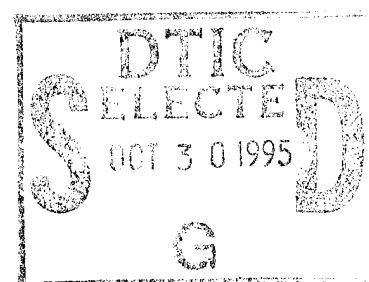


# NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



19951026 025

## THESIS



**A MULTIVARIATE ANALYSIS OF THE  
EFFECTS OF ACADEMIC PERFORMANCE  
AND GRADUATE EDUCATION ON THE  
PROMOTION OF SENIOR U. S. NAVY  
OFFICERS**

by

Thomas A. Buterbaugh

June, 1995

Co-Advisors:

Stephen L. Mehay  
Julie A. Dougherty

Approved for public release; distribution is unlimited.

DTIC QUALITY INSPECTION

| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                                         | Form Approved OMB No. 0704-0188                |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------|------------------------------------------------|--|
| Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                                                         |                                                |  |
| 1. AGENCY USE ONLY (Leave blank)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2. REPORT DATE<br>June 1995                              | 3. REPORT TYPE AND DATES COVERED<br>Master's Thesis     |                                                |  |
| 4. TITLE AND SUBTITLE<br>A MULTIVARIATE ANALYSIS OF THE EFFECTS OF ACADEMIC PERFORMANCE AND GRADUATE EDUCATION ON THE PROMOTION OF SENIOR U.S. NAVY OFFICERS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          |                                                         | 5. FUNDING NUMBERS                             |  |
| 6. AUTHOR(S) Buterbaugh, Thomas A.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                                         |                                                |  |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>Naval Postgraduate School<br>Monterey CA 93943-5000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                                         | 8. PERFORMING ORGANIZATION REPORT NUMBER       |  |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                         | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER |  |
| 11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                                                         |                                                |  |
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT<br>Approved for public release; distribution is unlimited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                                         | 12b. DISTRIBUTION CODE                         |  |
| 13. ABSTRACT (maximum 200 words)<br>This thesis develops multivariate models to estimate the effects of undergraduate academic performance and fully-funded graduate education on promotion to the ranks of Commander (O-5) and Captain (O-6) in the U. S. Navy. Using data extracted from the Officer Promotion History Files, two sample populations were selected for analysis: officers who appeared before the Commander promotion boards between fiscal years 1981 and 1994, and those who appeared before the Captain promotion boards during this same period. These data sets were further categorized into five warfare communities and two separate time periods; the period between 1981-1989 (the pre-drawdown), and the period between 1990-1994 (the drawdown).<br>Ordinary least squares (OLS) and maximum likelihood logit regression models were employed to estimate the probability of being promoted to these two ranks. The findings reveal that graduate education and academic performance have positive effects on promotion probability for some, but not all, of the communities over the various time periods.<br>Recommendations for further study are included. |                                                          |                                                         |                                                |  |
| 14. SUBJECT TERMS<br>Promotion, Graduate Education, Graded, Academic Performance, Performance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                          |                                                         | 15. NUMBER OF PAGES 97                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                          |                                                         | 16. PRICE CODE                                 |  |
| 17. SECURITY CLASSIFICATION OF REPORT<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 18. SECURITY CLASSIFICATION OF THIS PAGE<br>Unclassified | 19. SECURITY CLASSIFICATION OF ABSTRACT<br>Unclassified | 20. LIMITATION OF ABSTRACT<br>UL               |  |



Approved for public release; distribution is unlimited.

**A MULTIVARIATE ANALYSIS OF THE EFFECTS OF ACADEMIC  
PERFORMANCE AND GRADUATE EDUCATION ON THE PROMOTION  
OF SENIOR U.S. NAVY OFFICERS**

Thomas A. Buterbaugh  
Lieutenant Commander, United States Navy  
B.S., United States Naval Academy, 1982

Submitted in partial fulfillment  
of the requirements for the degree of

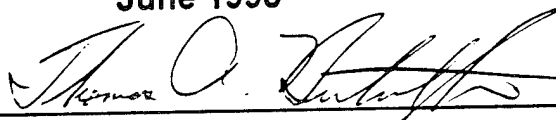
**MASTER OF SCIENCE IN MANAGEMENT**

from the

**NAVAL POSTGRADUATE SCHOOL**

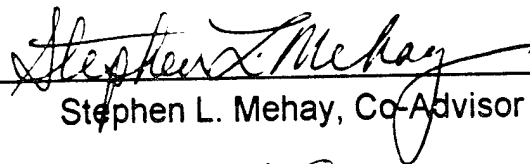
**June 1995**

Author:

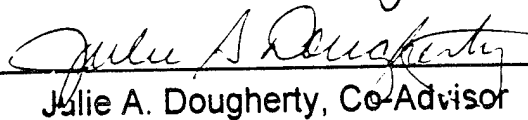


Thomas A. Buterbaugh

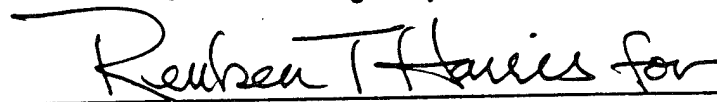
Approved by:



Stephen L. Mehay, Co-Advisor



Julie A. Dougherty, Co-Advisor



David R. Whipple, Chairman  
Department of Systems Management



## ABSTRACT

This thesis develops multivariate models to estimate the effects of undergraduate academic performance and fully-funded graduate education on promotion to the ranks of Commander (O-5) and Captain (O-6) in the U. S. Navy. Using data extracted from the Officer Promotion History Files, two sample populations were selected for analysis: officers who appeared before the Commander promotion boards between fiscal years 1981 and 1994, and those who appeared before the Captain promotion boards during this same period. These data sets were further categorized into five warfare communities and two separate time periods; the period between 1981-1989 (the pre-drawdown), and the period between 1990-1994 (the drawdown).

Ordinary least squares (OLS) and maximum likelihood logit regression models were employed to estimate the probability of being promoted to these two ranks. The findings reveal that graduate education and academic performance have positive effects on promotion probability for some, but not all, of the communities over the various time periods.

Recommendations for further study are included.

|                                      |                                                  |
|--------------------------------------|--------------------------------------------------|
| Accession For                        |                                                  |
| NTIS                                 | CRA&I <input checked="checked" type="checkbox"/> |
| DTIC                                 | TAB <input type="checkbox"/>                     |
| Unannounced <input type="checkbox"/> |                                                  |
| Justification _____                  |                                                  |
| By _____                             |                                                  |
| Distribution / _____                 |                                                  |
| Availability Codes                   |                                                  |
| Dist                                 | Avail and/or Special                             |
| A-1                                  |                                                  |



## TABLE OF CONTENTS

|                                                                  |    |
|------------------------------------------------------------------|----|
| I. INTRODUCTION .....                                            | 1  |
| A. BACKGROUND .....                                              | 1  |
| B. OBJECTIVES .....                                              | 2  |
| C. SCOPE, LIMITATIONS, AND ASSUMPTIONS .....                     | 2  |
| D. ORGANIZATION OF THE STUDY .....                               | 3  |
| II. LITERATURE REVIEW .....                                      | 5  |
| A. EDUCATION AND NAVAL OFFICER PERFORMANCE .....                 | 5  |
| B. EDUCATION AND CIVILIAN JOB PERFORMANCE .....                  | 9  |
| III. DATA AND METHODOLOGY .....                                  | 13 |
| A. VARIABLE DEFINITION .....                                     | 13 |
| 1. Dependent Variables .....                                     | 13 |
| 2. Independent Variables .....                                   | 13 |
| B. DATA SETS .....                                               | 17 |
| 1. Commander Data Set .....                                      | 18 |
| 2. Captain Data Set .....                                        | 18 |
| 3. Promotion Rates .....                                         | 19 |
| C. METHODOLOGY .....                                             | 22 |
| IV. EMPIRICAL ANALYSIS .....                                     | 25 |
| A. MULTIVARIATE ANALYSIS .....                                   | 25 |
| 1. Preliminary Analysis of the Commander Data Set .....          | 25 |
| 2. Parameter Estimates for the Commander Data Set (Pooled Years) |    |
| .....                                                            | 25 |
| 3. Preliminary Analysis of the Captain Data Set .....            | 28 |



|                                                                              |    |
|------------------------------------------------------------------------------|----|
| 4. Parameter Estimates for the Captain Data Set (Pooled Years)               | 28 |
| 5. Parameter Estimates for Specific Warfare Communities (All Years)          | 29 |
| 6. Comparison of Promotion Determinants in Pre-Drawdown and Drawdown Periods | 32 |
| V. CONCLUSIONS AND RECOMMENDATIONS                                           | 43 |
| A. CONCLUSIONS                                                               | 43 |
| B. RECOMMENDATIONS FOR FURTHER RESEARCH                                      | 46 |
| APPENDIX A. LOGIT MODEL RESULTS                                              | 47 |
| APPENDIX B. CHOW TEST RESULTS                                                | 83 |
| LIST OF REFERENCES                                                           | 85 |
| INITIAL DISTRIBUTION LIST                                                    | 87 |

## I. INTRODUCTION

I reaffirm the investment in graduate education of selected officers to be a strategic requirement for the Navy. With today's technological, managerial, political, and economic complexities, the need for graduate level expertise has never been greater. Educating officers in specific subspecialties greatly increases operational readiness and, as a corollary benefit, develops the intellectual diversity and capacity that enhances the total professional performance of our officer corps. Our investment in graduate education must be pursued as a priority even in the face of competing demands and declining resources. (CNO, 1994)

-- ADM J. M. Boorda, Chief of Naval Operations, on graduate education policy.

### A. BACKGROUND

Restating the Chief of Naval Operation's (CNO) position on graduate education is by no means a unique way to begin a thesis on this subject (Talaga, 1994), but it does provide an interesting launch point for this work. The top Navy leadership recognizes the importance of graduate education and remains committed to maintaining a certain portion of the officer corps with graduate level education subspecialty skills. This priority remains in spite of the fact that the Navy is faced with a declining budget and a need to downsize its force structure to man a leaner, more efficient war fighting machine. It can also be argued that this leaner force may require better educated officers and that the investment in these officers will benefit the Navy by providing leaders skilled in technical, analytical, and managerial skills.

There are mixed perceptions about graduate education, however, from officers within the different occupational specialties, known as warfare communities, in the Navy. Many feel that a graduate education will benefit their careers by providing an extra competitive edge over contemporaries vying for promotion spots. Others feel that time spent away from the chosen warfare specialty, the "opportunity costs" of attending a graduate school program for a period of two or so years, will make them less competitive in terms of promotion. The CNO recently has

attempted to clarify the issue, stating, "Promotion boards will be directed to consider graduate education as a positive influence on a Naval career during their deliberations" (CNO, 1994).

This thesis will examine the effects of graduate education on promotion to Commander and Captain prior to this renewed emphasis on graduate education. It will also serve as a baseline for further study as the CNO's positive emphasis on graduate education impacts both attitudes in the fleet and the results of promotion boards.

## **B. OBJECTIVES**

This thesis will analyze the effects of graduate education and undergraduate academic performance on the promotion of officers to the ranks of Commander (O-5) and Captain (O-6). Data used for this study are based on the officer Promotion History Files for fiscal years 1981-1994, and are comprised of all officers who appeared before Commander and Captain promotion boards during this period. Five warfare communities are examined and compared over the entire 14 year period, and during two sub-periods: the period between 1981-1989, referred to here as the pre-drawdown period, and the period between 1990-1994, referred to as the drawdown period. By comparing these two time periods, it should be possible to discover any changes in the effects of education on promotion probability as the Navy moved from a period of growth to a drawdown.

This study is intended to answer a straightforward research question. Is there a statistically significant difference in promotion to the ranks of Commander and Captain for U.S. Navy officers with and without graduate education?

## **C. SCOPE, LIMITATIONS, AND ASSUMPTIONS**

Five warfare communities are the subjects of this study. They are: Surface Warfare officers (SWO), Submarine Warfare officers, Pilots, Naval Flight Officers (NFO's), and a community of combined Fleet Support and Supply officers. Previous studies have, for the most part, focused on a single community. In this thesis, five communities will be studied separately; in addition, all communities will be

aggregated into a pooled data set. The available data cover a period of 14 years with one exception; information for the desired promotion boards during fiscal year 1985 was not available for this study. There is no reason to expect the 1985 data to exhibit radically different behavior than surrounding years, so this omission should not contribute any significant bias to the results. Promotion rate trends, displayed in Chapter III, seem to validate this assumption.

