but work year-round.

Computations:

- A. Enter table of 1978 drill pay (DP) for enlisted personnel. Drill pay depends on pay grade and years of service. To associate a particular drill pay with an individual, use the variable "Analytic Pay Grade Survey" and take years of service from the section of question 9.
- B. Enter "Daily Quarter Rate with Kin (DQRWK)." Assign to individual according to "Analytic Pay Grade Survey."
- C. Define A as = 48 if Q14 = 1; = 24 if Q14 = 2.
- D. Define B as a dummy indicating marital status.

B = 1 if Q35 = 1 (married).

B = 0 if Q35 = 2, 3, 4, or 5 (not married).

E. Calculate Annual Drill Pay (ADP) as

 $ADP = (A) \times (DP).$

F. Calculate SCP as

SCP = 14[DP + (B)(DQRWK)].

- G. Calculate Annual Reserve Pay Less Civilian Income Loss (ARPCIL) as follows:
 - a. If Q40 = 1 or 2 and Q52 = 0 or 2,

ARPCIL = ADP + SCP - (0.0385) (AIPJ)

(AIPJ is defined below under Civilian Hourly Wage Rate).

- b. If Q40 = 1 or 2 and Q52 = 1 or 4, ARPCIL = ADP + SCP.
- c. If Q40 = 1 or 2 and Q52 = 3, ARPCIL = ADP.

d. If Q40 = 3, 4, 5, 6 or 8, ARPCII. ¬ ADP + SCP.
H. Annual Net Drill and Summer Camp Pay (ANDSCP) is defined as ANDSCP = <u>ARPCIL/RPAF</u>,

where RPAF stands for the Reciprocal Price Adjustment Factor.

<u>Net Reserve Time (NRT)</u>. The number of days per year that the reservist is required to devote to monthly drills, summer camp, and travel to and from reserve meetings less any reduction in the number of days worked on the reservist's regular job due to reserve participation.

Assumptions:

T)

- A. Two paid drills per man-day.
- B. Travel time can be expressed on an equivalent-day basis.
- C. If a person can reduce his work time to go to summer camp, he will do so rather than reduce his free time.
- D. Summer camp takes 14 days.

Computations:

A. If Q14 = 1, then A = 24.

If Q14 = 2, then A = 12.

- B. $B = [(Q17) \times (A)]/480$.
- C. If Q40 = 1 or 2 and if Q52 = 0, 1, 2, or 3, then C = 0. If Q40 = 1 or 2 and if Q52 = 4, then C = 14. If Q40 = 3, 4, 5, 6 or 8, then C = 14.

D. NRT = A + B + C.

Assumption:

value is 0.

If the pay grades given on the reserve personnel file and the survey file do not agree, the pay grade on the survey is correct. Computation:

If the variable "Analytic Pay Grade Survey" equals 1, 2, or 3, then PG3 = 1. Otherwise, PG3 = 0.

<u>Pay Grade E5 (PG5)</u>. An indicator variable that takes on the value of 1 if the reservist's rank is E5. Otherwise, its value is 0.

Assumption:

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If the pay grades given on the reserve personnel file and survey file do not agree, the pay grade from the survey is correct. Computation:

If the variable "Analytic Pay Grade Survey" equals 5, then PG5 = 1. Otherwise, PG5 = 0.

<u>Pay Grade E6 (PG6)</u>. An indicator variable that takes on the value of 1 if the reservist's rank is E6. Otherwise, its value is 0.

Assumption:

If the pay grades given on the reserve personnel file and survey file do not agree, the pay grade on the survey is correct.

Computation:

If the variable "Analytic Pay Grade Survey" equals 6, then PG6 = 1. Otherwise, PG6 = 0.

Pay Grade E7 Above (PG7). An indicator variable that takes on the value of 1 if the reservist's rank is E7, E8, or E9. Otherwise, its value is 0.

