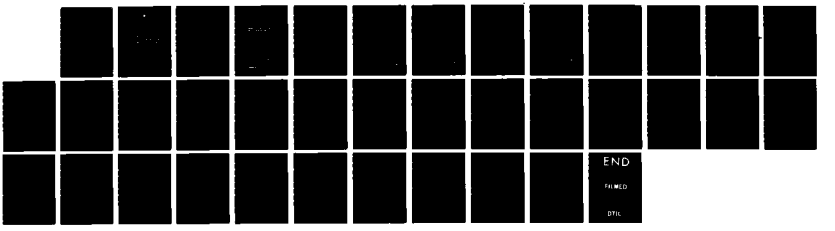
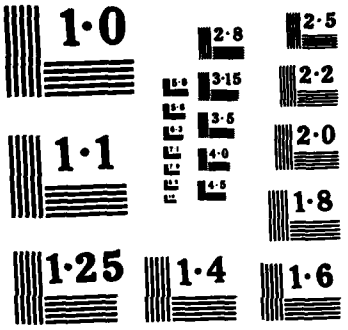
AD-A157 804 AN ANALYSIS OF THE EFFECTS OF VARYING MALE AND FEMALE FORCE LEVELS ANNEX 4.. (U) RAND CORP SANTA MONICA CA R BUDDIN ET AL. MAR 85 RAND/R-3265-AF F49620-82-C-0018 1/1

UNCLASSIFIED F/G 5/9 NL





NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

AD-A157 804

March 1985

United States Air Force
Personnel Force Composition Study:

An Analysis of the Effects of Varying Male and Female Force Levels

ANNEX FOUR:

Reducing the Air Force Male Enlistment Requirement: Effects on Recruiting Prospects of the Other Services

DTIC FILE COPY

DTIC
ELECTE
AUG 0 9 1985
S D
E

This document has been approved for public release and sale; its distribution is unlimited.

prepared for the

USAF Special Study Team
Headquarters,
United States Air Force

85 7 25 030

The research reported here was sponsored by the Directorate of Operational Requirements, Deputy Chief of Staff/Research, Development, and Acquisition, Hq USAF, under Contract F49620-82-C-0018. The United States Government is authorized to reproduce and distribute reprints for governmental purposes notwithstanding any copyright notation hereon.

ISBN: 0-8330-0645-2

The Rand Publications Series: The Report is the principal publication documenting and transmitting Rand's major research findings and final research results. The Rand Note reports other outputs of sponsored research for general distribution. Publications of The Rand Corporation do not necessarily reflect the opinions or policies of the sponsors of Rand research.

Published by The Rand Corporation

R-3265-AF

Reducing the Air Force Male Enlistment Requirement

Effects on Recruiting Prospects of the Other Services

Richard Buddin, Christina Witsberger

March 1985

A Project AIR FORCE report prepared for the United States Air Force

Accession For
NTIS GRA&I
DTIC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist
A-1

Rand
1700 MAIN STREET
P.O. BOX 2138
SANTA MONICA, CA 90406-2138

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

PREFACE

This research was performed for the Special Study Team, Headquarters United States Air Force, in support of its Personnel Force Composition Study. The Special Study Team was formed in response to a Congressional recommendation in the House Armed Services Committee Report on the *FY 1985 Department of Defense Authorizations Act*, that the Air Force undertake a complete review of the gender composition of enlisted accessions.

The research examines the premise that a reduction in the Air Force male recruiting requirement would substantially enhance the recruiting prospects of the other military services (principally the Army). The study was conducted as part of the concept formulation activities of the Project AIR FORCE Resource Management Program.

SUMMARY

If the Air Force filled a larger share of its enlistment requirement with women, how many of the displaced male Air Force recruits would join the Army, Navy, or Marines instead?

This is the key question raised by a Congressional proposal calling upon the Air Force to make a rapid increase in the number of its female nonprior service enlistees. The proposal is intended to increase the numbers of high-quality male personnel available to the Army. It would help the Army if young male Air Force accessions consider the other services to be close substitutes and would enlist in another branch of the armed forces even if denied their first service choice.

Our study concludes that, if the Air Force reduced its male enlistment requirement, most of the displaced male Air Force recruits would choose to remain civilians. Few would enlist in the other service branches. In particular, we estimate that only 5 to 17 percent would enlist in the Army.

Because the highly hypothetical nature of the research question makes it difficult to answer with precision, we approached the problem using several kinds of data and complementary methodologies. Of course, the size of the estimate depends on the data and method used. We examined both individual intentions (what applicants and recruits say they would do or would have done if denied entry into the Air Force) and individual behavior (what Air Force applicants have done who were ineligible for the Air Force but eligible for some other service branch or branches). We also used a multivariate enlistment supply model to predict the likelihood of an individual's choosing a particular service or civilian alternative; this model enabled us to determine the probable "second best" choice of recruits who were eligible for the Air Force but were displaced by an accession policy that reduces the Air Force's male enlistment requirement.

PREVIOUS PAGE IS BLANK

ACKNOWLEDGMENTS

The authors are especially grateful to Colonel Douglas A. Patterson and Captain Daniel L. Burkett II of the Special Study Team, Headquarters United States Air Force for their support and encouragement throughout this project. Jane Crotser and Leslie Willis of the Defense Manpower Data Center prepared working data files on the *1979 DoD Survey of Personnel Entering Military Service* and Air Force applicant transaction histories. George Germadnik and Lieutenant Colonel James Wortman of the Air Force Recruiting Service prepared the data file on the Air Force's Basic Military Training survey. Among Rand colleagues, Robert Bell and Karl Schutz provided invaluable statistical advice on estimation of the multivariate probit model. Julie DaVanzo, James Hosek, Christine Peterson, and Michael Rich, who directs the Project AIR FORCE Resource Management Program, offered valuable comments on various aspects of the research. Rick Eden contributed numerous suggestions to improve the clarity and structure of the note. Helen Turin provided expert editorial advice on the final draft.

PREVIOUS PAGE IS BLANK

CONTENTS

PREFACE iii

SUMMARY v

ACKNOWLEDGMENTS vii

FIGURES AND TABLES xi

Section

I. INTRODUCTION 1

II. HYPOTHETICAL ENLISTMENT INTENTIONS 3

III. ENLISTMENT CHOICES OF AIR FORCE APPLICANTS 8
- Pattern of Choices 8
- Predicting Substitution Between the Air Force and Army 10

IV. ENLISTMENT DECISIONMAKING ANALYSIS 16
- Background 16
- Model of Enlistment/Service Choice 17
- Estimation and Results 19

V. CONCLUSIONS 24

Appendix: VARIABLE DEFINITIONS AND MULTINOMIAL PROBIT RESULTS ... 25

BIBLIOGRAPHY 29

PREVIOUS PAGE IS BLANK

FIGURES

1. Army and Air Force Enlistment Eligibility for Male Air Force Applicants from FY81 Through FY83 9

TABLES

2.1. AFEES Survey Choice Among Alternatives by Education and AFQT 4
2.2. Choice Information from the Basic Military Training Survey 5
2.3. BMT Survey Choice Among Alternatives by Education and AFQT 6
2.4. BMT Survey Choice Among Alternatives by Status Before Enlistment 7
3.1. Enlistment Decisions Among Army-Eligible Air Force Applicants, High School Seniors and Graduates 11
3.2. Percentage of Air Force Applicants Choosing the Army by Fiscal Year, High School Seniors and Graduates 13
3.3. Predicted Army Enlistment Percentages of Potentially Displaced Air Force Enlistees by AFQT Category and Application Cohort, High School Seniors and Graduates 14
4.1. Factors Influencing the Enlistment/Service Choice Decision of High School Seniors in the AFEES/NLS 20
4.2. Factors Influencing the Enlistment/Service Choice Decision of High School Graduates in the AFEES/NLS 22
A.1. Definitions of Probit Variables 25
A.2. Multinomial Probit Regression Results for High School Seniors 26
A.3. Multinomial Probit Regression Results for High School Graduates 27

PREVIOUS PAGE IS BLANK

I. INTRODUCTION

The House Armed Service Committee Report on the *FY1985 DoD Authorization Act* recommends that the Air Force rapidly increase the number of female recruits who have no previous military service.[1] Pressure to attract women is directed toward the Air Force because women are eligible for a larger share of Air Force jobs than for jobs in other services, and in some jobs the proportion of women in the Air Force enlisted ranks is lower than in other services. The proposal is based on the premise that if the Air Force filled a larger share of their enlisted requirements with women, then other services (principally the Army) would have less difficulty meeting their male requirements.[2] The premise is predicated on the belief that individuals consider service alternatives as fairly close substitutes, so that those individuals who now presumably prefer the Air Force will choose another service if the Air Force becomes unavailable. If those preferring the Air Force were unwilling to substitute toward other service alternatives, the proposed reduction in the Air Force male enlistment requirement would do little to ease the potential recruiting difficulties of other services. In short, the key question becomes what percentage of the displaced male Air Force recruits would join the Army, Navy, or Marines, if the Air Force filled a larger share of its enlistment requirement with women?

We utilize several types of evidence to shed light on how young men evaluate their military and civilian career options.[3] Our research relies on an examination of both individual intentions and actual behavior. The intentions data provide insights into how individuals might respond under various hypothetical scenarios. In some circumstances, intentions may be misleading, however, because the individual is not well informed about alternatives. A high school senior who joins the Air Force might believe that he would take a civilian job if the Air Force was unavailable, but he might actually choose another service if civilian job opportunities were less than expected. As a result, it is important to compare the results from the intentions analysis with results based on actual behavior patterns in similar situations.

Our examination of substitution between the Air Force and other services is based on three complementary approaches. The first research approach relies on enlistment intention information collected in personnel surveys of Air Force enlistees. These surveys contain questions about what alternatives the individual would have chosen if he had not joined the Air Force. This type of information can be used to predict whether Air Force recruits would have chosen another service or civilian employment if they had been unable to enter the Air Force. Other survey information can be used to determine how sensitive the hypothetical alternative choice is to economic conditions, status before enlistment, and other factors affecting enlistment.