For the purposes of this thesis, graduate education is assumed to be a fully-funded, dedicated educational process, one that effectively removes the student from the community of his or her peers during the period of time spent pursuing a Master's degree. It does not include graduate degrees obtained through night study or correspondence course work, or any programs requiring the student to fund all or part of the costs.

#### **D. ORGANIZATION OF THE STUDY**

This thesis is divided into five chapters. Chapter II reviews pertinent literature and previous studies, both military and civilian, relevant to the effects of education on job performance. Chapter III defines the variables specified in the performance models, provides details on the data sets used, and describes the methodology used to develop the promotion models. Chapter IV presents the empirical analysis of the multivariate regression models. Chapter V summarizes the results and provides recommendations for further study.



## **II. LITERATURE REVIEW**

### **A. EDUCATION AND NAVAL OFFICER PERFORMANCE**

The first study reviewed was a piece by Donald J. Cymrot of the Center for Naval Analyses (CNA). This 1986 work, entitled "Graduate Education and the Promotion of Officers," was intended to assess the benefit to the Navy of providing a graduate education to its officers. Cymrot used promotion, being selected for the next rank or paygrade in the military, as a measure of productivity. If an officer advanced more rapidly through the system or ultimately achieved a higher rank than his or her peers, the officer was considered to be more productive. Cymrot was able to evaluate in monetary terms this relative change in productivity using the basic pay tables for officers in the study group (1985) because salaries for military officers are, for the most part, tied to rank. This monetary value was the marginal benefit associated with an additional graduate educated officer.

Three types of variables were used to explain promotion in this study: personal characteristics, previous experience and performance indicators, and Navy structural variables. The personal characteristic variables were graduate education, age, sex, and race. Graduate education was the focus of the study, and was expected to have a positive influence on promotion. The other three demographic variables were included to control for other factors that may influence promotion. The previous experience and promotion variables were time-in-rank and service continuity. Time-in-rank indicates the speed at which an officer progresses through each paygrade and service continuity controlled for an expected productivity difference between officers who left the service and returned as compared with those who remained in the military. Cymrot also used the time-in-rank variable to control for potential selectivity bias. He felt a selectivity problem could arise because one of the criteria for selection for graduate study is promotability. Because only a very small percentage of officers is selected for promotion "out of zone", meaning promotion earlier or later than the normal career

point, the time-in-rank variable probably does not adequately quantify a difference in productivity. The Navy structural variables were essentially community (occupational specialty) categories: restricted line, staff, and unrestricted line.

As a result of his empirical analysis, Cymrot found the effect of graduate education to be positive and statistically significant for all ranks until selection for flag officer. Specifically, he found graduate education increased the probability of promotion to Commander by 10.6 percentage points, and promotion to Captain by 16.5 percentage points.

William R. Bowman produced a study that was similar in many ways entitled "Do Engineers Make Better Naval Officers?" Although his focus was on undergraduate vice graduate education, he utilized multivariate regression procedures (LOGIT) to estimate the effects of causal factors: undergraduate major and academic performance (GPA), along with control factors such as marital status, race, having children, and fleet experience (ship type and occupational code), on a dependent variable representing superior performance. As the title suggests, Bowman was investigating the effects of United States Naval Academy (USNA) graduates' having an undergraduate engineering degree, as opposed to another undergraduate degree, on performance or, what he terms, the "Rickover hypothesis". He was referring to Admiral Hyman Rickover, the "Father of the Nuclear Navy," who was a strong proponent of eliminating any non-technical curricula from a prospective Naval officer's undergraduate education. This hypothesis implies that in the highly technical, modern Navy, an officer with an academic background in engineering is more likely to be evaluated as a superior performer. The sample population for this study was made up of graduates of the U.S. Naval Academy between 1976 and 1980, who selected the surface and submarine warfare communities upon graduation. The data were compiled from four sources: USNA admission records, the 1986 Officer Master and Loss files (Defense Manpower Data Center, Monterey), and fitness report data maintained by the Navy Personnel Research Development Center (NPRDC). Bowman found that the

Rickover hypothesis was not supported by the data. Neither undergraduate major nor undergraduate academic performance were significant determinants of officer performance, with one notable exception. For this sample population, having a management/economics undergraduate major (relative to an engineering major) increased the probability of attaining superior officer performance in the conventional Navy by 24.1 percent (Bowman, 1990).

In his Master's Thesis, "An Analysis of Surface Warfare Officer Measures of Effectiveness as Related to Commissioning Source, Undergraduate Education, and Navy Training," Joseph Nolan examined Surface Warfare officers from three commissioning sources; USNA, the Navy Reserve Officer Training Corps (NROTC), and Officer Candidate School (OCS). He selected those officers who appeared before the Lieutenant (O-3) promotion boards from 1981 to 1985 and those who appeared before the Lieutenant Commander (O-4) boards between 1985 - 1990 and modeled their performance, as evidenced by retention, promotion, and achievement of early professional qualifications, on background factors such as personal demographics, undergraduate education, college selectivity, Navy experience, and Navy training. The models were multivariate LOGIT models estimated by maximum likelihood techniques and demonstrated that background factors were important in attaining his selected measures of performance. Specifically, a high undergraduate GPA, superior undergraduate academic performance in science and engineering courses, and early professional qualifications provided statistically significant and positive effects on promotion to LT (O-3) and to LCDR (O-4).

Another Master's Thesis, "An Analysis of the Impact of Graduate Education on the Performance and Retention of General Unrestricted Line Officers" (Jordan 1991), modeled the effect of graduate education and background factors on promotion to the ranks of Lieutenant Commander (O-4) and Commander (O-5). The focus group for Jordan's work was the General Unrestricted Line community, which has since become the Fleet Support community. The Officer Promotion



History File and Officer Master Loss File for fiscal years 1981 through 1990 were utilized, creating sample populations of 1,040 and 404 observations for the LCDR and CDR promotion models, respectively. Jordan also used multivariate LOGIT techniques and found that graduate education had a positive impact on the probability of promotion to LCDR, but no significant effect promotion to the rank of CDR.

Michael Talaga authored a 1993 Master's Thesis entitled "A Multivariate Analysis of the Effects of Graduate Education on Promotion and Retention of Surface Warfare Officers." This study analyzed the effects of background and experience data on all Surface Warfare officers appearing before the Lieutenant (O-3) selection boards between fiscal years 1981 and 1985, and the Lieutenant Commander (O-4) selection boards between 1986 and 1990. Talaga used two measures of performance; promotion to LCDR and performance on LT fitness reports, as dependent variables for his performance models which were estimated with non-linear maximum-likelihood LOGIT procedures. His chosen explanatory variables covered a wide range of personal demographic, Navy experience, and academic factors. Some of these included sex, race, marital status, having dependent children, commissioning source, undergraduate academic performance (GPA), college quality, and graduate education.

Talaga found that officers with a fully-funded graduate degree were promoted to the rank of LCDR at a statistically significant, 11.6 percent higher rate than their peers without the additional education. He also found significant positive effects for gender in that females were 45.4 percent more likely to be promoted than males. Those officers who were married with children were 9.2 percent more likely to promote than single officers. Because of the similarity between Talaga's work and the research in this thesis, a comparison of his results with the results of current models on Surface Warfare officers is provided in Chapter IV.

## **B. EDUCATION AND CIVILIAN JOB PERFORMANCE**

Some civilian studies also have examined the relationship between education attainment and performance on the job, normally using data from a single corporation. These studies are useful in terms of specifying the performance models to be estimated in this thesis in examining the effects of graduate education.

"Academic Achievement and Job Performance" is a study published by David Wise in 1975. It examines the effects of academic achievement and other personal characteristics on job productivity for college graduates working in a large corporation. Wise's review of the literature at the time indicated that academic achievement and job performance are not related for many occupations, even though the academic criteria may be used to select (screen) individuals into occupations.

Wise used a population of approximately 6,800 to select a sample of 1,300 white, male, college graduates who were hired before 1968 and were no older than 30 years old when hired. This age requirement effectively controlled for the effects of prior experience on performance. The performance measure chosen as a dependent variable for the study was salary, the effects on which were estimated using a linear probability (ordinary least squares) model. Chosen explanatory variables included; academic performance (GPA), quality of college attended, undergraduate major (technical or not), graduate education if attained while employed by the firm and not before (which is relevant to the Navy environment), and a socioeconomic index that encompasses personal background information.

Wise found that performance (salary) was related to many of his explanatory variables at statistically significant levels. Salaries of individuals with high grade point averages from selective colleges increased at nearly twice the rate of those with poorer academic performance from less selective schools. Graduate education provided a positive return on salary, but it was only significant if the individual was ranked in the top third of his graduate school class. An engineering undergraduate degree increased the rate of salary increases by nearly 3.9 percent, while liberal

arts and business degrees were associated with a slower salary growth rate. This would seem to lend credence to the "Rickover hypothesis" which was previously discussed.

In the final study reviewed, "Graduate Degrees and Job Success: Managers in One U.S. Corporation," Jennie Woo estimates the effects of various graduate degrees on four measures of productivity: annual salary, change in salary, supervisor's rating, and probability of promotion. She cites previous studies that found graduate education had positive effects on earnings, but questions whether or not this represents an increase in productivity. By choosing other measures of performance, she is able to control for the effects of her explanatory variables on salary. Woo used ordinary least squares techniques to estimate parameters for equations containing the first three productivity measures, and maximum likelihood LOGIT estimation for equations containing the promotion probability variable.

Woo found that a graduate degree did provide a greater annual salary advantage, although she attributes the advantage to the higher grade level that one reaches (or is initially assigned to upon entry) as a result of obtaining graduate education. Graduate education also positively affects the change in salary, even when controlling for grade level and supervisor ratings. Comparisons between the effects of graduate education on salary and other direct measures of performance are provided, and indicate that additional education (Bachelor's or Master's degree) and experience actually provide negative effects on receiving a high supervisor performance rating or promotion, suggesting that education or experience do not seem to be associated with better job performance (Woo, 1986). Unfortunately, there appear to be numerous flaws in this study. Unlike Wise, she includes all education levels in her study population, ranging from high school dropouts to individuals with doctorates. High school dropouts and high school diploma graduates are the omitted category in her models, and the observed negative effects of a college degree and greater experience fly in the face of a considerable body of research. Her sample also includes individuals who enter the corporation

with a graduate education. This prevents analysis of increased productivity as a result of obtaining a graduate degree after joining the firm. Finally, she excludes an important group of employees from her analysis, those who left the corporation. Her assumption that these individuals probably had lower productivity, lower promotion rates, and possibly lower earnings is unsupportable, as an argument could easily be made that more productive people have more choices in employment, and are likely to leave for job opportunities that provide a higher return on their own investment in human capital. It is difficult to find plausibility in her conclusions that obtaining a college education, a graduate degree, or having more experience are actually productivity detractors. Mehay and Bowman carefully critique this study in "Graduate Degrees and Job Performance: Evidence from Military Officers" (Mehay, 1995).

These studies serve as a framework for specifying the estimating models and as a baseline for comparing and evaluating the effects on promotion estimated in this thesis. This work generally finds that academic performance and graduate education will positively influence promotion in the Navy.



### **III. DATA AND METHODOLOGY**

#### **A. VARIABLE DEFINITION**

##### **1. Dependent Variables**

A single statistical model was specified for this analysis. This model regressed a dependent variable, which served as a proxy for performance, on a number of selected explanatory variables representing background and personal characteristics. For this promotion model, the dependent variable was a binary variable (PROMOTED), which took a value of one if the member was selected for promotion to the rank of Commander (O-5) in the Commander data set or promotion to Captain (O-6) in the Captain data set, and a value of zero if the member was passed over (not selected) for promotion. An officer's relative position with respect to the group of individuals being considered for promotion is referred to as his zone. When a particular cohort of officers is presented to the fiscal year's promotion board, they are said to be "in zone". Those not yet considered are termed "below zone" and those who have been considered but failed to be selected are "above zone". The variable PROMOTED measures promotion without regard to the number of appearances before the promotion board (usually limited to three). Although potential bias exists as "above zone" officers may be counted twice in the data, this represents only about 3 percent of the sample population for each rank being studied, an insignificant proportion. Note, however, that this approach does have the effect of lowering annual promotion rates below "official" Navy promotion statistics.