Assumption:

If the pay grades given on the reserve personnel file and survey file do not agree, the pay grade on the survey is correct. Computation:

It the variable "Analytic Pay Grade" equals 7, 8, or 9, then PG7 = 1. Otherwise, PG7 = 0.

<u>Combat Jób (COMMOS</u>). This indicator variable equals 1 if the reservist has a combat job; otherwise, it is 0.

Assumptions: None.

Computations:

A. Read first two digits of MOS.

- a. Use current MOS from survey if it is available (Q12).
- b. If response to Q12 is missing or "don't know," use duty MOS from personnel file.
- c. If responses to Q12 and duty MOS are missing, use PMOS from personnel file.

d. If a, b, and c are all missing, treat COMMOS as missing.

B. Where we have an MOS,

If first two digits = 11, 12, or 13, COMMOS = 1. Otherwise, COMMOS = 0.

<u>Component</u> (<u>COMP</u>). This indicator variable equals 0 if the reservist is in the Army Reserve and 1 if he is in the Army National Guard.

Assumptions: None.

Computations:

- A. Read ANAL.COMP. variable.
- B. If ANAL.COMP = 1, COMP = 1.
 - If ANAL.COMP = 2, COMP = 0.

The Civilian Job

<u>Civilian Hourly Wage Rate (CHWR)</u>. Earnings per hour from primary job before overtime.

Assumptions:

- A. If a person's primary activity is "Unemployed/laid off," "full-time student," "part-time student," "keeping house," or "other," he does not have a primary job.
- B. All part-time workers are employed for a fraction of a week but work all year.

C. No one works more than 40 hours a week before overtime. Computations:

A. If Q40 = 1 or 2,

a. Compute hours worked (HW) as follows: If Q44 is less than 40, HW = Q44.

If 044 is more than 40, HW = 40.

b. Compute annual income from primary job (AIPJ) as follows: If Q45 was answered as "per hour," $AIPJ = (Q45) \times (HW) \times$

52.

If Q45 was answered as "per week," $AIPJ = (Q45) \times 52$.

If Q45 was answered as "per month," AIPJ = (Q45) x 12.

If Q45 was answered as "per year," AIPJ = Q45.

c. Compute primary job pay per hour: CHWA = AIPJ/(RPAF x HW x 52)

where, RPAF stands for the Regional Price Adjustment Factor.

B. If Q40 = 3, 4, 5, 6, or 8, then CHWA = 0.

<u>Free Time (FT)</u>. The number of hours per week that the reservist has free after putting in the usual number of hours on his regular job and slueping 7 hours a night. [4]

Assumption: 17 usable hours a day. Computation:

A. If Q40 = 1 or 2, then FT = 119 - Q44.

^[4] The Free Time variable corresponds to the Hour-Worked-per-Week variable in Section IV, since the former is defined as a constant value less the latter.

- -122 -1. If Q40 = 3, 4, 5, 6, or 4, then FT = 119. Mark Paid Overties is evaluable from the primery job. Assumptions: None. Computations: A. If Q40 = 1 or 2 and if Q47 = 2 or 3, then A. If Q40 = 1 or 2 and if Q47 = 2 or 3, then A. If Q40 = 1, aFOT = 0. B. If Q40 = 1, aFOT = 20. C. If Q49 = 2, AFOT = 22. C. If Q49 = 3, AFOT = 24. C. If Q49 = 3, AFOT = 24. C. If Q49 = 3, AFOT = 24. C. If Q40 = 1 or 2 and Q47 = 1 or 4, or C. If Q40 = 5, 4, 5, 6, or 8, AFOT = 0. Middle-Sized Private Pire (MBFP). Indicator variable equals 1 if the reservist is employed by a civilian fire with 100 to 500 employees. Otherwise, it equals 0. If Q40 = 1 or 2 and Q42 = 6, then MSFF = 1. Otherwise, MSFF = 0.