The second approach predicts the probable substitution between services based on the current behavior of Air Force applicants[4] who are ineligible for the Air Force but are eligible

[1]U.S. House of Representatives Committee on Armed Services, *FY1985 DoD Authorization Act*, 1984, p. 237.

[2]See Representative Les Aspin, "Manning the Military: The Female Factor," unpublished paper, March 5, 1984; *Air Force Times*, March 19, 1984, p. 1.

[3]This research examines how young *men* choose from among service and civilian alternatives. A similar research plan could be extended to examine the choices of young women. Such research might indicate whether an increase in the Air Force female enlisted requirement would draw new recruits largely from the civilian sector or from other services. An analysis of the enlistment behavior of young women is beyond the scope of this research.

[4]All services require individuals to take an aptitude test to determine eligiblity for military enlistment. A common test is used for all services, but each service determines eligibility according to its own criterion. An Air Force appli-

for some other service. In recent years, the Air Force aptitude standards have exceeded those of other services. This phase of the study examines what percentage of ineligible Air Force applicants choose other available military alternatives. The current substitution behavior of Air Force ineligibles (adjusted for quality differences) is used to predict what percentage of currently eligible Air Force applicants would join other services if denied entry into the Air Force.

Our final approach examines how individual background and civilian employment experience influence enlistment/service choice. This approach, which relies on a multivariate enlistment supply model, allows us to predict the likelihood of an individual's choosing a particular service or civilian alternative (civilian employment or schooling). The order of preferences among alternatives can be estimated and used to predict the "second best" alternatives for potentially displaced Air Force enlistees. Also, this approach provides estimates of the importance of such factors as civilian employment status on enlistment and service choice. These estimates provide the capability of evaluating the effect of changing economic opportunities on substitution among alternatives.

The results from all three approaches indicate that young men who join the Air Force do not consider other services to be close substitutes for joining the Air Force. If the Air Force reduced its enlisted male accession requirement, few of the displaced male Air Force recruits would enlist in the Army, and most would probably choose civilian employment or schooling. Although the size of the estimate depends on data and method, the estimated substitution rate of displaced male Air Force recruits for the Army is in the range of 5 to 17 percent.

Section II examines the enlistment intentions of Air Force enlistees if they had not joined the Air Force. In Sec. III, we analyze the actual enlistment choices of individuals who are Air Force applicants. Section IV develops a multivariate model of enlistment and service choice based on individual background, work experience, socioeconomic characteristics, and educational expectations. This model is used to predict what percentage of Air Force enlistees would have chosen other services if the Air Force were unavailable. The final section draws together the estimates from the various approaches.

---

cant, as opposed to an applicant for another service, is an individual who is sponsored by an Air Force recruiter to take the common service aptitude test.

II. HYPOTHETICAL ENLISTMENT INTENTIONS

Military survey data provide our first source of information regarding the possible effects of being denied entry to the Air Force for men who would prefer to enlist in the Air Force. In a previous study (Orvis, 1984), responses to such hypothetical questions on future military enlistment had some predictive ability. In the Youth Attitude Tracking Study (YATS), males aged 16–21 were surveyed on the likelihood of their serving in the military within the next few years. In the follow-up period of three years, it was found that the strength of enlistment intention response did discriminate differences in actual enlistment rates, and the discriminatory ability was strongest for the first year after the survey. In contrast to the YATS, the survey information we use was collected near the actual enlistment decision point, which should increase its reliability and validity.

We have analyzed Air Force enlistees' responses to hypothetical questions on probable actions if they had not enlisted in the Air Force. Data were obtained from two separate surveys: (1) the 1979 DOD Survey of Personnel Entering Military Service—a survey of all persons on their date of enlistment into the military, taken during two 20-day periods in the fall and spring of 1979 (also known as the AFEES Survey, as it was administered at the Armed Forces Entrance Examination Stations);[1] and (2) the Air Force Basic Military Training (BMT) Survey from fiscal years 1982 through the first half of 1984—a survey, taken about once a month, of Air Force recruits who are in their 28th day of basic training.[2] Both surveys were merged with Air Force personnel data on an individual's aptitude test scores[3] and education. The AFEES survey data was weighted to adjust for survey nonresponse in order to make the sample representative of the entire population enlisting into the military during the survey period.[4] (We normalized the weights to sum to the number of observations in our sample.) No weights were provided for the BMT Survey data.

Table 2.1 shows the responses to the question in the 1979 AFEES Survey: "If you were *not able* to enlist in the service you joined today, which service(s) would you try to join?"[5] In addition to the total sample results, the percentages making each choice are reported by specific educational and test score groups to help in detecting whether preferences are very different for "high-quality" vs. "low-quality" Air Force enlistees.[6] Such quality differences are important in assessing policy implications of a change in Air Force enlistment sex ratios because the Army does not have trouble filling enlistment quotas from those in the lesser-educated and lower-scoring population segments.

---

[1]For details on sampling, methods, and survey questions, see Doering, Grissmer, and Morse (1980a, 1980b).

[2]The BMT Survey is given approximately six weeks to one year after enlistment, since the Delayed Entry Program allows individuals to postpone actual active military duty up to one year after signing an enlistment contract.

[3]The Armed Forces Qualification Test (AFQT) is a percentile test score derived from several components—verbal, arithmetic reasoning, and numerical operations—of the Armed Services Vocational Aptitude Battery (ASVAB), a battery of tests given to potential military applicants. The standard groupings of AFQT percentile scores are the following categories: I (93–99), II (65–92), IIIa (50–64), IIIb (31–49), IVa (21–30), IVb (16–20), IVc (10–15), and V (1–9).

[4]For details on survey weighting procedures, see Buddin (1984).

[5]Respondents were allowed to check more than one service, and 7 percent of our sample did so. In these cases, we tabulated the response that matched their highest ranked choice (excluding the Air Force) given in another survey question, in which respondents were asked to rank all four services in order of preference, assuming they were eligible to enlist in all four.

[6]The term "high-quality" is generally accepted as referring to high-school graduates scoring in the upper 50th percentile of the AFQT (Cat I through IIIa).

Table 2.1

AFEES SURVEY CHOICE AMONG ALTERNATIVES BY EDUCATION AND AFQT[a]

Education[b]	If you were not able to enlist in the Air Force, which service would you try to join? Army	Navy	Marines	None	Number
<HS and GED					
Cat I & II	18.0	39.1	11.9	31.1	120
Cat IIIa	7.9	51.3	11.3	29.4	76
Cat IIIb	14.2	49.7	6.1	30.0	61
Cat IV	25.8	74.2	—	—	11
Total	14.6	46.4	9.9	29.1	267
HS Graduates					
Cat I & II	14.0	44.8	6.7	34.5	524
Cat IIIa	13.1	38.2	11.2	37.6	326
Cat IIIb	17.8	43.1	9.4	29.6	358
Cat IV	23.4	32.1	9.2	35.4	173
Total	15.9	41.2	8.8	34.1	1382
>HS					
Cat I & II	22.3	40.1	2.0	35.7	46
Cat IIIa	10.9	25.1	17.6	46.5	10
Cat IIIb	15.2	31.1	16.0	37.7	6
Cat IV	—	—	—	100.0	1
Total	19.4	36.2	5.8	38.6	63
Overall	15.8	41.9	8.9	33.5	1712

SOURCE: 1979 AFEES Survey, Forms 1 and 3.

[a]Entries are the percentage of the row education and test score group with a given response. The "Number" column is the sample size for that row.

[b]Education is from Air Force official records rather than the survey, since a person could have completed some schooling between enlistment and accession.

Overall, one-third of the respondents said they would *not* try to join any other service if they could not enlist in the Air Force, and 16 percent chose the Army. The Navy was apparently viewed as the closest substitute for the Air Force because it was the most-cited alternative.

The majority (81 percent) of respondents were high school graduates with no further education; and because the Army would be most interested in attracting these recruits, the results for this group are also of greater interest than those for the nongraduates.[7] In the high school graduate group, the percentage of Air Force enlistees willing to enlist in the Army (or the Marines) increases somewhat as test scores decline. There is no clear pattern by AFQT for those choosing the Navy or no service.

The question in the AFEES Survey may have biased the responses toward the service categories as it specifically asked the respondent to choose an alternative service, even though a "no service" response box was provided. To examine this possibility, the Air Force BMT Surveys after 1979 included two questions on preferred alternatives to the Air Force. One question, asked early in the survey, posed the more general question, "Which of the following

[7]For completeness, Table 2.1 shows choices by AFQT category for non-high school diploma graduates and those with some schooling beyond high school. These groups have few observations, so the pattern of choice by AFQT within each education group cannot be estimated with precision.

of the Air Force alternative. Suppose an individual preferred the Air Force over all other choices, but that a reduction in the Air Force requirement meant that he was not allowed to join the Air Force. Under the IIA assumption, the individual's probability of choosing all remaining alternatives would increase by a constant proportion (the reciprocal of the unconstrained probability of choosing the Air Force) so that the odds ratio among all remaining choices would be unaffected by the absence of the Air Force alternative.

The IIA assumption is inappropriate for situations where some choices are very close substitutes. Consider the case of commuter transportation choice where X1, X2, and X3 correspond to the utilities associated with a trip by red bus, blue bus, and car respectively. Suppose individuals initially divide equally among the three alternatives, so one-third are using each mode. Now suppose a mode is eliminated. If travel by car is unavailable, one might expect (as the IIA axiom implies) that individuals would move proportionately to the two bus alternatives. If transportation on red buses became unavailable, however, it seems unlikely that commuters would be indifferent to the car and blue bus alternatives. Rather, those people who previously enjoyed the amenities of red bus transportation would probably enjoy similar attributes of blue bus transportation, so that most (if not all) of those displaced would probably choose the blue bus instead of an automobile commute.