##### **2. Independent Variables**

The independent (explanatory) variables for the promotion model were chosen from the background and personal characteristics provided in the data base. They were chosen because of their use, in either identical or similar forms, in prior studies on graduate degrees and job success (Woo, 1986) and academic achievement and job performance (Wise, 1975). They also closely resemble

variables used in earlier research relating undergraduate and graduate education to the performance of officers in the U.S. Navy (Nolan, 1993; Talaga, 1994). The models are run on pooled data sets, as well as on data sets restricted to specific designators or certain time periods. In an attempt to maintain comparability, the same explanatory variables are used in all models, with a few exceptions. Because there are no female officers represented in the data sets within the Submarine officer community, the MALE variable is not applied to the promotion model for the SUB designator. Likewise, minorities and females are not well represented for some warfare groupings in the earlier years (pre-drawdown period) or for the senior (Captain) promotion boards. This representation improves as more women and minorities advance through the ranks into the drawdown period.

The first two explanatory variables are MALE and WHITE. Each takes a binary value of one if the observed member is male or Caucasian, or a value of zero if the member is female or a member of any other ethnic group, respectively.

The next explanatory variable, and the focus of this study, is FFGE. It is also a dummy (binary) variable and is derived from the 'Sponsor1' field of the Officer Promotion History Files. A value of "N" in Sponsor1 represents a Navy sponsored (fully-funded) graduate program which, in most cases, indicates attendance at the Naval Postgraduate School in Monterey, CA. FFGE, therefore, takes a value of one if the member has completed a fully-funded graduate education program and a value of zero otherwise.

Other factors that are likely to have some effect on whether or not an officer is selected for promotion are his or her undergraduate performance, the "quality" of the undergraduate institution attended, and whether or not the undergraduate degree was in a technical field of study (Wise, 1975; Talaga, 1994). These education attributes are accounted for by the binary variables SCHOLAR, HIQUAL, USNA, and TECHMAJ. SCHOLAR takes a value of one if the member's undergraduate grade point average was 3.2 or higher, otherwise, it takes a value of zero. HIQUAL takes a value of one if the undergraduate institution the member

attended was rated in the two highest categories, "Most Competitive" or "Highly Competitive," in Barron's Profiles of American Colleges. If Barron's evaluates the school as "Very Competitive", "Competitive", "Less Competitive", or "Special", the HIQUAL variable takes a value of zero. The U.S. Naval Academy is rated by Barron's as a "Most Competitive" school. However, because of the possibility that being a Naval Academy graduate may influence promotability for reasons other than the school's academic quality, such as early leadership training, it is isolated from the HIQUAL variable and becomes its own binary variable, USNA. TECHMAJ takes a value of one if the undergraduate degree earned is in any engineering field or in one of the math intensive sciences, such as physics, chemistry, mathematics, operations research, or microbiology. TECHMAJ takes a value of zero otherwise.

One other explanatory variable believed to have an impact on promotability is whether or not an officer had prior service as an enlisted member. To control for this proxy for experience, the binary variable PRIENL takes a value of one if the member served as an enlisted person for at least 24 months prior to his or her date of commission, and a value of zero otherwise.

Five categorical variables were created to identify occupational specialties within the larger data sets. These are known in the Navy as "designators" and are used to control for the differences in promotion across communities. Officer career paths tend to differ by community. Also, the Navy promotes to fill vacancies, which may differ by community in a given fiscal year. These variables are SWO, SUB, PILOT, NFO, and SUPPORT, and represent the Surface Warfare (surface ship), Submarine Warfare (submarine), Aviation (separate variables for Pilot and Naval Flight Officer), and Fleet Support and Supply (combined) communities, respectively.

Definitions of the dependent, categorical, and independent variables can be found in Table 1.



| DEPENDENT VARIABLE     | DESCRIPTION                                                                                                                                                                                                                                                   |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROMOTED               | = 1 if promoted to the rank identified by the data set<br>= 0 if passed over                                                                                                                                                                                  |
| DESIGNATORS            |                                                                                                                                                                                                                                                               |
| SWO                    | = 1 if Surface Warfare Officer<br>= 0 otherwise                                                                                                                                                                                                               |
| SUB                    | = 1 if Submarine Officer<br>= 0 otherwise                                                                                                                                                                                                                     |
| PILOT                  | = 1 if Naval Aviator (Pilot)<br>= 0 otherwise                                                                                                                                                                                                                 |
| NFO                    | = 1 if Naval Flight Officer<br>= 0 otherwise                                                                                                                                                                                                                  |
| SUPPORT                | = 1 if Fleet Support or Supply Officer<br>= 0 otherwise                                                                                                                                                                                                       |
| INDEPENDENT VARIABLE   | DESCRIPTION                                                                                                                                                                                                                                                   |
| PERSONAL DEMOGRAPHICS  |                                                                                                                                                                                                                                                               |
| MALE                   | = 1 if male<br>= 0 otherwise                                                                                                                                                                                                                                  |
| WHITE                  | = 1 if Caucasian ethnicity<br>= 0 otherwise                                                                                                                                                                                                                   |
| MARRIED                | = 1 if married with no children<br>= 0 otherwise                                                                                                                                                                                                              |
| KIDS                   | = 1 if married with dependent children<br>= 0 otherwise                                                                                                                                                                                                       |
| EDUCATIONAL EXPERIENCE |                                                                                                                                                                                                                                                               |
| SCHOLAR                | = 1 if undergraduate grade point average was greater than 3.2 on a 4.0 scale<br>= 0 otherwise                                                                                                                                                                 |
| HIQUAL                 | = 1 if undergraduate degree received from a school rated as "Most" or "Highly" competitive in Barron's <u>Profiles of American Colleges</u><br>= 0 if USNA graduate or Barron's rating of "Very Competitive", "Competitive", "Less Competitive", or "Special" |
| FFGE                   | = 1 if completed a fully funded graduate education program (Naval Postgraduate School)<br>= 0 otherwise                                                                                                                                                       |

|         |                                                                                                     |
|---------|-----------------------------------------------------------------------------------------------------|
| USNA    | = 1 if Naval Academy graduate<br>= 0 otherwise                                                      |
| TECHMAJ | = 1 if engineering or math intensive science undergrad degree program<br>= 0 otherwise              |
| PRIENL  | = 1 if served as an enlisted member at least 24 months prior to being commissioned<br>= 0 otherwise |

TABLE 1. Description of Dependent and Independent Variables

## B. DATA SETS

The data used in this thesis were obtained from code Pers-10 in the office of the Chief of Naval Personnel. The data set is based on the Officer Promotion History Files which were provided to Professors William R. Bowman at the U.S. Naval Academy and Stephen Mehay at the Naval Postgraduate School. The files contain information on all U.S. Navy officers who appeared before promotion boards between fiscal years 1981 and 1984, and between 1986 and 1994, with the exception of Medical Corps and Judge Advocate General (JAG) Corps officers. Fiscal year 1995 data on Commander and Captain promotion boards were not available for this study. Since this thesis deals specifically with officers being considered for promotion to the ranks of Commander (O-5) and Captain (O-6), two separate data sets were created by grouping those officers who appeared before the O-5 and O-6 boards, respectively. Unlike previous studies which focused on a single warfare (occupational) specialty, this study will look at the results of models run on the full data sets, as well as separate models run on each of five warfare communities for each promotion. Additionally, these models will be estimated for the full period, then for two sub-periods. The first sub-period lies between fiscal years 1981 and 1989 and is referred to as the pre-drawdown period. The promotion decisions for this period will be compared with outcomes as the Navy "rightsizes", from fiscal years 1990 to 1994 (the drawdown period). This

disaggregation will allow a test of whether the determinants of promotion have changed during the drawdown.

### **1. Commander Data Set**

The Commander data set consists of 12,372 observations of 206 variables. Of all officers who appeared before the O-5 promotion boards over the 13 years considered, 8,557 were selected for promotion to the rank of Commander (O-5), an overall promotion rate of 69 percent. However, the promotion rates varied from a high of 82 percent in FY81 to a low of 63 percent in FY93. Further specifics about this data set are contained in Table 2. As Table 2 shows, most of the candidates were white males and 21 percent had fully-funded graduate degrees. Over 15 percent had undergraduate grade point averages (GPA) greater than 3.2 and 33 percent of the sampled officers attended highly selective colleges (USNA included) as undergraduates. The U.S. Naval Academy was the commissioning source for 24 percent of this group and 29 percent of these Commander aspirees had undergraduate degrees in technical fields. Almost 14 percent of the sampled population had served in an enlisted status before receiving an officer's commission. Sixteen percent were married with no children and another 75 percent had dependent children.

### **2. Captain Data Set**

The Captain data set consists of 4,616 observations and 206 variables. Of these candidates, 2,421 were selected for promotion to the rank of Captain (O-6) for an overall promotion rate of 52 percent. For this group of officers, the promotion rate varied from a high of 61 percent in FY83 to a low of 47 percent in FY94. Further specifics for this data set may be found in Table 3.

As presented in Table 3, the Captain data set is also predominantly male and white. Nearly 23 percent of its members have fully-funded graduate degrees and 13 percent had undergraduate GPA's above 3.2. The Naval Academy was again well represented with graduates comprising almost 29 percent of the group being studied.

| VARIABLE          | MEAN       |
|-------------------|------------|
| Sample Population | N = 12,372 |
| PROMOTED          | .692       |
| WHITE             | .965       |
| MALE              | .932       |
| FFGE              | .219       |
| SWO               | .249       |
| SUB               | .099       |
| PILOT             | .288       |
| NFO               | .180       |
| SUPPORT           | .184       |
| SCHOLAR           | .155       |
| HIQUAL            | .091       |
| USNA              | .243       |
| TECHMAJ           | .294       |
| PRIENL            | .137       |
| MARRIED (NO KIDS) | .161       |
| KIDS              | .752       |

TABLE 2. The Commander Data Set Variables and Means

Technical undergraduate majors were 22.8 percent of the sample and only 6.3 percent had served as enlisted members before commissioning. Nine percent of the sampled members were married with no children and 86 percent had dependent children.

### 3. Promotion Rates

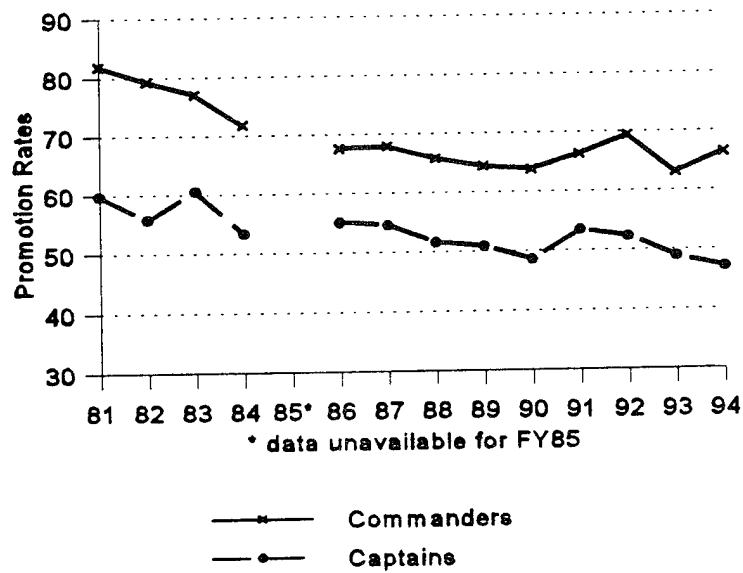
Comparisons of promotion rates for both Commander and Captain data sets, by fiscal year, are provided in Figure 1 and Table 4. As Figure 1 shows, promotion rates have slowly declined during the downsizing period. This has occurred even though the Navy has been thinning its ranks by using early retirement and

separation bonuses, among other policies. Recall, too, that the measured promotion rate in this thesis is somewhat lower than the "official" 70 percent target success rate as the data here include some individuals each year who were passed

| VARIABLE          | MEAN      |
|-------------------|-----------|
| Sample Population | N = 4,616 |
| PROMOTED          | .524      |
| WHITE             | .984      |
| MALE              | .966      |
| FFGE              | .229      |
| SWO               | .260      |
| SUB               | .116      |
| PILOT             | .329      |
| NFO               | .147      |
| SUPPORT           | .148      |
| SCHOLAR           | .130      |
| HIQUAL            | .095      |
| USNA              | .287      |
| TECHMAJ           | .228      |
| PRIENL            | .063      |
| MARRIED (NO KIDS) | .094      |
| KIDS              | .860      |

TABLE 3. The Captain Data Set Variables and Means

over in a previous year. In addition, the basis for computing promotion rates here is smaller than that used in official statistics because in constructing the primary data set for this thesis, observations were deleted when key variables were missing. Thus, the number of observations for Commander (O-5) promotions, for example, fell from 15,674 to 12,372 when these restrictions were applied to the sample. The annual promotion rates in the data set are consistent across years, but do not reflect "official" Navy promotion rates.