Small-Private Firm (SPF). Indicator variable equals 1 if the reservist is employed by a civilian firm with less than 100 employees. Otherwise, it equals 0.

Assumptions: None. Computation:

> If Q40 = 1 or 2 and Q42 = 7, then SPF = 1. Otherwise, SPF = 0.

<u>Self-Employed</u> (<u>SE</u>). Indicator variable equals 1 if the reservist is self-employed. Otherwise, it equals 0.

Assumptions: None. Computation:

> If Q40 = 1 or 2 and Q42 = 2, SE = 1. Otherwise, SE = 0.

Federal Government (FG). Indicator variable equals 1 if the reservist works for the federal government. Otherwise, it equals 0.

Assumptions: None. Computation:

If Q40 = 1 or 2 and Q42 = 1, then FG = 1. Otherwise, FG = 0.

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<u>State and Local Government</u> (<u>SLG</u>). Indicator variable equals 1 if the reservist works for a state or local government. Otherwise, it equals 0.

Assumptions: None. Computation:

> If Q40 = 1 or 2 and Q42 = 2 or 3, SLG = 1. Otherwise, SLG = 0.

Employer's Attitude (EA). An indicator variable that is assigned a value between 1 and 5, depending on the reservist's subjective perception and evaluation of his employer's attitude towards his reserve participation. If the reservist indicates that his employer's attitude is "very favorable," the indicator variable is assigned the value of 1; if the reservist indicates that his employer's attitude is "very unfavorable," the indicator is assigned the value 5. Intermediate evaluations are assigned values 2, 3, and 4.

Assumptions:

- A. A reservice 's supportive evaluation of his employer's attitude can be meaningfully expressed on a cardinal number scale.
- B. Self-employed person are assigned the value of 2. (An employed person would be assigned the value 2 if he judged that his employer was "somewhat favorable" to his participation in the reserve.)
If Q51 = 1, EA = 1. If Q51 = 0 or 2, EA = 2. If Q51 = 3, EA = 3. If Q51 = 4, EA = 4. If Q51 = 5, EA = 5.

Sumptions: None.
Computation:
If Q40 = 1 or 2 and if Q52 = 4, then ESCP = 1.
Otherwise, ESCP = 0.
Sumptions: None.
Description:
If Q40 = 1 or 2 and if Q52 = 4, then ESCP = 1.
Otherwise, ESCP = 0.
Sumption Last Reserve Participation Decision
Initial Enlistment Alternative (IEA). An indicator variable equal to 1 if the reservist first entered military service because he was drafted for active duty or to avoid being drafted. Otherwise, this variable is 0.
Assumption: A person is draft motivated if he indicated on the survey instrument that he first entered military service by the draft or to avoid being drafted and if he has not reenlisted in the National Guard or Army Reserve.

Computation:

If Q6 = 1 or 2 and if Q7 = 0, then IEA = 1. Otherwise, IEA = 0.

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Last Decision: Reenlistment vs Enlistment (PA). An indicator variable equal to 1 if the reservist had previously reenlisted in the reserve.

Assumptions: None.

Computation:

If Q7 = 0, then PA = 0. If Q7 = 1, 2, 3, 4, or 6, then PA = 1.

Years of Service (YOS). Including initial active duty for training, the number of years that the reservist has served in the Army Reserve or National Guard.

Assumptions: None. Computation: YOS = Q9.

The Reservist's Personal Characteristics

<u>Age</u> (<u>AGE</u>). The reservist's age when his current term of service ends.

Assumptions:

A. If a reservist's day and month of birth on our administrative records differ from his survey response, his survey response is correct.

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B. If a reservist's year of birth on our administrative records differs from his survey response, and if only one of the dates is between 1935 and 1958, the date in that interval is correct. If both years fall into the interval, then our administrative record is correct.