Estimation of the effect of a reduction in the male Air Force enlistment requirement on enlistments in other services depends critically on the validity of the IIA assumption. If IIA were valid, then the second choices of displaced Air Force recruits could be predicted from the systematic portion of the enlistment/service choice model ($X_j\beta_j$ for non-Air Force choices). Displaced recruits would move proportionately toward other alternatives depending on their observed, measured characteristics. Alternatively, suppose some unobserved characteristic, such as taste for the military, had a strong effect on the probablity of joining any service. Then predictions based on IIA would understate the probablity that displaced Air Force recruits would join other services, because those joining the Air Force would tend to have higher levels of "military taste" than individuals picked at random and would be more likely to choose another service than indicated by their measured characteristics. The next subsection proposes an enlistment/service choice model that relaxes the IIA restriction.

Multinomial Probit Model

While the multinomial logit model requires the independence of ϵ_j, the multinomial probit model permits estimation of correlations across residuals in different choice equations. The probit model rests on the assumption that the choice residuals have a multivariate normal distribution. The residual vector $(\epsilon_1, \ldots, \epsilon_m)$ has a mean vector zero and covariance matrix Σ. In the probit model, IIA is a special case where Σ is the identity matrix.

The multinomial probit model was used to estimate how observed characteristics affected the enlistment/service choice and whether the residuals across choice equations had nonzero correlations.[1] If there were some common, unobserved taste for military service, then the correlations between service alternatives should be positive and correlations between service and civilian choices should be negative.

The enlistment/service choice model is then used to predict what percentage of displaced Air Force recruits will join other services. The estimated coefficient vector and correlations can be used to predict the probability of an individual choosing each alternative. If the Air

[1]For identification purposes, the variance of ϵ_j was assumed to equal a constant for all j. The common variance term was normalized to equal one.

military, so most random surveys have too few enlistees to allow precise estimation of those factors affecting the enlistment decision. Second, most surveys, like the NLS, draw their military sample from the group of individuals *currently* serving in the military. This sampling approach is inappropriate for an analysis of enlistment choices, where the key question is what opportunities the individual faced *when he enlisted.* In the AFEES-NLS, over 50 percent of the sample are enlistees, and these enlistees are surveyed on the day they sign military enlistment contracts. Choice-based estimation techniques (Manski and Lerman, 1977) are used to derive consistent estimates of the factors affecting enlistment/service choice.

MODEL OF ENLISTMENT/SERVICE CHOICE

Random Utility Concept

A random utility framework (Hausman and Wise, 1978; Maddala, 1983) forms the basis of our model of enlistment/service choice. The primary assumption is that individuals make choices from among service branches and civilian alternatives that maximize their perceived or expected utility. This maximization is subject to errors because of misperceptions by individuals and is observed imprecisely by analysts because all factors affecting individual choice are not measured or observed precisely. Suppose m alternatives are available to each individual. Define a latent (unobserved) variable U_{ij} as the utility that the ith individual associates with the jth choice. Each individual chooses the alternative that maximizes his expected utility. The utility of the jth alternative can be written as

$$U_j = X_j\beta_j + \epsilon_j = V_j + \epsilon_j$$

where X = matrix of individual and choice characteristics with dimensions $I \times (N \times J)$, where I = number of individuals in the analysis, N = number of characteristics, J = number of alternatives available, β = coefficient vector, and ϵ = residual term. The residual captures unobserved characteristics of individual decisionmakers and unobserved attributes of the choices.

The most common functional form used to estimate this type of multinomial choice problem is the multinomial logit model. The logit specification is based on the assumption that the residual terms across equations are independently and identically distributed with extreme value density functions. The probability that the ith individual chooses the jth alternative is

$$\frac{\exp(V_j)}{D}$$

where D = 1 + sum of $\exp(V_j)$ over $m-1$ alternatives, and the probability that he chooses the mth alternative is $1/D$. Multinomial logit models are easily estimated by maximum likelihood procedures because the function is written in closed form.

Independence of Irrelevant Alternatives

While computationally convenient, the multinomial logit model is based on an underlying independence among choices that may be inappropriate for the enlistment/service choice model. In particular, the model requires that the odds ratio between any two choices is unaffected by the presence of other alternatives. This property is known as the independence of irrelevant alternatives (IIA). If this property held, then the ratio of the probabilities of an individual choosing the Army over civilian alternatives would be unaffected by the availability

IV. ENLISTMENT DECISIONMAKING ANALYSIS

Our final approach for assessing how closely other services might substitute for Air Force enlistment comes from a multivariate model of individual enlistment and service choice. In particular, individual career choices are affected by their background, work experiences, socioeconomic chacteristics, and educational expectations. Individuals with certain characteristics may prefer civilian alternatives over military alternatives, or they may prefer some service branches over others. Given the relationship between individual characteristics and choices, the model can be used to predict what alternatives Air Force enlistees would choose if Air Force enlistment became unavailable.

BACKGROUND

The enlistment/service choice model is an extention of the enlist/not enlist model developed by Hosek and Peterson (1985). In their research, Hosek and Peterson examine how individual factors affect the enlistment choice of male high school seniors and nonstudent high school graduates. These two groups have historically been the primary source of most service enlistments with a high school education or more. Hosek and Peterson show that these two groups constitute distinct and well-defined market segments in that the determinants of enlistment vary substantially between the senior and graduate groups. Their enlistment model controls for the individual's age, AFQT percentile, family income, educational expectation (do you expect more schooling?), time since left school for nonstudents, wage rate and hours, job tenure, time not employed, and ethnicity. As predicted from human capital theory, men with stronger attachment to civilian employment (i.e., higher civilian wage or more job tenure) are less likely to enlist than those with low-paying or no jobs. Seniors who expect more education are unlikely candidates for enlistment, but nonstudents who expect more schooling are more likely to join the military than those who do not. Perhaps nonstudents who want more schooling are disappointed with their success in civilian labor markets and view the military either as a better alternative directly or as a vehicle to eventually finance their educational aspirations or receive some vocational training. Overall, Hosek and Peterson find that educational expectations are the primary factor affecting enlistment choice of seniors, whereas work experiences dominate the enlistment decisions of those graduates who are not current students.

The enlistment/service choice model, like the Hosek and Peterson enlist/not enlist model, is estimated on the AFEES-NLS database. This database combines observations from the *1979 DoD Survey of Personnel Entering Military Service* (AFEES) and the 1979 wave of the *National Longitudinal Survey of Labor Force Behavior (NLS)*. Each survey collected information on individual backgrounds and work experiences of young adults in the spring of 1979. The AFEES-NLS contains comparable questions from the two surveys that can be used to analyze the enlistment and service choice decisions of young adults. The AFEES sample contains observations on young men who enlist in the Army, Navy, Air Force, or Marines in the spring of 1979. The NLS sample consists of comparable individuals who do not enlist.

The AFEES-NLS database has two primary advantages over other databases for analyzing enlistment behavior. First, the AFEES-NLS contains a disproportionately large number of enlistee observations. Fewer than 10 percent of the males in recent cohorts have joined the

Taken as a whole, the substitution pattern toward the Army does not vary much between 1981 and 1983. The effect of a reduction in the Air Force male enlistment requirement on Army enlistments would depend on which recruits were displaced, on Army demand constraints, and on economic conditions. The evidence from the behavior of Air Force applicants over the period from 1981 to 1983 indicates that 10 to 23 percent of the recruits displaced by a lower Air Force enlistment requirement would join the Army, depending on the quality mix of those actually displaced and the recruiting environment. If Air Force recruits were displaced randomly, the behavior of applicants suggests that net substitution toward the Army would be about 15 to 17 percent.

Indirect Effect of a Lower Air Force Requirement on the Army

If the Air Force male enlistment requirement declined, the Air Force male application rate would presumably decline as well. If the Air Force were substituting female enlistments for male enlistments, the Air Force recruiters would spend less time recruiting male applicants and the Air Force male application rate would fall. Although the direct effect of this action may enhance Army recruiting prospects in the male market, this direct effect will be partially offset by a reduction in "spinoff" enlistments from the Air Force applicant pool. In recent years, 5,000 to 8,000 Army enlistments per year have come from the Air Force male applicant pool. If the Air Force recruiting effort is curtailed in this market, some of the prospective Air Force applicants who would ultimately join the Army may not enlist.

What proportion of those Air Force applicants who ultimately join the Army would have joined the Army even if they had not been contacted by Air Force recruiting? The answer to this question depends on whether Air Force recruiters are generating an independent interest in the armed services that can be transferred to other services or merely processing individuals with a fixed interest in the service branches. Many, if not most, of the spinoff enlistments might occur even if Air Force recruiting effort is curtailed, but even a fairly small loss in spinoff effects will reduce the rate of substitution associated with the proposed policy.

The full effect of a reduction in male Air Force enlistments may be demonstrated by an example. The proposed policy would raise the female share of accessions from the current level of 15 percent to 25 percent by 1988. Given current accession levels, this change would translate into 6,000 more female accessions annually and 6,000 fewer male accessions. Based on the behavior of Air Force applicants, about 900 (15 percent) of these displaced male Air Force recruits would join the Army. Because the Air Force would be accepting 12 percent fewer males under the policy, we presume that the size of the male applicant pool will be reduced proportionately. As a result, Army spinoffs from the Air Force pool would presumably fall by about 840 (12 percent of, say, 7,000 current spinoff enlistments). Of these 840, there is no good estimate of how many would enlist in the Army. For illustrative purposes, suppose that three-fourths do join the Army. This would leave the Army with 210 fewer enlistments than available through spinoffs from the current Air Force recruiting effort. Combining the substitution effect and the reduction in spinoff enlistments, the reduction of 6,000 male Air Force enlistments would translate into about 690 male Army enlistments per year.[5] Annual male Army accessions are about 115,000, so the effect of the proposed reduction in male Air Force accessions would be an increase in Army enlistments of about 0.6 percent.