**Figure 1. Promotion Rates by Fiscal Year for U.S. Navy Commanders and Captains**

| FISCAL YEAR* | Commanders | Captains |
|--------------|------------|----------|
| 1981         | .819       | .598     |
| 1982         | .793       | .557     |
| 1983         | .771       | .606     |
| 1984         | .718       | .534     |
| 1986         | .676       | .551     |
| 1987         | .679       | .546     |
| 1988         | .658       | .516     |
| 1989         | .644       | .509     |
| 1990         | .638       | .486     |
| 1991         | .663       | .535     |
| 1992         | .694       | .522     |
| 1993         | .631       | .489     |
| 1994         | .664       | .471     |

Note: \* fiscal year 1985 data unavailable for this study

**Table 4. Promotion Rates for U.S. Navy Commanders and Captains (Fiscal Years 1981-1994)**

### C. METHODOLOGY

This thesis is intended to examine the effect of fully-funded graduate education and other factors on a naval officer's promotion to the rank of either Commander (O-5) or Captain (O-6). The binary nature of the dependent variable, PROMOTED, allows for estimation of multivariate models using both ordinary least-squares (OLS) and maximum likelihood procedures. In the first case a linear regression model is specified and estimated, while in the second a non-linear LOGIT model is estimated. In essence, it is assumed that promotion is a function of numerous background and demographic factors, many of which can be quantified from the data set in use. In this vein, the PROMOTE variable is regressed on each member's sex, race (white versus non-white), marital and dependent status, undergraduate academic performance, undergraduate institution's "quality", undergraduate major (technical versus non-technical), whether or not he or she served as an enlisted person before receiving a commission, and whether or not the individual possesses a fully-funded graduate degree.

Identical models were specified for each subset of the pooled data set, as sorted by warfare designator, as well as for the overall data set, to enable comparisons between officer communities and between each community and the entire sample population. The parameter estimates provided by the LOGIT model reflect the increase (or decrease) in the log of the odds ratio of being promoted, per unit increase in the explanatory variable being considered (Gujarati, 1988). Because each of the explanatory variables in the model are dummy (binary) variables, the change in the log of the odds ratio of being promoted is only seen when the observed member possesses the attribute (male, white, etc.) in question. A more understandable interpretation of these LOGIT results is the change in probability of being promoted, given the member has the attribute under consideration. There are two ways to determine this probability. The estimate may be obtained from the formula:  $B \cdot P(1-P)$  where **B** represents the LOGIT parameter estimate for a given explanatory variable and **P** represents the probability of the

observation having the attribute under consideration for the overall sample (Gujarati, 1988). As an alternative, since identical linear probability models were specified, the parameter estimates derived as a result of the OLS regressions also approximate this result (the change in probability of promotion) and are provided in tables with the LOGIT estimates in the following chapter.

The members of the data sets were grouped not only by warfare designator, but by time periods as well. In an effort to identify differences in promotion success between those who appeared before promotion boards while the Navy was increasing its manning to fill positions in a 600-ship navy (the pre-drawdown period) versus the period after fiscal year 1989 while the Navy was downsizing to fill a more streamlined force of approximately 350 ships (the drawdown period), Chow tests were performed to compare differences in determinants between these two groups. Details of the procedure may be found in Gujarati (1988, p. 443) and the test results are provided in the following chapter.





## **IV. EMPIRICAL ANALYSIS**

### **A. MULTIVARIATE ANALYSIS**

As explained in the previous chapter, the promotion model was specified for all designators combined in each major data set (Commander and Captain) as well as for subsets of the data for each warfare community. These regressions were, in turn, run separately in an attempt to distinguish different behaviors during the pre-drawdown period as compared with the drawdown period. This chapter will first present some descriptive statistics for the data sets, and will then present the results of the multivariate regressions over the pooled years (FY1981-FY1994). The final section will provide a comparison of the parameter estimates between pre-drawdown and drawdown periods.

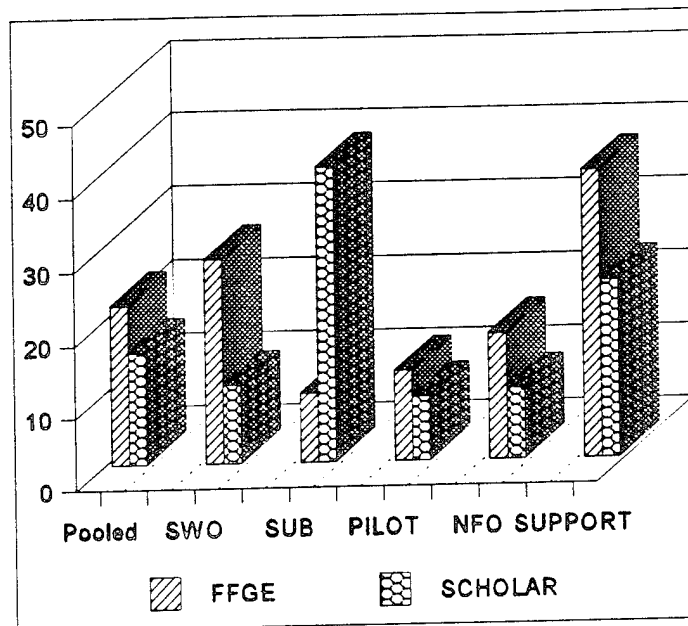
#### **1. Preliminary Analysis of the Commander Data Set**

The principal focus of this thesis was to identify the effects of graduate education and undergraduate academic performance on the promotion of U.S. Navy officers. Preliminary analysis of the data set reveals a significant percentage of the officers who appeared before the Commander promotion boards possess fully-funded graduate degrees (22%) and 16 percent exhibit superior undergraduate academic performance, which is defined as an undergraduate GPA greater than 3.2. This is presented for the entire data set as well as for individual warfare communities in Figure 2.

#### **2. Parameter Estimates for the Commander Data Set (Pooled Years)**

Both OLS and LOGIT models were estimated for the data set using promotion as the dependent variable. This section presents the overall results for the grouped warfare designators, as well as for the individual models run on each warfare community.

The parameter estimates for the LOGIT model on combined warfare designators are provided in Table 5, along with the associated signs, standard errors, and the OLS estimates. The OLS estimates are arguably the most easily



**Figure 2. Percentage of Officers with Fully-funded Graduate Education and Superior Undergraduate Academic Performance (Commander Data Set).**

interpreted results, as they closely represent the calculated change in probability associated with a one unit change in each of the explanatory variables. In this particular model, eight explanatory variables are statistically significant at a 0.05 level of significance in terms of their effect on promotion. Officers with a fully-funded graduate degree and those who had superior undergraduate academic performance have higher probabilities of being promoted to the rank of Commander by 8.7 and 6.6 percent, respectively. Likewise, higher probabilities of promotion are observed for those who are male, white, graduates of the U.S. Naval Academy, are married, or have at least one dependent child. As indicated by the negative values on their coefficient estimates, officers who served as enlisted members before receiving their commission, and those whose undergraduate degrees were in math-intensive science or engineering fields, were less likely to be promoted to O-5.

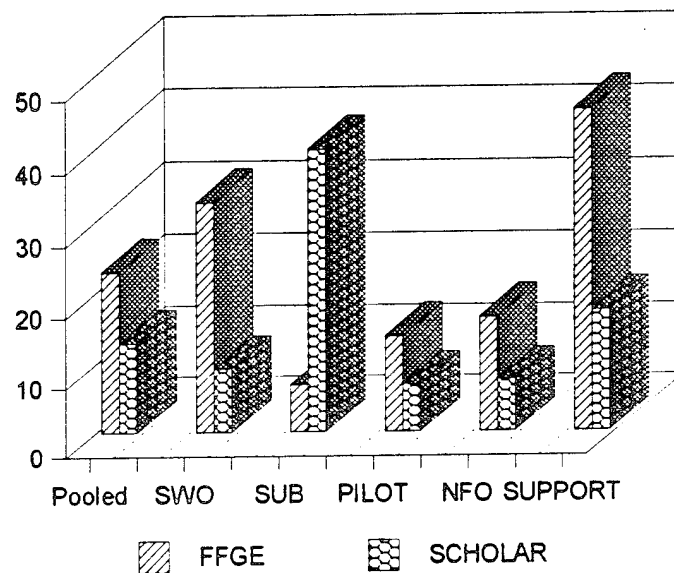
The likelihood ratio chi-square test statistic for this model, 339.833, tests the joint significance of all the explanatory variables included in the model. In this case, it is significant at the .005 level. The concordance ratio, in this case a value of .582, provides a measure of the predictive ability of the model. A Chow test was also performed, to compare the behavior of the pooled designator model with the specific community models. In this instance, the test suggests rejecting the null hypothesis, indicating that the regressions are not similar.

| Independent Variables                              | LOGIT                                    | OLS                   |
|----------------------------------------------------|------------------------------------------|-----------------------|
|                                                    | Coefficient Estimate<br>(Standard error) | Change in Probability |
| MALE                                               | 0.1976 <sup>*</sup><br>(0.0874)          | 0.043                 |
| WHITE                                              | 0.3532 <sup>*</sup><br>(0.1131)          | 0.079                 |
| FFGE                                               | 0.4677 <sup>*</sup><br>(0.0579)          | 0.087                 |
| SCHOLAR                                            | 0.3534 <sup>*</sup><br>(0.0661)          | 0.066                 |
| HIQUAL                                             | 0.1292<br>(0.0792)                       | 0.026                 |
| USNA                                               | 0.4606 <sup>*</sup><br>(0.0559)          | 0.085                 |
| PRIENL                                             | -0.6355 <sup>*</sup><br>(0.0853)         | -0.141                |
| TECHMAJ                                            | -0.0538<br>(0.0543)                      | -0.011                |
| MARRIED                                            | 0.4009 <sup>*</sup><br>(0.0881)          | 0.088                 |
| KIDS                                               | 0.5375 <sup>*</sup><br>(0.0780)          | 0.114                 |
| LOGIT CHI-SQUARE (Likelihood Ratio test) : 339.833 |                                          |                       |
| LOGIT Concordance Ratio : 0.582                    |                                          |                       |
| Note: <sup>*</sup> Significant at the 0.05 level   |                                          |                       |

TABLE 6. Parameter Estimates of the Commander Promotion Model for All Designators (Pooled Fiscal Years 1981-1994)

### 3. Preliminary Analysis of the Captain Data Set

Officers who appeared before the Captain (O-6) promotion boards between fiscal years 1981 and 1994 were selected for promotion at a rate of 52 percent. Of the total sample population, 23 percent had completed graduate degrees and 13 percent exhibited superior undergraduate academic performance (GPA>3.2). The FFGE and SCHOLAR percentages for combined designators and individual warfare communities are presented in Figure 3.



**Figure 3. Percentage of Officers with Fully-funded Graduate Education and Superior Undergraduate Academic Performance (Captain Data Set).**

### 4. Parameter Estimates for the Captain Data Set (Pooled Years)

Graduate education appears to lose its significance as an officer progresses from the Commander promotion board to the Captain promotion board. This may be due to the fact that promotion to the rank of Captain, for some warfare communities, is thought to be determined primarily by performance while serving

in a command position in the rank of Commander. This criteria is not necessarily mirrored for the Fleet Support and Supply community. As this section analyzes the models for pooled designators, the effect of FFGE in some communities may be lost in the aggregate.

As shown in Table 6, only four of the ten explanatory variables are statistically significant for this data set. The probability of being promoted to Captain appears to be positively influenced by undergraduate academic performance (7 percent difference), attendance at USNA (9 percent), and having dependent children (11 percent). Prior enlisted status was a detriment for promotion in this data set, as it was for the Commander data set, and reflects an 11.6 percent decrease in the probability of being promoted to Captain. All other explanatory variables were insignificant at a 95 percent confidence level (0.05 level of significance).

The likelihood ratio chi-square test statistic for this model was 62.666 and the concordance ratio was .515. Chow testing of this model also suggests rejecting the null hypothesis, therefore, the specific community models behave differently than the pooled designator model.