Computations:

- A. DOBY stands for year of birth.
- B. Calculate B = 78 DOBY.
- C. Let ETSM stand for month of ETS and DOBM stand for month of birth.
- D. Computa DOBM and ETSM:

- a. If DOBM is greater than ETSM, then AGE = B 1.
- b. If DOBM = ETSM, go to Step F.
- c. If DOBM is smaller than ETSM, then AGE = B.
- E. Let ETSD stand for date of ETS and DOBD stand for date of birth.
- F. If DOBD is greater than ETSD, the AGE = B 1. If POBD < ETSD, then AGE = B.

<u>Race (BLACK)</u>. Indicator variable equals 1 if the reservist is black.

Assumptions: None.

Computation: Use the RACE variable from the reserve personnel master file.

If RACE = 1 or 3, BLACK = 0. If RACE = 2, BLACK = 1.

Sex (SEX). Indicator variable equals 1 if the reservist is female.

Assumptions: None. Computation: Use the ANAL.SEX variable from the reserve personnel master file.

If ANAL.SEX = 1, SEX = 0.

If ANAL.SEX = 2, SEX = 1.

<u>Marital Status (MS)</u>. An indicator variable equal to 1 if the respondent is married. Otherwise, it is 0.

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Assumptions: None.
Computation:
If Q35 = 1, then MS = 1.
Otherwise, MS = 0.
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Spouse's Annual Earnings (SAE). Spouse's 1977 earnings, if any.

Assumptions: None. Computation:

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If Q35 = 1 and Q60 = 1 or 2, then SAE = (Q61/RPAF). Otherwise, SAE = 0.

<u>Number In Household (NIH).</u> Number of people in the respondent's household.

Assumptions: None. Computation: NIH = Q58.

<u>Education</u>: <u>Not a High-School Graduate (NHSD</u>). An indicator variable equal to 1 if the respondent did not receive a high-school diploma.

Assumption: A respondent who has earned a CED diploma is not considered a high-school graduate.

Computation:

If Q38 = 0 or 11, then NHSD = 1. Otherwise, NHSD = 0.

<u>Education</u>: <u>College Graduate</u> (<u>CG</u>). An indicator variable equal to 1 if the respondent has a baccalaureate or higher degree from a college or university. Otherwise, it is 0.

Assumptions: None. Computation: If Q38 = 16, 18, or 20, then CG = 1. Otherwise, CG = 0.

Regional Characteristics

<u>Middle-sized City</u> (<u>NC</u>). An indicator variable equal to 1 if the respondent lives in a city of 50,000 to 250,000 population or in a suburb near such a city. Otherwise, it is 0.

Assumptions: None. Computation: If Q39 = 3 or 4, then MC = 1. Otherwise, MC = 0.

<u>Small City</u> (<u>SC</u>). An indicator variable equal to 1 if the respondent lives in a city or town with a population of less than 50,000. Otherwise, it is 0.

Assumptions: None. Computation: If Q39 = 5, then SC = 1.

Otherwise, SC = 0.

<u>Rural</u> (<u>RU</u>). An indicator variable equal to 1 if the respondent lives in a rural area. Otherwise, it is 0.

Assumptions: None. Computation:

If Q39 = 6 or 7, then RU = 1. Otherwise, RU = 0.

<u>Suburb</u> (<u>SUB</u>). An indicator variable equal to 1 if the respondent lives in a suburb of a city with a population of 50,000 or more.

Otherwise, it is O.

Assumptions: None.

Computation:

If Q39 = 2 or 4, then SUB = 1.

Otherwise, SUB = 0.

<u>Regional Inflation Factor (RIF)</u>. The ratio of the income needed to purchase a mid-level budget in fall 1978 to the income necessary to purchase the same budget in fall 1977.

Assumptions:	See	8	bo	ve.
Computation:	None	۶.		