[5]The Army is primarily interested in increasing enlistments among those scoring in the upper half of the AFQT test (categories I through IIIa). About 25 percent Air Force enlistees are in categories IIIb and IVa. If the Air Force reduced its male enlistment requirement, some of those displaced Air Force recruits in categories IIIb and IVa may not be wanted or needed by the Army.

emphasis would be placed on higher quality personnel than those in the Air Force-ineligible group and estimated net substitution would be 16 percent for 1981, 17 percent for 1982, and 11 percent for 1983. Average net substitution over the three years is 15 percent.[4] Table 3.3 summarizes how the predicted Army enlistment percentage of potentially displaced Air Force recruits varies with AFQT category and application cohort.

Table 3.3

PREDICTED ARMY ENLISTMENT PERCENTAGES OF POTENTIALLY DISPLACED AIR FORCE ENLISTEES BY AFQT CATEGORY AND APPLICATION COHORT, HIGH SCHOOL SENIORS AND GRADUATES[a]

	Army Enlistment Percentage	Air Force Enlistments
FY81		
Cat I&II	14.6	22,397
Cat IIIa	17.1	11,827
Cat IIIb	18.9	11,987
Cat IVa	22.5	1,586
Overall	16.6	47,797
FY82		
Cat I&II	15.6	21,263
Cat IIIa	16.5	10,898
Cat IIIb	20.4	10,996
Cat IVa	19.5	1,269
Overall	17.1	44,426
FY83		
Cat I&II	9.8	19,149
Cat IIIa	12.4	9,815
Cat IIIb	12.2	5,900
Cat IVa	15.6	106
Overall	10.9	34,970
FY81 - FY83		
Cat I&II	15.9	62,863
Cat IIIa	18.2	32,526
Cat IIIb	19.7	28,886
Cat IVa	19.7	2,960
Overall	17.5	127,193

[a]The percentages are based on the average percentage (weighted) of Air Force-ineligibles less the percentage of Air Force eligibles in each category joining the Army. This percentage is then adjusted for quality differences by a proportionality factor equal to the ratio of the percentage of Air Force eligibles joining the Army in a particular category to the percentage of Army enlistments from Air Force eligibles in category IVa. The overall percentage is the predicted probability of Army enlistment if the Air Force enlistees were displaced randomly.

[4]This estimate is a weighted average of predicted net substitution for each year where the weights are the number of Air Force enlistments in each fiscal year. Net substitution of 15 percent is slightly lower than the 17 percent average calculated in the last subsection. The different estimates occur because the first estimate is imputed from behavior averaged over three years, and the second estimate is the average of predicted substitution for each year. There is no compelling reason to prefer one estimate over the other.

Table 3.2 provides evidence on how substitution of Air Force applicants toward the Army has been affected by changes in cohort quality and service demand constraints. Among those applicants who are Air Force-ineligible and Army-eligible, the percentage enlisting in the Army has fallen from 25 percent in FY81 to 17 percent in FY83. This change reflects the sharp decline in Army category IVb enlistments and moderate decline in category IVa enlistments, while Army enlistments actually rose from 25 to 28 percent in category IIIb. The pattern is consistent with an increasingly demand-constrained environment for the category IVb group and implies that the observed rate of Army enlistments in the category IVb group understates the true supply of Army enlistments. Army enlistments from the pool of Air Force-ineligibles in categories I through IVa falls from 26 percent in 1981 and 1982 to 23 percent in 1983, the strongest recruiting year. Most of this decline in substitution occurs because the category IVa group is demand-constrained in 1983.

The percentage of Air Force-eligibles joining the Army in 1982 and 1983 is about twice that in 1981, the poorest recruiting year in our data. As a result, net substitution toward the Army associated with Air Force ineligiblity declined from 23 percent in 1981 to 20 percent in 1982 and 18 percent in 1983. If Air Force personnel were displaced randomly, then more

Table 3.2

PERCENTAGE OF AIR FORCE APPLICANTS CHOOSING THE ARMY BY FISCAL YEAR, HIGH SCHOOL SENIORS AND GRADUATES[a]

	Air Force-Ineligible		Air Force-Eligible	
	Percent	Number	Percent	Number
FY81				
Cat I&II	—	11	2.4	35,950
Cat IIIa	6.7	30	2.8	18,112
Cat IIIb	24.6	904	3.1	18,499
Cat IVa	26.7	5,127	3.7	2,534
Cat IVb	23.7	4,512		
Total	25.1	10,584	2.7	75,095
FY82				
Cat I&II	—	12	5.3	38,174
Cat IIIa	7.7	13	5.6	18,920
Cat IIIb	28.7	2,227	6.9	19,848
Cat IVa	25.4	7,586	6.6	2,435
Cat IVb	16.7	5,055		
Total	22.9	14,893	5.8	79,377
FY83				
Cat I&II	—	5	4.6	35,994
Cat IIIa	22.2	9	5.8	17,910
Cat IIIb	28.2	2,578	5.7	10,947
Cat IVa	21.0	7,188	7.3	206
Cat IVb	1.7	3,939		
Total	16.8	13,719	5.1	65,057

[a]The entries refer to the percentage of individuals in an AFQT category choosing the Army and the corresponding number of observations in each AFQT category. The table is based on Air Force applicants between 1981 and 1983 who were eligible for active duty Army enlistment and were either high school seniors or graduates.

effect on Army enlistments probably overstates the effect of a reduction in Air Force recruiting requirements, because those displaced under such a policy will come from higher aptitude categories than the groups (categories IIIb and IVa) that dominate current substitution of Air Force-ineligibles toward the Army. Those in categories I through IIIa are likely to have better civilian alternatives than those in lower aptitude groups and are less likely to accept their second-choice service.

The decisions of Air Force eligibles also suggest an adjustment for differences in tastes for the military and military opportunities. Although the percentage choosing the Air Force does not vary much by AFQT, the percentage of Air Force eligibles choosing the Army declines 20 percent from category IVa to categories I and II. This difference presumably reflects differences in military job opportunities, in civilian alternatives, and in individual tastes for military services. Whatever the reasons, the lower rate of Army enlistment by higher quality Air Force-eligible individuals implies that potential recruits displaced by a reduction in male Air Force enlistment requirements will have a smaller net substitution percentage than indicated by the behavior of Air Force ineligibles in categories IIIb and IVa. Displaced individuals in categories I and II can be expected to enlist in the Army at a rate of 16 percent (80 percent of the 20 percentage point net increment). For displaced individuals in category IIIa, the Army enlistment rate would be about 18 percent. The highest level of substitution toward the Army is likely among those in category IIIb, where the behavior of applicants suggests that about 23 percent of the displaced Air Force applicants might choose Army enlistment.

After we adjust for both recruit quality and the propensity of some Air Force applicants to choose the Army regardless of Air Force eligibility, the predicted probability of a displaced Air Force applicant joining the Army is in the range of 16 to 23 percent, depending on AFQT. The Air Force could enhance the effect of the plan on Army enlistments by disproportionately displacing lower quality applicants who would be more likely to choose the Army. Army recruiting objectives, however, focus on individuals in categories I through IIIa who are predicted to shift toward the Army at the rate of 16 to 18 percent. If Air Force recruits were displaced randomly, then more weight would be placed on the higher quality groups (with lower substitution rates), and overall substitution toward the Army would be about 17 percent.

Adjusting for Recruiting Environment

Between 1981 and 1983, the quality of the enlisted recruits changed considerably. The services were attempting to raise quality, and a recession made military service a viable alternative for many who would probably have chosen additional schooling or civilian employment in more prosperous economic times. The quality change was most dramatic in the Army, where the percentage of male high school graduate enlistments rose from 78.1 to 85.8 and the percentage scoring in the upper fiftieth percentile of AFQT rose from 39.9 to 59.2. Air Force quality also improved, although not as dramatically, with the proportion of male high school graduate enlistments rising from 89.2 to 98.4 and the proportion scoring in the upper half of the AFQT test rising from 65.7 to 72.2.[3] As a result of these changes in cohort quality, any assessment of substitution between the Army and Air Force during this period should consider how substitution patterns were affected by the changing recruiting environment between 1981 and 1983. If observed substitution toward the Army was much greater when the civilian economy was sluggish, then predicted substitution from this period may overstate probable substitution in a more typical economic and recruiting environment.

[3]The Defense Manpower Data Center provided these estimates of the changes in recruit quality by service.

Table 3.1

ENLISTMENT DECISIONS AMONG ARMY-ELIGIBLE AIR FORCE APPLICANTS, HIGH SCHOOL SENIORS AND GRADUATES[a]

	Army	Navy	Air Force	Marines	Reserves	Civilian	Number
Air Force-Ineligible							
Cat I&II	—	7.1	60.7	—	—	32.1	28
Cat IIIa	9.6	5.8	51.9	5.8	1.9	25.0	52
Cat IIIb	27.8	12.6	1.6	8.3	8.8	40.9	5,709
Cat IVa	24.2	7.3	0.5	2.2	4.9	60.9	19,901
Cat IVb	14.7	4.6	0.2	0.1	3.6	76.8	13,506
Total	21.4	7.2	0.7	2.4	5.0	63.4	39,196
Air Force-Eligible							
Cat I&II	4.2	3.4	57.0	1.2	1.0	33.3	110,286
Cat IIIa	4.8	3.0	59.2	1.4	1.3	30.4	54,942
Cat IIIb	5.2	2.8	58.6	1.6	1.6	30.2	49,294
Cat IVa	5.2	1.7	57.2	0.8	1.0	34.1	5,175
Total	4.6	3.1	57.9	1.3	1.2	31.9	219,697

[a]The entries refer to the percentage of individuals in an AFQT category choosing each alternative. The table is based on Air Force applicants between 1981 and 1983 who are eligible for active duty Army enlistment and are either high school seniors or graduates. The Air Force-eligible group does not include a category IVb, because individuals with AFQT scores in this range are not eligible for the Air Force.