#### **5. Parameter Estimates for Specific Warfare Communities (All Years)**

A comparison of how the explanatory variables affect promotion for each of the warfare communities in the Commander data set is provided in Table 7. For the SWO and SUPPORT communities, graduate education is statistically significant and has a pronounced effect on promotion probability. For the Surface Warfare officer, having a graduate degree results in a 13.5 percent higher probability of promotion to the rank of Commander. Likewise, a Fleet Support or Supply officer could expect a substantial 23.4 percent advantage over peers who do not have a graduate education. Having dependent children produces positive effects for all five warfare designators and being a Naval Academy graduate is significant for each of the four warfare communities known as "unrestricted line" communities. The Naval Academy produces far more unrestricted line officers than Fleet Support

|                                                  | LOGIT                                    | OLS                   |
|--------------------------------------------------|------------------------------------------|-----------------------|
| Independent Variables                            | Coefficient Estimate<br>(Standard error) | Change in Probability |
| MALE                                             | -0.1045<br>(0.1876)                      | -0.026                |
| WHITE                                            | -0.0754<br>(0.2536)                      | -0.0185               |
| FFGE                                             | -0.0375<br>(0.0764)                      | -0.009                |
| SCHOLAR                                          | 0.3007 <sup>*</sup><br>(0.0976)          | 0.072                 |
| HIQUAL                                           | 0.2091<br>(0.1129)                       | 0.052                 |
| USNA                                             | 0.3746 <sup>*</sup><br>(0.0724)          | 0.092                 |
| PRIENL                                           | -0.4732 <sup>*</sup><br>(0.1917)         | -0.116                |
| TECHMAJ                                          | 0.0155<br>(0.0806)                       | 0.004                 |
| MARRIED                                          | 0.2656<br>(0.1855)                       | 0.065                 |
| KIDS                                             | 0.4509 <sup>*</sup><br>(0.1663)          | 0.111                 |
| LOGIT Chi-Square (Likelihood Ratio Test): 62.666 |                                          |                       |
| LOGIT Concordance Ratio : 0.515                  |                                          |                       |
| Note: <sup>*</sup> Significant at the 0.05 level |                                          |                       |

TABLE 6. Parameter Estimates of the Captain Promotion Model for All Designators (Pooled Fiscal Years 1981-1994)

or Supply officers as a result of its admission requirements and a policy that only permits a graduating midshipman to enter one of the "restricted line" communities if he or she is not physically qualified for the unrestricted line. This may explain the lack of statistical significance for the USNA variable in the promotion model for the SUPPORT community.

| Independent Variables                                                                                                                                                                                                                                      | Community *** |          |         |         |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|---------|---------|----------|
|                                                                                                                                                                                                                                                            | SWO           | SUB      | PILOT   | NFO     | SUPPORT  |
| MALE                                                                                                                                                                                                                                                       | -0.067        | **       | 0.067   | 0.100   | -0.006   |
| WHITE                                                                                                                                                                                                                                                      | 0.052         | -0.185   | 0.180 * | 0.026   | 0.045    |
| FFGE                                                                                                                                                                                                                                                       | 0.135 *       | -0.038   | 0.002   | -0.009  | 0.234 *  |
| SCHOLAR                                                                                                                                                                                                                                                    | 0.055 *       | 0.009    | 0.087 * | 0.069   | 0.043    |
| HIQUAL                                                                                                                                                                                                                                                     | 0.057         | 0.092 *  | -0.025  | 0.046   | 0.021    |
| USNA                                                                                                                                                                                                                                                       | 0.064 *       | 0.163 *  | 0.044 * | 0.124 * | 0.013    |
| PRIENL                                                                                                                                                                                                                                                     | -0.141 *      | -0.221 * | -0.055  | -0.058  | -0.136 * |
| TECHMAJ                                                                                                                                                                                                                                                    | -0.023        | 0.021    | -0.035  | -0.045  | -0.115 * |
| MARRIED                                                                                                                                                                                                                                                    | 0.078 *       | 0.142 *  | 0.131 * | 0.112   | 0.044    |
| KIDS                                                                                                                                                                                                                                                       | 0.129 *       | 0.168 *  | 0.116 * | 0.162 * | 0.075 *  |
| Notes: * Significant at the 0.05 level      ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |               |          |         |         |          |

**TABLE 7. Comparison of Parameter Estimates (OLS) for the Commander Promotion Model by Warfare Community (1981-1994)**

Table 8 provides a comparison of promotion model parameter estimates for the Captain data set. These OLS coefficients are provided for each warfare designator over the entire 14 year period. Only five of the ten explanatory variables display a high degree of statistical significance for this model, suggesting that other factors, which are not accounted for in this model, are more likely to determine successful promotion to the rank of Captain.

The graduate education variable, FFGE, loses its statistical significance from the Commander model for all communities, with one exception. Fleet Support and Supply officers continue to benefit from obtaining a graduate degree, with a promotion probability 19 percent higher than officers without the degree. Recall that FFGE provided positive influence on both SWO and SUPPORT models for the Commander data set, and was statistically significant for the model on pooled Commander designators as well.



The USNA variable continues to positively influence promotion probability for the SWO and SUB communities, providing higher promotion rates of 8.6 and 13.9 percent, respectively. Although only significant for the Surface Warfare community, having served as an enlisted member before being commissioned exhibits a consistent decrease in likelihood for promotion.

| Independent Variables                                                                                                                                                                                                                                      | Community *** |         |        |          |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|--------|----------|---------|
|                                                                                                                                                                                                                                                            | SWO           | SUB     | PILOT  | NFO      | SUPPORT |
| MALE                                                                                                                                                                                                                                                       | **            | **      | -0.188 | **       | -0.124  |
| WHITE                                                                                                                                                                                                                                                      | -0.100        | 0.618   | 0.166  | 0.112    | -0.132  |
| FFGE                                                                                                                                                                                                                                                       | 0.023         | -0.011  | -0.038 | -0.072   | 0.191 * |
| SCHOLAR                                                                                                                                                                                                                                                    | 0.120 *       | -0.004  | 0.029  | 0.102    | -0.016  |
| HIQUAL                                                                                                                                                                                                                                                     | 0.026         | 0.030   | 0.099  | 0.084    | 0.019   |
| USNA                                                                                                                                                                                                                                                       | 0.086 *       | 0.139 * | 0.022  | 0.083    | 0.006   |
| PRIENL                                                                                                                                                                                                                                                     | -0.236 *      | -0.146  | -0.048 | -0.232   | -0.020  |
| TECHMAJ                                                                                                                                                                                                                                                    | -0.009        | 0.045   | -0.037 | -0.186 * | -0.050  |
| MARRIED                                                                                                                                                                                                                                                    | 0.081         | 0.144   | 0.098  | 0.044    | 0.016   |
| KIDS                                                                                                                                                                                                                                                       | 0.135         | 0.163   | 0.120  | 0.193    | 0.045   |
| Notes: * Significant at the 0.05 level      ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |               |         |        |          |         |

TABLE 8. Comparison of Parameter Estimates (OLS) for the Captain Promotion Model by Warfare Community (1981-1994)

## 6. Comparison of Promotion Determinants in Pre-Drawdown and Drawdown Periods

One area that appears to have received little attention in previous studies relating to this subject is the potential change in promotion outcomes as the Navy's manning policies change during the downsizing of the force. Promotion rates for both data sets demonstrate a fairly steady decline over the 14 year period of this analysis, but fail to indicate the more subtle changes in determinants of promotion that may occur over time. This section will attempt to address these issues by

providing comparisons of pre-drawdown and drawdown promotion outcomes for the combined designators, as well as for individual communities. These comparisons will be verified statistically through the use of a Chow test (Gujarati, 1988). The null hypothesis ( $H_0$ ) for this test is that the estimated coefficients are the same, in other words, there is no difference between the determinants for the two groups being compared. The results of the Chow test will allow for rejecting the null hypothesis, indicating that the groups behave differently, or failing to reject the null hypothesis, which indicates that the regressions may be similar.

Table 9 displays the parameter estimates for the OLS linear probability model for the combined warfare designators. For the Commander data set, six of the variables are significant during both periods. The positive impact of graduate education increases from 8.4 to 9.8 percent, possibly reflecting the emphasis placed on graduate education for officers by the Chiefs of Naval Operations over the last fourteen years. The effect of being a graduate of the Naval Academy also displays an increasing trend, increasing from a 6.6 to an 11.6 percent probability. The effects of undergraduate academic performance, being married, and having dependent children are all positive factors, but their effect on promotion probability lessens during the drawdown period. Prior enlistment decreases the probability of being promoted to Commander, and this effect becomes more pronounced during the later period.

Three of the remaining four variables change in significance. The college quality variable, HIQUAL is insignificant during the pre-drawdown period but becomes statistically significant during the later period, improving the probability of promotion by 8 percent. Likewise, MALE becomes significant and has a positive effect on promotion. WHITE, on the other hand, loses its significance during the drawdown period. Chow test results for this analysis indicate a rejection of the null hypothesis, suggesting that the two regressions are dissimilar.

Table 9 also shows results of the promotion models for combined designators in the Captain data set. The only variable that remains statistically

significant over both periods is USNA, although the positive effects decrease from 12.5 to 7.3 percent over time. Only three other variables display any significance during either period. Undergraduate academic performance (SCHOLAR) becomes statistically significant and increases the probability of promotion by 9 percent during the drawdown. The positive effects of having dependent children increases from 8.6 to 12.3 percent, and becomes statistically significant during the second period. Finally, prior enlisted service, which provides a 14.5 percent decrease in probability of promotion during the pre-drawdown, decreases promotion probability by only 9.7 percent and loses its significance during the drawdown. Chow tests on these models result in a failure to reject the null hypothesis, indicating that the regressions behave in a like manner.

| Independent Variables                                                                                                       | Commander Data Set |          | Captain Data Set |          |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                             | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                        | 0.014              | 0.055 *  | 0.019            | -0.039   |
| WHITE                                                                                                                       | 0.121 *            | 0.030    | 0.015            | -0.033   |
| FFGE                                                                                                                        | 0.084 *            | 0.098 *  | -0.038           | 0.009    |
| SCHOLAR                                                                                                                     | 0.097 *            | 0.050 *  | 0.044            | 0.091 *  |
| HIQUAL                                                                                                                      | -0.007             | 0.082 *  | 0.037            | 0.060    |
| USNA                                                                                                                        | 0.067 *            | 0.116 *  | 0.125 *          | 0.073 *  |
| PRIENL                                                                                                                      | -0.121 *           | -0.142 * | -0.145 *         | -0.097   |
| TECHMAJ                                                                                                                     | 0.000              | -0.018   | 0.046            | -0.014   |
| MARRIED                                                                                                                     | 0.089 *            | 0.087 *  | 0.012            | 0.098    |
| KIDS                                                                                                                        | 0.127 *            | 0.095 *  | 0.086            | 0.123 *  |
| Notes: * Significant at the 0.05 level    ** coefficients represent change in probability of promotion (from OLS estimates) |                    |          |                  |          |
| *** LOGIT model results may be found in Appendices                                                                          |                    |          |                  |          |

TABLE 9. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Commander and Captain Data Sets Combined Designators

An analysis of the pre-drawdown and drawdown periods for the Surface Warfare Officer (SWO) community is depicted in Table 10. A fully-funded graduate

education is a significant factor in both periods for the Commander promotion model. It increases the probability of promotion by 14.7 percent in the earlier period and continues this positive effect, although at slightly smaller (11.2 percent) rate during the downsizing. Having dependent children is a positive contributor to promotion at 13 percent and 12 percent over the respective time frames. Prior enlistment also remains a statistically significant negative factor, decreasing promotion probability by 14 and 12.8 percent in the two periods, respectively. Undergraduate academic performance increased promotion chances by 8.9 percent in the pre-drawdown period, but did not contribute significantly in the later period. Attending a high quality college, or the Naval Academy, improved promotion rates significantly in the early 1990's, by 10.3 and 11.1 percent, respectively. The Chow test on the models causes a failure to reject the null, suggesting similar behavior between the regressions.

A previous study of Surface Warfare officers used excerpts of the same data base utilized for this study and analyzed promotion behavior to the ranks of Lieutenant (LT) and Lieutenant Commander (LCDR) (Talaga, 1994). Talaga used data files containing background, Navy experience, and promotion selection board results for all officers going before the Lieutenant (O-3) board between fiscal years 1981 and 1985, and those going before the Lieutenant Commander board between fiscal years 1985 and 1990. Were he to have continued his analysis of these officers, his next group of subjects would coincide with the Surface Warfare officers who comprise the drawdown Commander data set. In other words, his cohort would include those Surface Warfare officers who appeared before the Commander promotion board between fiscal years 1990 and 1994. In light of this connection, it is possible to compare results of the Talaga study with the analysis in this thesis.

Six variables from Talaga's promotion model are similar to variables in this promotion model, and two of these were statistically significant. Talaga's FFGE variable exhibited a 13.6 percent increase in probability of promotion to the rank of LCDR and was statistically significant. Likewise, the drawdown Commander

FFGE variable here demonstrated a significant 11.2 percent increase in promotion probability. Another significant variable for LCDR promotion was married with children (MARCHILD), which increased promotion probability by 9.2 percent. Similarly, the drawdown KIDS variable increased promotion odds by 12.1 percent and was significant at the .05 level. The other four variables from Talaga's work that were also used in this study were FEMALE, MINORITY, GPA, and MARONLY (married only, no children). Their OLS parameter estimates were 0.454, 0.027, 0.014, and 0.055, respectively. It should be remembered, however, that none of these variables were statistically significant. Keeping this in mind, these estimates may be compared with parameter estimates for MALE, WHITE, SCHOLAR, and MARRIED in the promotion model for drawdown Surface Warfare officers in the Commander Data set.