Appendix F

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MISSING VALUES

Not all the surveys were filled out completely. Because many lacked responses to one or more questions that we had to use, we could not calculate all the values of some variables in our analysis. When only a small percentage of the observations lacked values for a variable, we filled in the missing values with the mean of the available values. Three independent variables--years of service, age, and pay grade dummy--were missing less than 2 percent of their values. So few missing observations means that lack of randomness among the missing values is not a major concern. We inserted the mean values of the observed age and years-of-service variables for their respective missing values and assumed that the missing pay grades were E4s.

When values were missing for a larger percentage of the observations, we created a missing value indicator variable. When a value for the variable was available, its missing value indicator variable was set equal to zero. When a value was not available, the variable was assigned the value of zero and its missing value indicator variable was assigned the value of one. We chose this way to deal with the most serious missing value problems because it allowed us to use all the information available and it provided a means of finding out whether values were missing in a random way.[1] Our missing value indicator variable can be seen at the bottom of Tables 12 and D.4.

[1] Winston K. Chow, <u>A Look at Various Estimators in Logistic</u> <u>Models in the Presence of Missing Values</u>, The Rand Corporation, N-1324-HEW, October 1979. Let X_i be an independent variable, b_i its estimated regression coefficient, I_i its associated missing value indicator variable, and c_i the indicator variable's estimated regression coefficient. We can write a part of the right-hand side of the regression equation as

$$b_i X_i + c_i I_i$$

This expression reduces to $b_i X_i$ when a value for the independent variable is available; it reduces to c_i when a value is not available.

Let X_i stand for the mean of the observed X_i 's. If values of X_i are missing randomly, the expression $b_i \tilde{X}_i^a$ should be about equal to c_i . In other words, the assumption of values missing in a random way implies that:

$$\overline{\mathbf{X}}_{\mathbf{i}}^{\mathbf{a}} \simeq \frac{\mathbf{c}_{\mathbf{i}}}{\mathbf{b}_{\mathbf{i}}} \equiv \overline{\mathbf{X}}_{\mathbf{i}}^{\mathbf{i}} \ .$$

An implied mean of the missing values (\bar{X}_{1}^{i}) may be compared to the actual mean of the observed X_{1} 's. If the actual mean and the implied mean turn out to be significantly different, then the assumption that values of X_{1} are missing randomly does not hold up. The difference between the actual means of the observed values and implied means of the missing values are compared in Table F.1. These means reflect the Guard/Control subsample and maximum likelihood logit regression given in Table 12. The results suggest substantial item response bias for net reserve pay, net reserve time, availability of overtime, employer's attitude, and spouse's earnings.

Table F.1

ITEM RESPONSE BIAS ANALYSIS

Variable	Percentage of Missing Observations	Unit	Mean of Observed Values	Implied Mean or Values
Reserve net pay	20.9	\$ per year	871.30	-896.67
Not reserve time	10.2	Days per year	26.46	-822.83
Free time	5.9	Hours per week	77.06	90.11
Civilian hourly earnings	20.7	\$ per hour	6.68	7.39
Availability of overtime	8.6	Weeks per year	24.92	86.97
Employer's attitude	7.7	Scale of 1 to 5	2.45	3.92
Spouse's earnings	15.6	\$ per year	2,581	40,794

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Appendix G

PAY GRADE VARIABLES

Our basic equation in Table 11 includes not only the annual-netdrill-and-camp-pay (ANDACP) variable but also a set of pay grade indicator variables. When we were doing the econometric analysis, we were not sure whether we should include the pay-grade-indicator variables in our basic equation. However, the decision had more than technical interest; when the pay-grade-indicator variables were included, our estimate of the ANDACP variable's coefficient dropped 40 percent and became much less significant. Here we outline how we decided to include the pay-grade-indicator variables in our basic equation:

From the outset of our analysis, we recognized that one way in which a reservist's pay grade influenced his decisions to reenlist is through monetary compensation--the ANDACP variable.[1] But, whether we also should include the pay-grade-indicator variables seemed to depend on whether a reservist's pay grade also influenced his reenlistment decisions in other ways. (For example, if a reservist's pay grade indicates his relative status in his unit and if higher status would make him more likely to reenlist, them pay grade would have an influence separate from its influence through monetary compensation.)