Most of the Air Force-ineligible population score in the lower fiftieth percentile of the AFQT test, test categories IIIb (31 – 49th percentile), IVa (21 – 30th percentile), and IVb (16 – 20th percentile). Applicants in the IIIb category are more likely to enlist than those in category IV: 28 percent of the Air Force-ineligible category IIIb individuals join the Army compared with 24 percent in the category IVa group and 15 percent in the category IVb group. This difference and the higher category IIIb enlistment rate in other services may indicate greater military job opportunities for higher aptitude recruits. Although those in category IV are eligible for the Army, job opportunities available to these individuals are typically in unpopular, hard-to-fill specialties. Category IV enlistments in the Army were also demand-constrained to different degrees over this period; i.e., the Army set quotas on category IV enlistments that precluded the enlistment of all otherwise eligible individuals in this group.

Adjusting for Differences in Tastes and Opportunities

If fewer Air Force-eligible applicants were allowed to enter the Air Force, how many would join the Army? Air Force applicants in category IVb are not eligible for the Army, so the behavior of Air Force-ineligible applicants in categories I through IVa provides a first approximation. About 25 percent of this group join the Army. The enlistment behavior of Air Force eligibles (as shown in Table 3.1), however, suggests that 5 percent of Air Force-ineligible applicants would probably have joined the Army even if they had been eligible for the Air Force. As a result, the unavailability of the Air Force has a net effect of increasing by about 20 percentage points the probability that an individual will choose the Army (25 percent of Air Force-ineligibles less 5 percent of Air Force-eligibles joining the Army). Moreover, this net

At first glance then, the behavior of Air Force applicants suggests that most of the eligible and ineligible applicants do not consider other services to be a close substitute for Air Force enlistment. If Air Force applicants were simply interested in active duty military service per se and chose Air Force testing randomly, then the percentages of Air Force eligibles joining the Army, Navy, and Marines should be similar to the percentage joining the Air Force. In fact, Air Force enlistment is the dominant service choice of applicants who are eligible for the Air Force. Among Air Force ineligibles, however, close substitution would imply that the percentage enlisting should be quite similar to the percentage of Air Force eligibles enlisting. If the Army and Air Force were close substitutes, then those Army-eligible, Air Force-ineligible applicants would simply join the Army. In fact, however, only 33 percent of those who were eligible for the Army but ineligible for the Air Force enter active duty in some service compared with 66 percent of the Air Force eligibles.[2] Thus, the behavior of Army-eligible Air Force applicants indicates that these individuals do not consider Army enlistment as a close substitute for Air Force enlistment.

PREDICTING SUBSTITUTION BETWEEN THE AIR FORCE AND ARMY

If the Congressional proposal were implemented, a portion of those males currently eligible for Air Force enlistment would not be able to join the Air Force. The behavior of these displaced male Air Force recruits can be predicted from the enlistment decisions of ineligible Air Force applicants. Because all Air Force-eligible applicants are Army-eligible, the displaced recruits will all have the option of joining the Army. Overall, 20 percent of the Air Force-ineligible applicants who are Army-eligible join the Army, but the quality of the Air Force recruits displaced by the Congressional proposal would exceed that of these Air Force-ineligible recruits. As a result, the predicted substitution rate must be adjusted for changes in the substitution rate associated with quality differences. Higher quality recruits—those with more education and higher mental aptitude—presumably have better civilian alternatives than lower quality recruits and also have better job options in the military than low-quality recruits. Taste for the military may also vary with education or mental aptitude, so substitution patterns should be examined across quality.

Recruit Quality and Enlistment Choice

Table 3.1 reports enlistment decisions of Army-eligible Air Force applicants by quality differences. General aptitude is typified in terms of the Armed Forces Qualification Test (AFQT) category that measures general aptitude and potential for military trainability. The population described in the table is restricted to high school graduates and seniors: These groups constitute over 90 percent of all Air Force applicants and are most sought after by Army recruiting. The behavior of Air Force-ineligible high school graduates and seniors closely parallels that of the entire population of Air Force-ineligible, Army-eligible applicants: 21 percent join the Army, 63 percent do not enlist, and another 5 percent enlist in reserve components.

---

[2]This difference may be exaggerated in Fig. 1 because there is no adjustment for Navy and Marine eligibility. Some of the Army-eligible, Air Force-ineligible group might have been willing to join the Navy, for example, but were ineligible. Further analysis of applicants by mental aptitude, however, indicates that Air Force applicants are unlikely to join the Navy and Marines, regardless of aptitude. This suggests that the low rate of substitution toward the Navy and Marines is probably not severely biased by eligibility restrictions on entry.

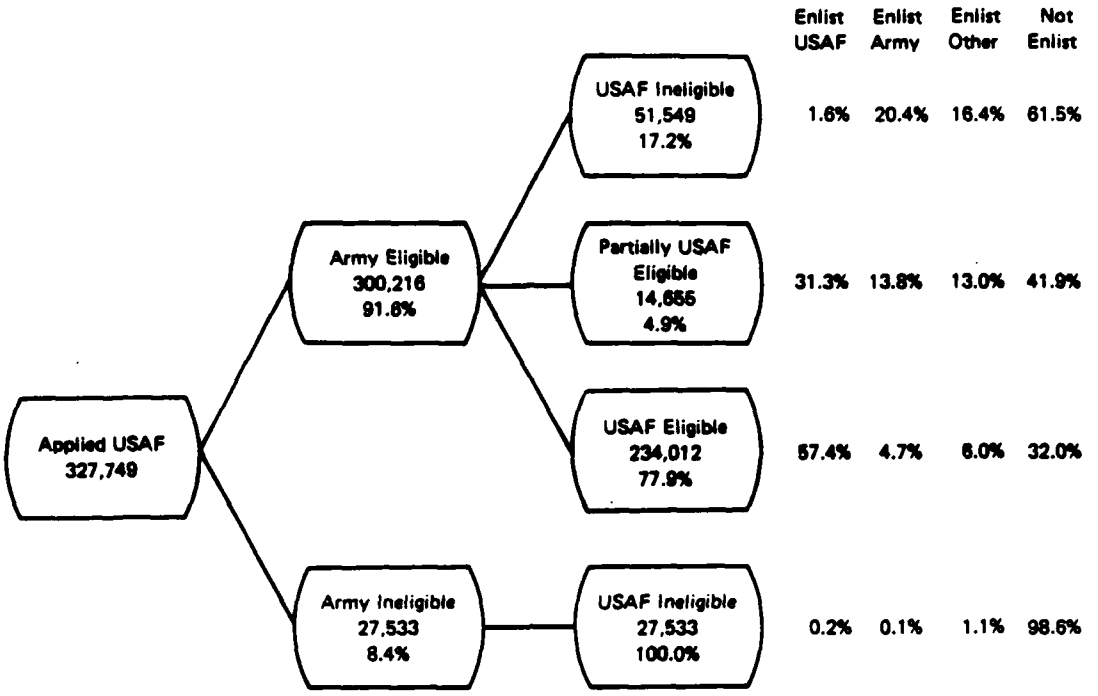


Fig. 1—Army and Air Force enlistment eligibility for male Air Force applicants from FY81 through FY83

services.[1] Another 6 percent join reserve or national guard units in lieu of active full-time military service. The percentages joining active duty are 20, 8, and 3 for the Army, Navy, and Marines, respectively.

The two remaining categories of Air Force applicants in Fig. 1 are not used in our analysis. Those applicants who are ineligible for both the Army and Air Force would remain so under the Congressional proposal. Service preferences for those in this category are unknown, because these men are not allowed to reveal their choices. The other undiscussed category shown in Fig. 1 contains individuals who are Army-eligible but only partially eligible for the Air Force. In this small group (5 percent of those Army-eligible), some were very close to Air Force eligibility standards and were presumably given eligibility waivers depending on recruiting conditions, military job preferences, or other factors. As a result, the specific availability of the Air Force alternative is indeterminate in this category. As one would expect, the percentages of partially Air Force-eligible applicants choosing the Air Force and Army are between those percentages for the Air Force-ineligible and -eligible categories.

[1]Figure 1 shows that some recruits who did not meet the Army or Air Force eligibility criterion were allowed to enter these services. About 0.3 percent of those "ineligible" for the Army and Air Force enlisted. Similarly, 1.6 percent of those who were Army eligible and Air Force "ineligible" enlisted in the Air Force. Most of these errors in defining eligibility are probably caused by errors in recording ASVAB test scores for some individuals. In general, our service eligibility rules work well. Only 0.3 percent of the male Air Force applicants enter a service for which they were believed to be ineligible.

III. ENLISTMENT CHOICES OF AIR FORCE APPLICANTS

The actual behavior of current Air Force applicants provides insights into the alternatives that would be chosen if fewer males were allowed to enter the Air Force. In recent years, about 100,000 young men per year have tested for active duty Air Force eligibility. These applicants take the Armed Services Vocational Aptitude Battery (ASVAB), a common test administered to applicants for enlistment in the armed services. The Air Force, like other services, determines eligibility based on demonstrated skills in various test areas and educational attainment that are related to probable military success. Each service determines eligibility separately, so individuals eligible for enlistment in one service may be ineligible for enlistment in another. Air Force applicants are not obligated to the Air Force. They can choose to enlist in any service for which they are eligible or they can choose not to enlist. Available service alternatives can be determined for all Air Force applicants because the other services define eligibility in terms of test information from the ASVAB along with educational attainment.