The models on SWO Captains show quite different results. No variables demonstrated statistical significance across both periods. Although being a graduate of the Naval Academy increased promotion to O-6 during the pre-drawdown by almost 14 percent, it became an insignificant factor during the drawdown. Likewise, prior enlistment decreased an officer's promotion chances by an impressive 46.5 percent in the earlier time frame, but the effect decreased in magnitude and became statistically insignificant during the drawdown. Undergraduate scholastic performance and being married without children both moved in the opposite direction. These variables went from insignificance in the pre-drawdown, to providing increased probabilities of 17 and 28 percent in the later period. The Chow test yields a rejection of the null hypothesis, so the regressions differ.

Based on the results of this analysis, promotion rates for officers in the Submarine Warfare community, as shown in Table 11, seem to be unaffected by graduate education and undergraduate academic performance, although this community exhibits the largest percentage of members with superior undergraduate

grade point averages. This high representation of the SCHOLAR variable is most likely due to the rigorous academic screening that precedes acceptance into this

| Independent Variables                                                                                                                                                                                                                               | Commander Data Set |          | Captain Data Set |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                                                                                                                                                     | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                                                                                                                                                | 0.004              | -0.096   | **               | **       |
| WHITE                                                                                                                                                                                                                                               | 0.084              | 0.033    | -0.477           | 0.046    |
| FFGE                                                                                                                                                                                                                                                | 0.147 *            | 0.112 *  | 0.061            | -0.013   |
| SCHOLAR                                                                                                                                                                                                                                             | 0.089 *            | 0.015    | 0.031            | 0.171 *  |
| HIQUAL                                                                                                                                                                                                                                              | 0.023              | 0.103 *  | 0.016            | 0.023    |
| USNA                                                                                                                                                                                                                                                | 0.037              | 0.111 *  | 0.139 *          | 0.048    |
| PRIENL                                                                                                                                                                                                                                              | -0.141 *           | -0.128 * | -0.465 *         | -0.152   |
| TECHMAJ                                                                                                                                                                                                                                             | -0.018             | -0.031   | 0.001            | -0.009   |
| MARRIED                                                                                                                                                                                                                                             | 0.075              | 0.079    | -0.170           | 0.282 *  |
| KIDS                                                                                                                                                                                                                                                | 0.130 *            | 0.121 *  | 0.084            | 0.192    |
| Notes: * Significant at the 0.05 level    ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>LOGIT model results may be found in Appendices |                    |          |                  |          |

**TABLE 10. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Surface Warfare Officers Commander and Captain Data Sets**

community. The USNA and KIDS variables are significant across periods for the Commander data set, providing roughly 15 percent increases in promotion probability. The college quality and prior enlistment variables become significant in the later years. HIQUAL increases promotion rates by 13.9 percent and PRIENL decreases the likelihood of promotion by 30 percent for this sample. The null hypothesis is rejected as a result of the Chow test, indicating different behaviors across periods.

For Submarine officers in the Captain group, only one variable exhibited statistical significance during either period. Of the officers who appeared before the

Captain promotion board between fiscal years 1990 and 1994, Naval Academy graduates were promoted at a 20 percent higher rate than those who attended other colleges. The Chow test suggests not rejecting the null hypothesis, an indication that the regressions are similar.

| Independent Variables                                                                                                                                                                                                                                    | Commander Data Set |          | Captain Data Set |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                                                                                                                                                          | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                                                                                                                                                     | **                 | **       | **               | **       |
| WHITE                                                                                                                                                                                                                                                    | -0.400             | -0.198   | 0.057            | **       |
| FFGE                                                                                                                                                                                                                                                     | -0.103             | 0.025    | -0.053           | 0.069    |
| SCHOLAR                                                                                                                                                                                                                                                  | 0.013              | 0.006    | -0.046           | 0.055    |
| HIQUAL                                                                                                                                                                                                                                                   | 0.041              | 0.139 *  | -0.004           | 0.058    |
| USNA                                                                                                                                                                                                                                                     | 0.149 *            | 0.161 *  | 0.117            | 0.204 *  |
| PRIENL                                                                                                                                                                                                                                                   | -0.174             | -0.300 * | -0.172           | -0.065   |
| TECHMAJ                                                                                                                                                                                                                                                  | 0.050              | 0.013    | 0.098            | 0.002    |
| MARRIED                                                                                                                                                                                                                                                  | 0.115              | 0.160    | 0.155            | 0.364    |
| KIDS                                                                                                                                                                                                                                                     | 0.144 *            | 0.178 *  | 0.060            | 0.443    |
| Notes: * Significant at the 0.05 level    ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |                    |          |                  |          |

**TABLE 11. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Submarine Warfare Officers Commander and Captain Data Sets**

The parameter estimate comparisons for Naval Aviators (Pilots) are provided in Table 12. For the Commander data set, four variables show significance during the pre-drawdown phase, but only one appears to be significant during the drawdown. Before the pre-drawdown promotion boards, a superior undergraduate academic record provided a 10.5 percent increase in promotion. Naval Academy graduates were promoted at a 4.7 percent rate over their peers from other schools. Being married and having children each improved promotion probabilities by approximately 15 percent. During the drawdown time frame, the WHITE variable became significant, providing a 26.4 percent increase in promotability. Chow tests

for this set of regressions failed to reject the null hypothesis, indicating like behaviors between groups.

The Captain data set for pilots was far less remarkable. Only the WHITE variable demonstrated any statistical significance, a 62.6 percent probability increase during the pre-drawdown period. All other variables remained insignificant. A Chow test performed on this set of regressions showed a failure to reject the null hypothesis.

| Independent Variables                                                                                                                                                                                                                                    | Commander Data Set |          | Captain Data Set |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                                                                                                                                                          | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                                                                                                                                                     | -0.241             | 0.201    | **               | -0.210   |
| WHITE                                                                                                                                                                                                                                                    | 0.109              | 0.264 *  | 0.626 *          | 0.016    |
| FFGE                                                                                                                                                                                                                                                     | 0.010              | -0.029   | -0.090           | 0.007    |
| SCHOLAR                                                                                                                                                                                                                                                  | 0.105 *            | 0.074    | 0.011            | 0.049    |
| HIQUAL                                                                                                                                                                                                                                                   | -0.032             | -0.007   | 0.090            | 0.113    |
| USNA                                                                                                                                                                                                                                                     | 0.047 *            | 0.043    | 0.062            | 0.008    |
| PRIENL                                                                                                                                                                                                                                                   | -0.065             | -0.030   | -0.061           | -0.027   |
| TECHMAJ                                                                                                                                                                                                                                                  | -0.033             | -0.027   | 0.035            | -0.091   |
| MARRIED                                                                                                                                                                                                                                                  | 0.157 *            | 0.074    | 0.104            | 0.093    |
| KIDS                                                                                                                                                                                                                                                     | 0.152 *            | 0.038    | 0.101            | 0.129    |
| Notes: * Significant at the 0.05 level    ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |                    |          |                  |          |

TABLE 12. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Naval Aviators (Pilots) Commander and Captain Data Sets

Naval Flight Officers (NFO), depicted in Table 13, are also promoted, apparently, without regard for graduate education or undergraduate academic performance, as these variables are insignificant across both periods for both ranks. In the Commander data, the USNA variable is significant, during both pre-drawdown and drawdown periods, providing increased promotion probabilities of 10.9 and 13.2 percent, respectively. In the pre-drawdown period, having children



appears to improve promotability by almost 19 percent, but this variable becomes insignificant in later years. A Chow test results in rejection of the null hypothesis. The regressions behave differently.

Captain NFO's are affected to an even lesser degree by the variables in this promotion model. In the pre-drawdown period, having a technical undergraduate major decreased one's probability of promotion by nearly 40 percent, although this factor was not significant when appearing before the drawdown promotion boards. Having a superior undergraduate academic record was insignificant for pre-drawdown Captains, but showed a significant 26.8 percent increase in promotion probability in the drawdown years. The Chow test on this set suggests rejecting the null hypothesis, indicating different behaviors between models.

| Independent Variables                                                                                                                                                                                                                                    | Commander Data Set |          | Captain Data Set |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                                                                                                                                                          | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                                                                                                                                                     | **                 | 0.031    | **               | **       |
| WHITE                                                                                                                                                                                                                                                    | 0.009              | 0.000    | 0.046            | 0.278    |
| FFGE                                                                                                                                                                                                                                                     | 0.066              | -0.094   | -0.144           | -0.035   |
| SCHOLAR                                                                                                                                                                                                                                                  | 0.128              | 0.033    | -0.086           | 0.239    |
| HIQUAL                                                                                                                                                                                                                                                   | 0.052              | 0.047    | -0.109           | 0.268 *  |
| USNA                                                                                                                                                                                                                                                     | 0.109 *            | 0.132 *  | 0.189            | 0.078    |
| PRIENL                                                                                                                                                                                                                                                   | -0.118             | 0.028    | -0.304           | -0.070   |
| TECHMAJ                                                                                                                                                                                                                                                  | -0.030             | -0.066   | -0.399 *         | -0.029   |
| MARRIED                                                                                                                                                                                                                                                  | 0.166              | 0.060    | -0.081           | 0.143    |
| KIDS                                                                                                                                                                                                                                                     | 0.188 *            | 0.117    | -0.003           | 0.310    |
| Notes: * Significant at the 0.05 level    ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |                    |          |                  |          |

TABLE 13. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Naval Flight Officers (NFO) Commander and Captain Data Sets

The final warfare community analyzed in this thesis, and the one most consistently benefitting from graduate education, is the community made up of Fleet

Support and Supply officers. The results of OLS regression promotion models for this group are provided in Table 14. It can be clearly seen from this table, that the FFGE variable provides a consistently significant, positive affect on promotion to the ranks of Commander and Captain for these officers. In the Commander data set, a pre-drawdown promotion probability of 22.1 percent increases to 26.4 percent during the drawdown period. Other variables that impact promotion during the pre-drawdown are WHITE, which provides a positive 13.3 percent increase, and KIDS, which contributes a 9.5 percent increase in probability. In the drawdown period, college quality improves promotion chances by 10.8 percent whereas prior enlisted service and a technical undergraduate major reduce promotion probabilities by 15.1 and 13.1 percent, respectively. The Chow test suggests rejecting the null hypothesis, an indication that the models perform differently.

For the Captain data set, the only variable that demonstrates any statistical significance is the FFGE variable. It provides an increased probability of promotion of 16 percent during the pre-drawdown period. This probability increases to 20.5 percent during the later period. The Chow test on these regressions leads to a failure to reject the null hypothesis, indicating similarity between regressions.

| Independent Variables                                                                                                                                                                                                                                    | Commander Data Set |          | Captain Data Set |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|------------------|----------|
|                                                                                                                                                                                                                                                          | Pre-drawdown       | Drawdown | Pre-drawdown     | Drawdown |
| MALE                                                                                                                                                                                                                                                     | -0.054             | 0.027    | -0.147           | -0.118   |
| WHITE                                                                                                                                                                                                                                                    | 0.133 *            | -0.051   | 0.017            | -0.138   |
| FFGE                                                                                                                                                                                                                                                     | 0.221 *            | 0.264 *  | 0.161 *          | 0.205 *  |
| SCHOLAR                                                                                                                                                                                                                                                  | 0.065              | 0.034    | 0.146            | -0.085   |
| HIQUAL                                                                                                                                                                                                                                                   | -0.053             | 0.108 *  | 0.115            | -0.058   |
| USNA                                                                                                                                                                                                                                                     | -0.023             | 0.060    | -0.006           | 0.024    |
| PRIENL                                                                                                                                                                                                                                                   | -0.082             | -0.151 * | **               | -0.047   |
| TECHMAJ                                                                                                                                                                                                                                                  | -0.096             | -0.131 * | 0.152            | -0.147   |
| MARRIED                                                                                                                                                                                                                                                  | 0.010              | 0.088    | 0.030            | 0.018    |
| KIDS                                                                                                                                                                                                                                                     | 0.095 *            | 0.071    | 0.151            | 0.017    |
| Notes: * Significant at the 0.05 level    ** Not included in model because of no variance in representation<br>*** coefficients represent change in probability of promotion (from OLS estimates)<br>**** LOGIT model results may be found in Appendices |                    |          |                  |          |

**TABLE 14. Comparison of Parameter Estimates (OLS) for Pre-drawdown and Drawdown Periods. Supply and Fleet Support Officers. Commander and Captain Data Sets**

## V. CONCLUSIONS AND RECOMMENDATIONS

### A. CONCLUSIONS

This thesis demonstrates the effects of undergraduate background and fully-funded graduate education (FFGE) on promotion to the ranks of Commander and Captain in the Navy. Based on analysis of the promotion model's parameter estimates by rank, warfare community, and time period, one can conclude that these two education variables do affect promotion, although the magnitude and significance of this effect varies according to which sub-group is being analyzed.