[1] It is not possible to compute a simple correlation coefficient between the ANDACP variable and our set of pay-grade variables. But, it is possible to compute a correlation coefficient between the ANDACP variable and a single variable that takes on the value of the reservist's pay grade. For all the usable survay responses, the value of the estimated calculation coefficient is 0.17, but it is significantly different from zero at the 1 percent level.

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If pay grade influenced reenlistment decisions only through its effect on monetary compensation, then a set of pay-grade-indicator variables would be redundant and could dilute the estimates of the impact of monetary compensation by dividing it arbitrarily among several variables. But, if a reservist's pay grade also influenced his reenlistment decision in ways other than monetary compensation, the failure to include the set of pay-grade-indicator variables would mean that our estimate of the ANDACP variable coefficient might be subject to missing variables bias and we might be overestimating the impact of monetary compensation.

We used an F-test to decide whether reserve pay grades had a separate effect on reenlistment decisions and, therefore, should be included in our basic equation. The notion that pay grades do not have a separate impact implies that the true values of their coefficients in our basic equation are all zero. We can test the hypothesis that the true values of the coefficients are zero with an F-test.[2] If the value of the F-test indicates that it is most unlikely that the true value of the coefficients of the pay-grade-indicator variables are all zero, we would conclude that a reservist's pay grade influences his reenlistment decision in other ways than monetary compensation. Table G.1 gives the two linear probability relationships that we used to compute our F-test value.[3] The calculated value is 24.95 and 4 and 2827 degrees of freedom. This value indicates that the chances that the

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^[2] Franklin M. Fisher, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions: An Expository Note," Econometrica 38 (March 1970), pp. 362-363.

^[3] The discriminant function is used rather than the logit form because the F-test is predicted on a normal distribution rather than on a logistic one.

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Table G.1

EFFECT OF ADDING PAY-GRADE VARIABLES USING A LINEAR MODEL

Without Pay Grade		Grade	With Pay Grade		
Variable	Coefficient	t-Ratio	Coefficient	t-Ratio	
Reserve pay and time					
Annual net drill and camp pay	0.769×10^{-7}	2.75	0.440×10^{-7}	1.70	
Net reserve time	-0.116×10^{-1}	-0.72	-0.549×10^{-5}	-0.24	
Reserve experience			_1		
Pay grade E3 or below			-0.910 x 10	-2.36	
Pay grade E5			0.133	7.24	
Pay grade E6			0.217	7.04	
Pay grade E7 or above	1		C.449 _1	3.35	
Combat job	-0.605×10^{-1}	-3.45	$-0.651 \times 10_{1}^{-2}$	-3.74	
Years of service	-0.111×10^{-1}	-2.65	-0.153×10^{-1}	-3.69	
Revealed reserve preferences					
Drafc motivation	-0.134	-5.05	-0.125	5.33	
Prior reenlistment	0.224	7.79	0.192	8.90	
Civilian work environment	2		9		
Free time	0.173×10^{-1}	1.90	0.193×10^{-2}	2.15	
Civilian hourly wage	-0.103 x 10	-2.93	-0.126×10^{-3}	-3.64	
Availability of paid overtime	-0.876×10^{-3}	-2.14	-0.894×10^{-3}	-2.22	
Must use vacation	-0.534×10^{-1}	-1.19	-0.514×10^{-1}	-1.16	
Employer's attitude	-0.472×10^{-1}	-5.89	-0.476×10^{-1}	-6.02	
Federal government employment	0.245×10^{-1}	-0.50	-0.349×10^{-2}	-0.07	
State/local government	_1		_1		
employment	0.602×10^{-1}	1.64	0.604×10^{-1}	1.67	
Middle-sized firm employment	0.135×10^{-1}	0.51	0.176×10^{-1}	0.66	
Small firm employment	0.453×10^{-1}	2.00	0.415×10^{-1}	1.86	
Self-employed	$-0.569 \times 10^{-1}_{5}$	-1.21	-0.481 x 10_5	-1.04	
Spouse's annual earnings	-0.177×10^{-3}	-0.76	-0.166×10^{-5}	-0.72	
Individual characteristics					
Sex: female	0.139	2.83	0.144	2.68	
Race: black	0.186 ,	5.30	0.200 _ 1	4.85	
Age	0.133×10^{-1}	4.69	0.120×10^{-1}	4.30	
Married	0.170×10^{-1}	0.70	-0.297 x 10_1	-0.12	
Number in household	0.118×10^{-1}	1.64	0.115×10^{-1}	1.64	
Not high-school graduate	0.126×10^{-1}	0.48	0.382×10^{-1}	1.47	
College graduate	-0.740×10^{-1}	-2.96	-0.922 x 10 ⁻¹	-3.73	
Regional characteristics	•		•		
Middle-sized urban area	-0.194×10^{-1}	-0.67	-0.127 x 10 ⁻¹	-0.44	
Small urban area	-0.279×10^{-1}	-0.94	-0.201×10^{-1}	-0.68	
Rural area	-0.226×10^{-1}	-0.74	-0.138 x 10_,	-0.45	
Suburban area	0.207×10^{-1}	0.73	0.202×10^{-1}	0.73	
1978/1977 local inflation					
factor	0.466	0.61	0.297	0.26	