We are particularly interested in whether Army enlistment is a fairly close substitute for Air Force enlistment, both because Army accession levels are high relative to other services and because the Army has historically had the greatest difficulty reaching its recruiting objectives. Under the Congressional proposal, fewer males would be allowed to enter the Air Force. The behavior of these displaced Air Force recruits can be predicted from the enlistment choices of ineligible Air Force applicants. This prediction is adjusted for the quality difference between those currently ineligible for the Air Force and those likely to be displaced by a reduced male accession goal. Finally, the predicted shift toward the Army must be adjusted for the reduced male recruiting effort of the Air Force. Many Army recruits currently come from the Air Force applicant pool, and some of this "spinoff" effect may be lost if male Air Force recruiting effort is curtailed.

PATTERN OF CHOICES

Figure 1 describes the enlistment opportunities and choices of applicants to the Air Force during FY81 through FY83. The Army's eligibility standards are not as restrictive as those of the Air Force. As a result, 92 percent of the applicants who test for the Air Force are eligible for the Army but only 71 percent are eligible for the Air Force. Among those applicants eligible for the Air Force, the Air Force is clearly the preferred service alternative: More than five times as many choose Air Force enlistment as choose enlistment in all other services combined. Only 5 percent of the Air Force applicants who are eligible for the Air Force join the Army, with 3 and 1 percent entering active duty in the Navy and Marines respectively. After Air Force enlistment, the second most common choice by Air Force-eligible applicants is nonenlistment (civilian employment or schooling). If we combine civilian alternatives and reserve enlistments, 33 percent of the Air Force-eligible applicants forgo active duty enlistment compared with 57 percent who join the Air Force and 10 percent who enter active duty in the Army, Navy, and Marines.

Among Air Force applicants who are eligible for the Army but not eligible for the Air Force, 62 percent prefer civilian alternatives over available enlistment opportunities in other

A tabulation of preferred alternatives by status before enlistment (see Table 2.4) shows that respondents are most likely to say that they would continue in their current situation if they had not enlisted in the Air Force. Students would continue in school and those in the labor force would probably continue working. Part-time workers are the exception, being nearly evenly split between employment and school (this may indicate that many of them are also students, although they did not cite this as their "primary" status). There are no strong preferences for service alternatives by primary status before enlistment, although the unemployed are most likely to consider joining another service branch, and those with full-time jobs are least likely to substitute another service for the Air Force. Also, the unemployed are about twice as willing to enlist in the Army as those employed full time. We might infer from this that the Army could gain more recruits from applicants turned away from the Air Force during recessionary periods; but under poorer economic conditions, the Army itself has received an increase in applicants and does not have as much difficulty meeting its enlistment requirements. However, even among the unemployed, only 25 percent cite other services as a probable alternative to the Air Force.

In summary, military survey data indicate that perhaps 5 to 15 percent of men who qualify for and apply to the Air Force would enlist in the Army if denied entry to the Air Force; and the estimate of less than 10 percent from the non-service-directed BMT Survey question seems more probable. Those with fewer civilian alternatives (the unemployed and lower test score groups) appear to be more amenable to Army enlistment. But no classification criteria based on education, aptitude test scores, or status before enlistment show any group of Air Force recruits with a strong desire for substituting other service branches for the Air Force.

Table 2.4

BMT SURVEY CHOICE AMONG ALTERNATIVES BY STATUS BEFORE ENLISTMENT[a]

	Which of the following actions would you most probably have taken if you had not enlisted in the Air Force?					
Status	Army	Navy	Marines	Civ Job	School	Number
High School Student	6.8	12.0	4.0	24.2	53.0	776
College/tech Student	5.0	12.5	3.8	29.0	49.7	497
Employed Full-time	4.5	8.8	3.1	50.3	33.3	1730
Employed Part-time	7.5	10.2	3.6	36.8	42.0	786
Looking for Job	9.5	11.6	3.4	50.4	25.0	524
Total	6.1	10.4	3.5	40.7	39.3	4313

SOURCE: Basic Military Training Survey, FY 1982-84.

[a]Entries are the percentage of the row status group with a given response. The "Number" column is the sample size for that row.

AFEES-worded question. This consistency in response pattern demonstrates that the questions do have reliability for those making a service choice in the more general question. We can thus be more confident in expecting less than 10 percent of Air Force enlistees to seriously consider enlisting in the Army if the Air Force were not available to them.

Although the AFEES survey data showed that high AFQT graduates had less interest in the Army than those with low aptitude, this pattern is not present in the BMT data.[9] The percentage of high school graduates who chose the Army in the general question (see Table 2.3) does not vary systematically from the average of 6 percent for all graduates. However, in the two civilian response categories, a greater proportion chose employment over school in both the less-than-high-school and greater-than-high-school education groups. This pattern might be expected because persons in these categories have already tried, and presumably rejected, school. More of the lower-scoring (Cat IIIb and IV) high school graduates also preferred working to attending school, which also seems reasonable as they probably had not done as well in school as others.

Table 2.3

BMT SURVEY CHOICE AMONG ALTERNATIVES BY EDUCATION AND AFQT[a]

	Which of the following actions would you most probably have taken if you had not enlisted in the Air Force?					
	Army	Navy	Marines	Civ Job	School	Number
<HS and GED						
Cat I & II	11.0	12.1	3.3	44.0	29.7	91
Cat IIIa	1.4	16.7	4.2	41.7	36.1	72
Cat IIIb	—	—	—	50.0	50.0	2
Cat IV	—	—	—	66.7	33.3	3
Total	6.6	13.7	3.6	43.4	32.7	168
HS Graduates						
Cat I & II	6.2	11.4	2.9	37.3	42.2	1191
Cat IIIa	5.0	8.9	3.5	39.8	42.9	835
Cat IIIb	6.5	8.8	4.3	41.9	38.5	771
Cat IV	6.1	9.9	7.6	42.7	33.6	131
Total	5.9	9.9	3.6	39.4	41.0	2928
>HS						
Cat I & II	7.0	10.7	2.8	44.5	34.9	824
Cat IIIa	5.0	10.1	4.0	43.1	37.7	297
Cat IIIb	6.1	12.2	3.6	37.6	40.6	197
Cat IV	—	21.4	14.3	21.4	42.9	14
Total	6.4	10.9	3.3	42.9	36.5	1332
Overall	6.1	10.3	3.5	40.7	39.3	4406

SOURCE: Basic Military Training Surveys, FY 1982-84.

[a]Entries are the percentage of the row education and test score group with a given response. The "Number" column is the sample size for that row.

[9]In Table 2.3 we used the education marked by the respondent on the BMT survey, rather than from his official record. In contrast to the AFEES sample, a much smaller proportion of enlistees do not have a high school diploma and a greater proportion say they have some education beyond high school. This is at least partly due to an increased supply of higher quality applicants in 1982-84 (described in more detail in Sec. III). Also, about 50 percent of those who said they had education beyond high school had official records that indicated only a high school diploma—the official record data only records a person as having some college if at least 15 semester hours are completed, whereas the BMT survey simply had a category marked "some college." Preliminary tabulations using the official record education did not show any major differences in results.

actions would you most probably have taken if you had not enlisted in the Air Force?" The other question, asked near the middle of the survey, was the same as the AFEES Survey question, except the respondent was told to check only one response.

Table 2.2 shows a cross-tabulation of the responses to these two questions for the combined fiscal years of 1982 through 1984.[8] Substantially fewer recruits give a service response to the more general question (the rows in Table 2.2) than the service specific question. The difference in the percentage of respondents choosing a specific service as an alternative to Air Force enlistment, rather than civilian opportunities, is large enough (e.g., 6 percent vs. 15 percent for the Army and 10 percent vs. 31 percent for the Navy) to suggest that the wording of the AFEES Survey question did channel responses toward the service choices.

The responses to the AFEES-worded question (the columns in Table 2.2) were similar to those in the AFEES Survey, with 15 percent saying they would try to join the Army. There was an increase to 46 percent (rather than 34 percent in the AFEES survey) in those who said they would *not* try to join another service branch, with a corresponding decrease in those choosing the Navy. The similarity of responses to the same question in the two surveys helps ascertain that the results were not strongly affected by the differences in time period (either in survey years or in the point during the enlistment process when surveyed—actual enlistment date versus basic training).

Many respondents who cited a civilian choice (job or school) in the more general question switched to a service choice in the later question, and this accounts for most of the response difference between the two questions. There was a good degree of consistency for those selecting a service branch in both questions, however—approximately 92 percent of those who selected a service in the general question responded with the same service choice in the

Table 2.2

CHOICE INFORMATION FROM THE BASIC MILITARY TRAINING SURVEY[a]

		If you had not been able to enlist in the Air Force, which other service would you have tried to join?				
		Army	Navy	Marines	None	Total
Which of the following actions would you most probably have taken if you had not enlisted in the Air Force?	Army	252	12	2	4	270 (6.1%)
	Navy	7	424	5	19	455 (10.3%)
	Marines	5	6	139	6	156 (3.5%)
	Civilian job	194	427	85	1087	1793 (40.7%)
	School	220	509	104	899	1732 (39.3%)
	Total	678 (15.4%)	1378 (31.3%)	335 (7.6%)	2015 (45.7%)	4406

SOURCE: Basic Military Training Surveys, FY 1982-84.
[a]Entries are numbers of respondents. Percentages are based on the total sample.

[8]Analysis by individual fiscal year revealed no time trends in survey response to the questions discussed in this research.

Force alternative becomes unavailable for certain Air Force enlistees, new choice probabilities are assigned for remaining alternatives. If correlations across choices are nonzero, then the predicted probability of choosing some alternatives will rise disproportionately relative to other choices. The predicted probabilities of joining each service are averaged over displaced individuals to determine the net effect of the reduction in Air Force requirement on enlistment in the other services.

The size of substitution toward other services will depend on which types of Air Force recruits are displaced. As in previous sections, we will calculate predicted substitution assuming that recruits are displaced randomly and then show whether predicted substitution varies substantially with recruit quality.