Both undergraduate academic performance and graduate education were significantly and positively associated with the probability of promotion, for officers' appearing before the Commander promotion boards, when using data pooled by designators and time periods. When analyzing data on separate communities, only the Surface Warfare officer community received significant effects from both variables. FFGE remained significant for the Fleet Support and Supply community and undergraduate GPA retained its significance for Pilots. When viewed from the perspective of differences between the pre-drawdown or drawdown time periods, these effects seem to change over time. SWO's had significant FFGE effects during both periods, although this effect diminished somewhat (from 14.7 to 11.2 percent) in the drawdown period. The undergraduate performance variable became statistically insignificant in the drawdown period. Fleet Support and Supply officers, on the other hand, saw an increase in the promotion rate effects from graduate education during the drawdown period, and the parameter estimates were significant during both periods.

Captains received somewhat different effects from these two education variables. Of the two, only SCHOLAR, the variable associated with an undergraduate GPA greater than 3.2, was significant for the pooled designators. A look at communities showed that undergraduate academic performance was significant for the SWO community alone, and only during the drawdown period.

FFGE returned as a significant factor for Fleet Support and Supply officers before the Captain promotion board and once again, this community demonstrated a tendency to place more emphasis on graduate education, promoting officers at a four percent greater rate during the drawdown (20.5 %), than during the pre-drawdown (16.1 %).

The simple answer to the research question presented as an introduction to this thesis is yes, there is a statistically significant difference in promotion to the ranks of Commander and Captain for U.S. Navy officers with and without graduate education. There is, however, a caveat. This difference does not seem to apply to Captain as much as it does to Commander promotions, and it does not seem to apply as much to the Submarine, Pilot, and NFO communities as much as it does to the Surface Warfare and Fleet Support and Supply communities.

These results bring to mind another question. Should graduate education have an effect on promotions? The Chief of Naval Operations indicates that it should have an effect, as quoted in his policy on graduate education (CNO, 1994). The Navy is being required to operate with a shrinking budget and manpower force, and the requirement to fill billets with people who are proven subspecialists will likely continue to grow rather than diminish.

A common theme has emerged from studies on how graduate education affects naval officer promotion. Generally, graduate education provides a positive influence on the probability for selection to the next rank. A summary of prior work from the literature review and the results of this thesis is presented in Table 15.

As this comparison shows, graduate education appears to be an important predictor of success for many designators and to many promotion points (O-4 and above).

| Author                                                                                                  | Data                                                                                                                                                                                                                                                                    | Effect of Graduate Education                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cymrot</b><br>(1986)                                                                                 | <u>Ranks:</u> O-3 to O-7<br><u>Communities:</u> 3 groups (RL, Staff, URL)<br>Analyzed as a combined group (pooled)<br><u>Source:</u> 1985 Officer Master File (OMF)                                                                                                     | To O-4 : + 0.260<br>To O-5 : + 0.106<br>To O-6 : +0.165<br>To O-7 : 0.000                                                                                                                                                                                        |
| <b>Jordan</b><br>(1991)                                                                                 | <u>Ranks:</u> O-3 to O-5<br><u>Community:</u> General Unrestricted Line<br><u>Source:</u> 1981-1990 OMF and Officer Promotion History Files (OPHF)                                                                                                                      | To O-4 : <b>+0.292</b><br>To O-5 : +0.140                                                                                                                                                                                                                        |
| <b>Talaga</b><br>(1994)                                                                                 | <u>Ranks:</u> O-3 to O-4<br><u>Community:</u> Surface Warfare (SWO)<br><u>Source:</u> 1981-1990 OPHF and Officer Fitness Report Files                                                                                                                                   | To O-4 : <b>+0.170</b>                                                                                                                                                                                                                                           |
| <b>Buterbaugh</b><br>(this thesis)                                                                      | <u>Ranks:</u> O-4 to O-6<br><br><u>Communities:</u> Surface, Sub, Pilot, NFO, and Support (Supply and Fleet Support)<br><br>Analyzed as pooled group and by individual community, then by time period (pre-drawdown vs. drawdown).<br><br><u>Source:</u> 1981-1994 OPHF | To O-5 :<br>Pooled : <b>+0.087</b><br>SWO : <b>+0.135</b><br>SUB : -0.038<br>PILOT : +0.002<br>NFO : -0.009<br>SUPPORT: <b>+0.234</b><br>To O-6 :<br>Pooled : -0.009<br>SWO : +0.023<br>SUB : -0.011<br>PILOT : -0.038<br>NFO : -0.072<br>SUPPORT: <b>+0.191</b> |
| Note: Bolded figures under Effect of Graduate Education are statistically significant at the 0.05 level |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                  |

**Table 15. Studies on the Effect of Graduate Education on Naval Officer Promotion**

## **B. RECOMMENDATIONS FOR FURTHER RESEARCH**

This thesis has focused on the factors that affect promotion to two of the senior U.S. Navy ranks. It is, apparently, unique in its approach to evaluating promotion performance by community as well as over different time periods, one of which includes the transition to a smaller force. The data base used in this study contains similar information on all of the other officer ranks, and further research should be conducted to evaluate education effects on the different communities at lower ranks. Additionally, the promotion trends should be followed as the Navy completes its drawdown to a "right sized" force and the CNO's 1994 directive begins to take hold. If the CNO's directions are followed, fully-funded graduate education should begin to become a more important promotion factor for all communities in future years.

The issue of selectivity bias is not addressed directly in this research. Arguably, the positive promotion effects attributed to graduate education in this study's models could be attributed to the selection of officers who attend graduate school. That is to say, a higher promotion rate may not be caused by the fact that an officer has a graduate degree, but rather, that officer may have been chosen to attend graduate school because he or she was more promotable. This issue was addressed and found to be a minor one in models of promotion to the rank of LCDR (O-4) in a previous study (Talaga, 1994). Nonetheless, it deserves further investigation.

Finally, the models were limited in scope because of the available data. There are numerous factors besides those considered in this promotion model, that could affect an officer's promotability. One example would be performance during a command tour or equivalent at the rank of Commander. This factor is commonly believed to be a primary predictor of promotion to Captain and there are undoubtedly other factors that would produce similar negative effects. A study of these perceived "showstoppers" might prove an interesting follow-on to this work.

## APPENDIX A. LOGIT MODEL RESULTS

TABLE A.1.A LOGIT RESULTS FOR COMMANDER DATA SET - POOLED DESIGNATORS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 9962  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 7153    |
| 2                | 1     | 2809    |

WARNING: 2410 observation(s) were deleted due to missing values for the response or explanatory variables.

### Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates     |
|-----------|-------------------|--------------------------------|-------------------------------|
| AIC       | 11852.909         | 11533.075                      | .                             |
| SC        | 11860.115         | 11612.347                      | .                             |
| -2 LOG L  | 11850.909         | 11511.075                      | 339.833 with 10 DF (p=0.0001) |
| Score     | .                 | .                              | 338.824 with 10 DF (p=0.0001) |

### Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.2859            | 0.1372         | 4.3411          | 0.0372          | .                     | 0.751      |
| MALE     | 1  | 0.1976             | 0.0874         | 5.1106          | 0.0238          | 0.030131              | 1.219      |
| WHITE    | 1  | 0.3632             | 0.1131         | 10.3066         | 0.0013          | 0.037425              | 1.438      |
| FFGE     | 1  | 0.4677             | 0.0579         | 65.2678         | 0.0001          | 0.109047              | 1.596      |
| SCHOLAR  | 1  | 0.3534             | 0.0661         | 28.5691         | 0.0001          | 0.072413              | 1.424      |
| HIQUAL   | 1  | 0.1292             | 0.0792         | 2.6622          | 0.1028          | 0.020518              | 1.138      |
| USNA     | 1  | 0.4606             | 0.0559         | 67.9187         | 0.0001          | 0.116612              | 1.585      |
| PRIENL   | 1  | -0.6355            | 0.0853         | 55.4532         | 0.0001          | -0.086723             | 0.530      |
| TECHMAJ  | 1  | -0.0538            | 0.0543         | 0.9793          | 0.3224          | -0.013273             | 0.948      |
| MARRIED  | 1  | 0.4009             | 0.0881         | 20.7135         | 0.0001          | 0.082552              | 1.493      |
| KIDS     | 1  | 0.5375             | 0.0780         | 47.4600         | 0.0001          | 0.130352              | 1.712      |

### Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 58.2% | Somers' D = 0.229 |
| Discordant = 35.3% | Gamma = 0.245     |
| Tied = 6.5%        | Tau-a = 0.093     |
| (20092777 pairs)   | c = 0.615         |



TABLE A.1.B LOGIT RESULTS FOR COMMANDER DATA SET - SURFACE WARFARE OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 2717  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 1935  |
| 2                | 1       | 782   |

WARNING: 368 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates     |
|-----------|-------------------|--------------------------------|-------------------------------|
| AIC       | 3263.410          | 3167.234                       | .                             |
| SC        | 3269.317          | 3232.214                       | .                             |
| -2 LOG L  | 3261.410          | 3145.234                       | 116.176 with 10 DF (p=0.0001) |
| Score     | .                 | .                              | 113.587 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | 0.2217                | 0.4317            | 0.2637             | 0.6076             | .                        | 1.248         |
| MALE     | 1  | -0.3308               | 0.3905            | 0.7178             | 0.3969             | -0.021424                | 0.718         |
| WHITE    | 1  | 0.2439                | 0.1945            | 1.5727             | 0.2098             | 0.028385                 | 1.276         |
| FFGE     | 1  | 0.7387                | 0.1092            | 45.7258            | 0.0001             | 0.184776                 | 2.093         |
| SCHOLAR  | 1  | 0.2974                | 0.1458            | 4.1590             | 0.0414             | 0.051703                 | 1.346         |
| HIQUAL   | 1  | 0.2846                | 0.1561            | 3.3270             | 0.0682             | 0.044710                 | 1.329         |
| USNA     | 1  | 0.3383                | 0.0988            | 11.7116            | 0.0006             | 0.089264                 | 1.402         |
| PRIENL   | 1  | -0.6294               | 0.1536            | 16.7988            | 0.0001             | -0.092286                | 0.533         |
| TECHMAJ  | 1  | -0.1177               | 0.1044            | 1.2701             | 0.2598             | -0.028966                | 0.889         |
| MARRIED  | 1  | 0.3600                | 0.1696            | 4.5044             | 0.0338             | 0.072859                 | 1.433         |
| KIDS     | 1  | 0.6089                | 0.1448            | 17.6791            | 0.0001             | 0.146080                 | 1.838         |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 59.7% | Somers' D = 0.254 |
| Discordant = 34.2% | Gamma = 0.271     |
| Tied = 6.1%        | Tau-a = 0.104     |
| (1513170 pairs)    | c = 0.627         |

TABLE A.1.C LOGIT RESULTS FOR COMMANDER DATA SET - SUBMARINE OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 983  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 814   |
| 2                | 1       | 169   |

WARNING: 240 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 904.240        | 852.979                  | .                           |
| SC        | 909.131        | 901.885                  | .                           |
| -2 LOG L  | 902.240        | 832.979                  | 69.261 with 9 DF (p=0.0001) |
| Score     | .              | .                        | 72.463 with 9 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 24.2661            | 0.3563         | 4637.4905       | 0.0001          | .                     | 999.000    |
| WHITE    | 0  | -24.2785           | .              | .               | .               | .                     | 0.000      |
| FFGE     | 1  | -0.2633            | 0.2713         | 0.9423          | 0.3317          | -0.043907             | 0.768      |
| SCHOLAR  | 1  | 0.0548             | 0.1791         | 0.0935          | 0.7598          | 0.014983              | 1.056      |
| HIQUAL   | 1  | 0.5405             | 0.2915         | 3.4384          | 0.0637          | 0.091707              | 1.717      |
| USNA     | 1  | 1.1453             | 0.1925         | 35.3883         | 0.0001          | 0.312809              | 3.144      |
| PRIENL   | 1  | -1.0783            | 0.4220         | 6.5298          | 0.0106          | -0.098950             | 0.340      |
| TECHMAJ  | 1  | 0.1584             | 0.2048         | 0.5984          | 0.4392          | 0.038111              | 1.172      |
| MARRIED  | 1  | 0.8260             | 0.3429         | 5.8023          | 0.0160          | 0.175445              | 2.284      |
| KIDS     | 1  | 1.0159             | 0.2987         | 11.5658         | 0.0007          | 0.241730              | 2.762      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 67.6% | Somers' D = 0.398 |
| Discordant = 27.8% | Gamma = 0.418     |
| Tied = 4.7%        | Tau-a = 0.113     |
| (137566 pairs)     | c = 0.699         |