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Table G.1

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	Without Pay Grade		With Pay Grade	
Variable	Coefficient	t-Ratio	Coefficient	t-Ratio
Missing value indicator (MVIV)				
Annual net drill and camp pay	-0.108×10^{-2}	-0.02	-0.254×10^{-1}	-0.56
Net reserve time	0.264×10^{-2}	0.02	0.462×10^{-1}	0.57
Draft motivation	-0.411×10^{-1}	-0.27	-0.335×10^{-1}	-0.23
Prior reenlistment	0.555×10^{-1}	0.32	0.502×10^{-1}	0.25
Free time	0.178	2.06	0.180	2.00
Civilian hourly wage	-0.860	-2.64	-0.102 ,	-2.20
Availability of paid overtime	-0.897	-2.06	-0.751×10^{-1}	-1.76
Must use vacation	-0.291	-0.52	-0.272×10^{-1}	-0.49
Employer's attitude	-0.186	-3.33	-0.185	-3.33
Kind of employer	0.152	2.96	0.151 .	2.98
Spouse's income	-0.691	-1.89	-0.597×10^{-1}	-1.66
Married	0.112 ,	1.93	0.993 .	1.74
Number in household	-0.407×10^{-1}	-1.20	-0.378×10^{-1}	-1.13
Education	0.437×10^{-1}	-1.13	-0.566×10^{-1}	-1.49
Residential area	-0.238×10^{-1}	-0.20	0.132×10^{-1}	0.11
Intercept	-0.229	-0.32	0.742×10^{-2}	0.01
Number of observations	2876		2876	
Mean square error		0.198		0.192
\mathbf{R}^2		0.22		0.24
F-ratio		17.80		18.92

true values of the coefficients of all the pay-grade-indicator variables are zero is much less than 1 in 100. Pay grades appear to have a separate impact on a reservist's reenlistment decision. To fail to include our set of pay-grade-indicator variables would have meant that the estimates of the other coefficients in our basic equation could be subject to missing variable bias. <page-header><text><caption>

Conversion for		Maximum	
Discriminant Function ^a		Likelihood ^b	
Without	With	With	
Pay Grades	Pay Grades	Pay Grades	
0.394×10^{-3}	0.234×10^{-3}	0.230×10^{-3}	

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