ESTIMATION AND RESULTS

The enlistment/service choice model was estimated for high school seniors and nonstudent high school graduates. Computational considerations dictated that the multivariate probit model could be estimated for only four alternatives.[2] The Marines were dropped from this phase of the analysis because they were the smallest service branch and substitution of Air Force recruits toward the Marines is not a major focus of this research.

Correlations Across Choice Equations

The estimated residual correlations across choice equations are all statistically insignificant for students and nonstudents. A special model was also estimated that allowed for a common correlation among the service alternatives and between the service alternatives and the civilian choice. This more restricted model tested the assumption that the residuals had a common, unmeasured component related to a taste for military service.[3] The correlations in the restricted model are also insignificant; t-statistics for estimated correlations in all specifications were typically less than 0.5.

The insignificance of the correlations implies that the IIA property holds for the enlistment/service choice model. The predicted substitution of potentially displaced Air Force recruits is simply a function of the systematic portion of the estimated utility function.

Individual Characteristics in the Enlistment/Service Choice Decision

In their research, Hosek and Peterson (1985) show that the individual background, prior work experiences, and educational expectations affect the enlistment decision. One would expect that many factors would have a similar effect on the decision to enter any particular service. For example, individuals with fairly high wages and long job tenure are unlikely to change jobs and are not likely to join any service. However, individuals may perceive enlistment in different services as satisfying different personal and career objectives. For example, one service may offer more skill training in a particular area, so potential recruits interested in this training may forgo fairly high civilian wages to acquire the training.

---

[2]Maximum likelihood probit estimation requires costly evaluation of multiple integrals. Estimation costs rise disproportionately with the number of choices. The multivariate probit model with four choices requires evaluation of a trivariate normal. Amemiya (1981) and Maddala (1983) have suggested that costs and computational difficulties preclude consideration of more than four alternatives.

[3]Multicollinearity among estimated correlations might have precluded measurement of significant correlations in the unrestricted model. The restricted model estimated, with common service correlations, was the most apparent alternative model specification if independence did not hold.

Tables 4.1 and 4.2 summarize the results from the multinomial probit regressions for samples of seniors and nonstudent high school graduates respectively. The characteristics are grouped into four categories: demographics, socioeconomic factors, whether the individual expects more education, and employment history. The tables report the significance of all coefficients relative to the Air Force alternative. A statistically significant positive effect of civilian wage rate in the civilian/Air Force equation, for example, indicates that increases in the ratio of civilian to military pay will increase the probability that a potential recruit will prefer the civilian alternative to the Air Force. Complete regression results are presented in the appendix.

Results for High School Seniors. The primary demographic differences between seniors who prefer civilian alternatives to the Air Force relate to individual aptitude. A dummy variable was included in the regression specification to adjust for service demand-constraints on those in AFQT category IV. The positive sign of the coefficient in the civilian/Air Force equation indicates that those scoring in this range are more likely to remain

Table 4.1

FACTORS INFLUENCING THE ENLISTMENT/SERVICE CHOICE DECISION OF HIGH SCHOOL SENIORS IN THE AFEES/NLS[a]
(All choices relative to Air Force)

Characteristic	Civilian/ Air Force	Army/ Air Force	Navy/ Air Force
Demographics			
Age when senior			
Age 17	0	0	0
Age 19+	−	0	0
Black	0	+	0
Hispanic	0	+	0
AFQT score	+	0	0
AFQT Cat. IV	+	+	+
Socioeconomic factors			
Live at home	0	−	0
Family income	+	0	0
Number of siblings	0	0	0
Education of mother	0	0	0
Expect more education	0	−	−
Employment history			
Ln hourly wage	+	0	0
Weekly hours, employed	0	0	0
Ln months on job, employed	+	0	0
Not currently employed	0	0	0
Months not employed	−	+	0
Not employed last 12 mos.	+	0	0

[a]Entries show the signs of effects that differ significantly from zero at the 5 percent level. Positive, negative, and insignificant effects are represented by plus, minus, and zero, respectively. Coefficients and t-statistics are reported in appendix Table A.2.

civilian than join the Air Force. After demand-constrained enlistments are controlled for, AFQT score has a positive effect on the probability of choosing civilian alternatives. This presumably reflects the fact that many high aptitude seniors choose college over service enlistment. Another measure of learning proficiency in the regression specification was age when a senior. The results indicate that slower students who are age 19 or older in their senior year are less likely to join the Air Force. Blacks and Hispanics are neither more nor less likely to prefer civilian alternatives to Air Force enlistment.

Socioeconomic background affects the ability of young adults to finance higher education or job training as well as individual career goals. Most socioeconomic factors do not significantly affect the choice between civilian and Air Force alternatives. The exception is family income. Family income is positively related to the probability of choosing civilian alternatives over Air Force enlistment, reflecting the fact that the ability to finance higher education rises with family income.

Surprisingly, seniors who expect more education do not prefer the civilian alternative to Air Force enlistment. We had expected that those seniors expecting more education would prefer entering postsecondary institutions after high school graduation. The results suggest that many young men defer their formal education plans and enter the Air Force.

Most seniors have some labor market experience, and this experience has an important bearing on their enlistment decision. Other things equal, individuals with better civilian employment alternatives are less likely to enlist than those with poor job prospects. As expected, nonenlistees have higher civilian wages, more job tenure, and less time out of work than those who join the Air Force.

Many variables have similar effects on the enlistment decision of seniors, regardless of service chosen, but some differences are important. Air Force recruits are more likely to expect more schooling than recruits in either the Army or Navy. In fact, after the ability to finance higher education is controlled for, educational expectations do not significantly affect the choice between Air Force enlistment and the civilian alternative. Apparently, many young men believe that Air Force service is complementary to their educational expectations. Young men with strong attachments to the civilian labor force are less likely to join any service, but individuals with more time out of work are more likely to join the Army than either the Air Force or the Navy.

Results for Nonstudent High School Graduates. Most demographic factors are insignificant in the civilian/Air Force choice equation. The learning proficiency and minority status coefficients are all insignificant. Nonenlistment is positively related to time since leaving school. Graduates who have been out of school for a while have presumably settled into a civilian career path and are unlikely to join the Air Force. Young men with some postsecondary schooling have better civilian opportunities than those who do not and prefer these alternatives to Air Force enlistment.

Socioeconomic background was expected to have less effect on nonstudent graduates than on seniors, because most of these individuals are more self-sufficient than seniors. The results indicate that socioeconomic factors do not affect the enlistment choice of nonstudent high school graduates.

Among nonstudent high school graduates, most significant differences between nonenlistees and Air Force recruits relate to labor market variables. As with high school seniors, a strong attachment to the civilian labor market reduces the chances of Air Force enlistment. Young men joining the Air Force have less civilian experience (as measured by months out of school), lower wage rates, less time on their current job, and more time out of work (among

Table 4.2

FACTORS INFLUENCING THE ENLISTMENT/SERVICE CHOICE DECISION OF HIGH SCHOOL GRADUATES IN THE AFEES/NLS[a]
(All choices relative to Air Force)

Characteristic	Civilian/ Air Force	Army/ Air Force	Navy/ Air Force
Demographics			
Age when senior			
Age 17	0	0	0
Age 19 +	0	0	0
Black	0	+	0
Hispanic	0	0	0
AFQT score	0	0	0
AFQT Cat. IV	0	0	+
Some postsec. schooling	+	0	0
Ln months since school	+	0	0
Socioeconomic factors			
Live at home	0	0	0
Family income	0	0	0
Number of siblings	0	0	0
Education of mother	0	0	0
Expect more education	–	–	–
Employment history			
Ln hourly wage	+	0	0
Weekly hours, employed	0	0	–
Ln months on job, employed	+	0	0
Not currently employed	0	0	0
Weekly hours, not curr. emp.	0	0	0
Months not employed	–	0	0
Not employed last 12 mos.	0	0	0

[a]Entries show the signs of effects that differ significantly from zero at the 5 percent level. Positive, negative, and insignificant effects are represented by plus, minus, and zero, respectively. Coefficients and t-statistics are reported in appendix Table A.3.

The educational expectations of nonstudent Air Force enlistees are anomalous relative to those who choose other alternatives. In general, nonstudents who want more schooling are strong candidates for enlistment. Air Force recruits are more likely to prefer more education than either Army or Navy recruits, so that the Air Force is the most common alternative chosen by nonstudents who want more education. This result, like that for high school seniors, indicates that the Air Force is perceived as offering either valuable skill training as a substitute for formal education or job experience as a prelude to further education.

Predicted Alternatives for Displaced Air Force Recruits

The estimated enlistment/service choice model can be used to predict how a reduction in the male Air Force enlistment requirement would affect enlistment in other services. The level of substitution will depend on how the policy is implemented, because some Air Force enlistees are more (or less) likely to accept a "second best" service choice. Nevertheless, the insignificant coefficients on AFQT score for the Army and Navy relative to the Air Force indicate that substitution toward these services is not sensitive to the aptitude of those displaced.[4] The enlistment/service choice estimates suggest that those Air Force recruits in category I and II are neither more nor less likely to choose the Army or Navy than those in category IIIb if the Air Force became unavailable.

If the Air Force alternative were unavailable to some Air Force enlistees, the estimates from the enlistment/service choice model indicate that most of those displaced would prefer civilian alternatives to enlistment in other service branches. About 96 percent of the displaced high school seniors are predicted to remain civilians compared with 2 percent each enlisting in the Army and the Navy. Among nonstudent high school graduates, 90 percent are predicted to choose nonenlistment, with 5 percent each joining the Army and the Navy. Although substitution toward the other services is quite low, Air Force enlistees are much more likely to choose enlistment in other services than individuals picked at random. General population enlistment rates for the AFEES-NLS period were 1 percent each for the Army and Navy among high school seniors, and 2 and 1 percent per year among nonstudents for the Army and Navy respectively (Hosek and Peterson, 1985).

---

[4]This presumes that those displaced will be in categories I through III. Those in category IV would perhaps substitute at higher rates (depending on demand constraints in other services), but well over 90 percent of recent Air Force enlistments have been in categories I through III.

V. CONCLUSIONS

A reduction in the male Air Force enlistment requirement would do little to alleviate recruiting difficulties of the Army or other service branches. Most young men who join the Air Force do not consider other services to be close substitutes for joining the Air Force. The evidence from both hypothetical intentions data and actual behavior indicates that most of the potentially displaced Air Force recruits would prefer civilian employment or schooling over a "second best" service choice.

The substitution rate of displaced male Air Force recruits to the Army is predicted to be in the range of 5 to 17 percent. Over this range, the estimate depends on methodology. About 6 percent of Air Force recruits claim that they would have joined the Army if they had not joined the Air Force. Similarly, the multivariate enlistment/service choice model indicates that about 5 percent of Air Force enlistees would substitute toward the Army. The actual enlistment choices of Air Force applicants suggest that 15 to 17 percent of Air Force enlistees would join the Army if the Air Force become unavailable. Although the complementary methodologies do not provide a uniform substitution estimate, they all support the conclusion that the substitution rate would be low.

With substitution rates of this magnitude, the Congressional proposal would do little to increase Army recruiting prospects. Increasing the female share of Air Force accessions from 15 to 25 percent would displace 6,000 male Air Force recruits. We estimate that 300 to 1,000 of these young men would be willing to shift to the Army. With current Army male accessions at 115,000, the proposal would raise accessions by 0.3 to 0.9 percent. Even this small increase may be diminished because the Army benefits indirectly from "spinoff" enlistments of young men who were originally Air Force applicants. Given the low predicted substitution rates, even a slight reduction in these spinoffs would be enough to significantly reduce the Army's benefit from the proposal. Furthermore, some of those displaced will not be high quality recruits, and the Army may not want or need more low quality recruits. Taken as a whole, the proposed reduction in the Air Force male enlistment requirement will not increase Army recruiting prospects appreciably.

Appendix

VARIABLE DEFINITIONS AND MULTINOMIAL PROBIT RESULTS

Table A.1

DEFINITIONS OF PROBIT VARIABLES

Variable Name	Variable (Indicator) Definition
Demographics	
Age when senior	
Age 17	Indicator for age 17 when senior
Age 18	Indicator for age 18 when senior
Age 19+	Indicator for age 19 or older when senior
Ethnic group	
Black	Indicator for whether individual is black
Hispanic	Indicator for whether individual is Hispanic
Others	Indicator for whether individual is neither black nor Hispanic
AFQT score	Percentile score on the Armed Forces Qualification Test (AFQT)
AFQT Cat. IV	Indicator for AFQT percentile score between 10 and 30
Some postsecondary schooling	Indicator for whether high school graduate has some schooling beyond high school
Ln months since school	Logarithm of months since high school graduate left school
Socioeconomic factors	
Live at home	Indicator for whether individual lives with parents or guardians
Family income	Family income in thousands of dollars for those individuals who live at home
Number of siblings	Number of brothers and sisters
Education of mother	Mother's years of schooling
Expect more education	Indicator for whether individual expects to eventually get more schooling
Employment history	
Ln hourly wage	Natural logarithm of individual hourly wage rate on current or most recent job
Weekly hours, employed	Hours worked per week for those currently employed
Ln months on job, employed	Natural logarithm of time of current job in months for those employed
Not currently employed	Indicator for whether individual is currently employed
Months not employed	Months since last employment for those who are not currently employed but have worked in the last year
Not employed last 12 mos.	Indicator for whether individual has not worked in the last year
Recruiter variables	
Share of seniors and recent graduates	Ratio of number of current high school seniors and 1978 graduates to the total male youth population ages 15 to 25 in the AFEES
Recruiter density	Ratio of number of production recruiters to the number of males ages 15 to 25 in each AFEES

Table A.2

MULTINOMIAL PROBIT REGRESSION RESULTS FOR HIGH SCHOOL SENIORS
(All coefficients relative to the Air Force)

	Civilian/Air Force		Army/Air Force		Navy/Air Force	
Factor	Coefficient	t	Coefficient	t	Coefficient	t
Demographics						
Age when senior						
Age 17	.2023	1.83	−.0700	−.660	.1797	1.77
Age 19+	−.4401	−2.10	.2365	1.30	.1873	1.06
Black	−.0685	−.060	.5318	3.44	.1700	.967
Hispanic	.2470	1.15	.6487	2.77	.1885	.676
AFQT score	.0091	2.61	.0002	.071	.0055	1.77
AFQT Cat. IV	1.078	4.18	.5958	2.58	.6292	2.76
Socioeconomic factors						
Live at home	−.4683	−1.69	−.4925	−2.27	−.1617	−.710
Family income	.1937	3.47	.0302	.643	.0206	.392
Number of siblings	−.0495	−1.65	−.0040	−.170	−.0137	−.523
Education of mother	−.0210	−.557	.0508	1.65	.0252	.928
Expect more education	−.0295	−.231	−.4680	−4.35	−.3296	−3.07
Employment history						
Ln hourly wage	.9402	3.13	−.2550	−.837	−.1161	−.401
Weekly hours, employed	−.0149	−1.15	−.0059	−.870	−.0006	−.100
Ln months on job, employed	.1395	2.62	−.0097	−.170	−.0177	−.333
Not currently employed	.7207	1.76	−.4496	−1.33	−.0415	−.114
Months not employed	−.0900	−2.26	.1000	2.69	.0212	.471
Not employed last 12 mos.	.9215	2.16	−.3400	−.841	−.0540	−.138
Recruiter variables						
Share of seniors and recent grad	2.673	.674	2.683	.736	.9205	.242
Recruiter density	−.7206	−.685	.0429	.040	.0662	.068
Constant	1.731	2.27	−.2959	−.421	−.5860	−.758

Table A.3

MULTINOMIAL PROBIT REGRESSION RESULTS FOR HIGH SCHOOL GRADUATES
(All coefficients relative to the Air Force)

	Civilian/Air Force		Army/Air Force		Navy/Air Force	
Factor	Coefficient	t	Coefficient	t	Coefficient	t
Demographics						
Age when senior						
Age 17	−.0634	−.455	−.0956	−.743	−.2337	1.72
Age 19 +	.1039	.415	−.3466	−1.51	−.1023	.470
Black	.0144	.063	.4402	2.15	.0869	.415
Hispanic	.3766	1.49	.4518	1.70	.0219	.068
AFQT score	−.0057	−1.40	−.0070	−1.94	.0042	1.16
AFQT Cat. IV	.4027	1.43	.5120	1.92	.5826	2.07
Some postsec. schooling	.4328	2.16	−.0803	−.432	−.0113	.061
Ln months since school	.2057	3.15	.0554	.987	−.0726	1.31
Socioeconomic factors						
Live at home	−.1004	−.522	−.2335	−1.32	.2611	1.34
Family income	−.0010	−.014	−.0479	−.759	−.0072	1.00
Number of siblings	−.0404	−1.23	.0211	.820	−.0174	.644
Education of mother	.0188	.563	.0350	1.12	.0212	.632
Expect more education	−.7391	−4.96	−.4524	−3.33	−.3801	−2.81
Employment history						
Ln hourly wage	.6223	2.43	−.0024	−.010	.1232	.517
Weekly hours, employed	.0075	.907	−.0052	−.684	−.0175	2.14
Ln months on job, employed	.1470	2.18	−.0097	−.177	−.0453	.776
Not currently employed	2.238	1.90	.3583	.416	−.9465	1.23
Weekly hours, not curr. emp.	−.0338	−1.30	−.0098	−.551	.0092	.610
Months not employed	−.2269	−2.48	−.0458	−.898	−.0178	.354
Not employed last 12 mos.	.8792	1.60	.0079	.015	−.2057	.386
Recruiter variables						
Share of seniors and recent grad	15.20	3.09	−1.944	−.439	−1.510	.330
Recruiter density	.0321	.024	.3855	.315	.3697	.293
Constant	−.6331	−.743	.5889	.709	.3741	.457

BIBLIOGRAPHY

Amemiya, Takeshi, "Qualitative Response Models: A Survey," *Journal of Economic Literature*, December 1981, pp. 1483–1536.

Aspin, Les, "Manning the Military: The Female Factor," Chairman Military Personnel and Compensation Subcommittee, United States House of Representatives, March 5, 1984.

Buddin, Richard, *Estimation of AFEES Survey Weights*, N-2072-MIL, The Rand Corporation, February 1984.

Doering, Z.D., D.W. Grissmer, and J. Morse, *1979 DoD Survey of Personnel Entering Military Service: Wave 1 User's Manual and Codebook*, N-1605-MRAL, The Rand Corporation, November 1980a.

Doering, Z.D., D.W. Grissmer, and J. Morse, *1979 DoD Survey of Personnel Entering Military Service: Wave 2 User's Manual and Codebook*, N-1606-MRAL, The Rand Corporation, December 1980b.

Hausman, Jerry A. and David A. Wise, "A Conditional Probit Model for Qualitative Choice: Discrete Decisions Recognizing Interdependence and Heterogeneous Preferences," *Econometrica*, March 1978, pp. 403–426.

Hosek, James R. and Christine E. Peterson, *Enlistment Decisions of Young Men*, R-3238-MIL, The Rand Corporation, forthcoming 1985.

Maddala, G.S., *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge, England, 1983.

Manski, Charles F., and Steven Lerman, "The Estimation of Choice Probabilities from Choice-Based Samples," *Econometrica*, November 1977, pp. 1977–1988.

Orvis, Bruce R., *Analysis of Youth Cohort Enlistment Intentions Data: Progress Report*, N-2075-MIL, The Rand Corporation, April 1984.

U.S. House of Representatives Committee on Armed Services, *FY1985 DoD Authorization Act*, 1984.

*U.S. GOVERNMENT PRINTING OFFICE: 1985-460-991/36148

END

FILMED

9-85

DTIC