TABLE A.1.D LOGIT RESULTS FOR COMMANDER DATA SET - PILOTS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 3074  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered Value    | LOGPROM | Count |
| 1                | 0       | 2307  |
| 2                | 1       | 767   |

WARNING: 488 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 3455.937       | 3434.495                 | .                            |
| SC        | 3461.967       | 3500.833                 | .                            |
| -2 LOG L  | 3453.937       | 3412.495                 | 41.442 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 42.230 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.6458            | 0.6376         | 1.0258          | 0.3111          | .                     | 0.524      |
| MALE     | 1  | 0.3538             | 0.5504         | 0.4133          | 0.5203          | 0.014039              | 1.425      |
| WHITE    | 1  | 0.8259             | 0.2939         | 7.8974          | 0.0050          | 0.057035              | 2.284      |
| FFGE     | 1  | 0.0106             | 0.1321         | 0.0064          | 0.9362          | 0.001946              | 1.011      |
| SCHOLAR  | 1  | 0.5223             | 0.1696         | 9.4862          | 0.0021          | 0.081251              | 1.686      |
| HIQUAL   | 1  | -0.1296            | 0.1549         | 0.6998          | 0.4028          | -0.019101             | 0.878      |
| USNA     | 1  | 0.2446             | 0.0954         | 6.5761          | 0.0103          | 0.063296              | 1.277      |
| PRIENL   | 1  | -0.2797            | 0.2226         | 1.5785          | 0.2090          | -0.027621             | 0.756      |
| TECHMAJ  | 1  | -0.1898            | 0.0972         | 3.8110          | 0.0509          | -0.047142             | 0.827      |
| MARRIED  | 1  | 0.6492             | 0.1981         | 10.7445         | 0.0010          | 0.123687              | 1.914      |
| KIDS     | 1  | 0.5657             | 0.1677         | 11.3748         | 0.0007          | 0.123477              | 1.761      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 50.2% | Somers' D = 0.135 |
| Discordant = 36.7% | Gamma = 0.155     |
| Tied = 13.1%       | Tau-a = 0.050     |
| (1769469 pairs)    | c = 0.567         |

TABLE A.1.E LOGIT RESULTS FOR COMMANDER DATA SET - NAVAL FLIGHT OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1029  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 688     |
|                  |       | 341     |

WARNING: 1196 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 1309.156       | 1303.180                 | .                            |
| SC        | 1314.092       | 1357.480                 | .                            |
| -2 LOG L  | 1307.156       | 1281.180                 | 25.976 with 10 DF (p=0.0038) |
| Score     | .              | .                        | 25.802 with 10 DF (p=0.0040) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.6019            | 0.9315         | 0.4175          | 0.5182          | .                     | 0.548      |
| MALE     | 1  | 0.4134             | 0.8385         | 0.2430          | 0.6220          | 0.017361              | 1.512      |
| WHITE    | 1  | 0.1066             | 0.3863         | 0.0762          | 0.7825          | 0.010053              | 1.113      |
| FFGE     | 1  | -0.0391            | 0.1846         | 0.0448          | 0.8324          | -0.008258             | 0.962      |
| SCHOLAR  | 1  | 0.3344             | 0.2299         | 2.1166          | 0.1457          | 0.056772              | 1.397      |
| HIQUAL   | 1  | 0.2076             | 0.2090         | 0.9867          | 0.3205          | 0.038290              | 1.231      |
| USNA     | 1  | 0.5845             | 0.1566         | 13.9340         | 0.0002          | 0.151640              | 1.794      |
| PRIENL   | 1  | -0.2576            | 0.3513         | 0.5377          | 0.4634          | -0.026455             | 0.773      |
| TECHMAJ  | 1  | -0.2087            | 0.1611         | 1.6789          | 0.1951          | -0.051235             | 0.812      |
| MARRIED  | 1  | 0.4765             | 0.3021         | 2.4878          | 0.1147          | 0.094505              | 1.610      |
| KIDS     | 1  | 0.7068             | 0.2636         | 7.1895          | 0.0073          | 0.160631              | 2.028      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 53.7% | Somers' D = 0.182 |
| Discordant = 35.5% | Gamma = 0.204     |
| Tied = 10.7%       | Tau-a = 0.081     |
| (234608 pairs)     | c = 0.591         |

TABLE A.1.F LOGIT RESULTS FOR COMMANDER DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS (1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 2159  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 1409    |
|                  |       | 750     |

WARNING: 118 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates     |
|-----------|----------------|--------------------------|-------------------------------|
| AIC       | 2790.614       | 2630.477                 | .                             |
| SC        | 2796.292       | 2692.928                 | .                             |
| -2 LOG L  | 2788.614       | 2608.477                 | 180.138 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 172.505 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.1236            | 0.2050         | 0.3634          | 0.5466          | .                     | 0.884      |
| MALE     | 1  | -0.0209            | 0.1223         | 0.0292          | 0.8643          | -0.005525             | 0.979      |
| WHITE    | 1  | 0.1909             | 0.1848         | 1.0670          | 0.3016          | 0.026185              | 1.210      |
| FFGE     | 1  | 1.1335             | 0.1048         | 116.9835        | 0.0001          | 0.305947              | 3.106      |
| SCHOLAR  | 1  | 0.2115             | 0.1153         | 3.3662          | 0.0665          | 0.050449              | 1.236      |
| HIQUAL   | 1  | 0.1018             | 0.1645         | 0.3828          | 0.5361          | 0.016016              | 1.107      |
| USNA     | 1  | 0.0679             | 0.2071         | 0.1075          | 0.7430          | 0.009192              | 1.070      |
| PRIENL   | 1  | -0.6142            | 0.1400         | 19.2497         | 0.0001          | -0.113443             | 0.541      |
| TECHMAJ  | 1  | -0.5424            | 0.1901         | 8.1390          | 0.0043          | -0.072424             | 0.581      |
| MARRIED  | 1  | 0.1947             | 0.1484         | 1.7221          | 0.1894          | 0.044378              | 1.215      |
| KIDS     | 1  | 0.3454             | 0.1447         | 5.6999          | 0.0170          | 0.093248              | 1.413      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 65.0% | Somers' D = 0.339 |
| Discordant = 31.1% | Gamma = 0.353     |
| Tied = 4.0%        | Tau-a = 0.154     |
| (1056750 pairs)    | c = 0.669         |

TABLE A.2.A LOGIT RESULTS FOR CAPTAIN DATA SET - POOLED DESIGNATORS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 3972  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 2131  |
| 2                | 1       | 1841  |

WARNING: 644 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 5487.169       | 5444.503                 | .                            |
| SC        | 5493.456       | 5513.660                 | .                            |
| -2 LOG L  | 5485.169       | 5422.503                 | 62.666 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 62.131 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.2547            | 0.3013         | 0.7147          | 0.3979          | .                     | 0.775      |
| MALE     | 1  | -0.1045            | 0.1876         | 0.3104          | 0.5774          | -0.011262             | 0.901      |
| WHITE    | 1  | -0.0754            | 0.2536         | 0.0884          | 0.7662          | -0.005275             | 0.927      |
| FFGE     | 1  | -0.0375            | 0.0764         | 0.2405          | 0.6238          | -0.008868             | 0.963      |
| SCHOLAR  | 1  | 0.3007             | 0.0976         | 9.4986          | 0.0021          | 0.056777              | 1.351      |
| HIQUAL   | 1  | 0.2091             | 0.1129         | 3.4329          | 0.0639          | 0.033878              | 1.233      |
| USNA     | 1  | 0.3746             | 0.0724         | 26.7424         | 0.0001          | 0.097392              | 1.454      |
| PRIENL   | 1  | -0.4732            | 0.1917         | 6.0941          | 0.0136          | -0.044484             | 0.623      |
| TECHMAJ  | 1  | 0.0155             | 0.0806         | 0.0369          | 0.8477          | 0.003549              | 1.016      |
| MARRIED  | 1  | 0.2656             | 0.1855         | 2.0501          | 0.1522          | 0.042406              | 1.304      |
| KIDS     | 1  | 0.4509             | 0.1663         | 7.3567          | 0.0067          | 0.086465              | 1.570      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 51.5% | Somers' D = 0.139 |
| Discordant = 37.7% | Gamma = 0.155     |
| Tied = 10.8%       | Tau-a = 0.069     |
| (3923171 pairs)    | c = 0.569         |

TABLE A.2.B LOGIT RESULTS FOR CAPTAIN DATA SET - SURFACE WARFARE OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1127  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 619     |
|                  |       | 508     |

WARNING: 75 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 1553.403       | 1544.027                 | .                           |
| SC        | 1558.431       | 1594.300                 | .                           |
| -2 LOG L  | 1551.403       | 1524.027                 | 27.376 with 9 DF (p=0.0012) |
| Score     | .              | .                        | 26.891 with 9 DF (p=0.0015) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.0960            | 0.5951         | 0.0260          | 0.8718          | .                     | 0.908      |
| MALE     | 0  | 0                  | .              | .               | .               | .                     | .          |
| WHITE    | 1  | -0.4146            | 0.5243         | 0.6252          | 0.4291          | -0.027053             | 0.661      |
| FFGE     | 1  | 0.0944             | 0.1404         | 0.4524          | 0.5012          | 0.024594              | 1.099      |
| SCHOLAR  | 1  | 0.5170             | 0.2251         | 5.2751          | 0.0216          | 0.081091              | 1.677      |
| HIQUAL   | 1  | 0.1071             | 0.2099         | 0.2602          | 0.6100          | 0.017876              | 1.113      |
| USNA     | 1  | 0.3547             | 0.1324         | 7.1737          | 0.0074          | 0.095287              | 1.426      |
| PRIENL   | 1  | -1.0092            | 0.4089         | 6.0913          | 0.0136          | -0.089605             | 0.365      |
| TECHMAJ  | 1  | -0.0360            | 0.1566         | 0.0528          | 0.8183          | -0.008315             | 0.965      |
| MARRIED  | 1  | 0.3390             | 0.3559         | 0.9073          | 0.3408          | 0.049910              | 1.404      |
| KIDS     | 1  | 0.5579             | 0.2902         | 3.6962          | 0.0545          | 0.101490              | 1.747      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 53.4% | Somers' D = 0.174 |
| Discordant = 36.0% | Gamma = 0.195     |
| Tied = 10.6%       | Tau-a = 0.086     |
| (314452 pairs)     | c = 0.587         |

TABLE A.2.C LOGIT RESULTS FOR CAPTAIN DATA SET - SUBMARINE OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 478  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 335     |
|                  |       | 143     |

WARNING: 59 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates   |
|-----------|-------------------|--------------------------------|-----------------------------|
| AIC       | 585.307           | 591.959                        | .                           |
| SC        | 589.476           | 633.655                        | .                           |
| -2 LOG L  | 583.307           | 571.959                        | 11.347 with 9 DF (p=0.2526) |
| Score     | .                 | .                              | 11.745 with 9 DF (p=0.2281) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | -0.6387               | 1.3772            | 0.2151             | 0.6428             | .                        | 0.528         |
| WHITE    | 1  | 0.2985                | 1.2351            | 0.0584             | 0.8090             | 0.013010                 | 1.348         |
| FFGE     | 1  | -0.0525               | 0.3980            | 0.0174             | 0.8950             | -0.007350                | 0.949         |
| SCHOLAR  | 1  | -0.0163               | 0.2139            | 0.0058             | 0.9391             | -0.004448                | 0.984         |
| HIQUAL   | 1  | 0.1247                | 0.3651            | 0.1168             | 0.7326             | 0.021070                 | 1.133         |
| USNA     | 1  | 0.6496                | 0.2580            | 6.3399             | 0.0118             | 0.167264                 | 1.915         |
| PRIENL   | 1  | -0.6047               | 0.7430            | 0.6624             | 0.4157             | -0.042815                | 0.546         |
| TECHMAJ  | 1  | 0.2225                | 0.2174            | 1.0468             | 0.3063             | 0.061337                 | 1.249         |
| MARRIED  | 1  | 0.5969                | 0.6829            | 0.7638             | 0.3821             | 0.092245                 | 1.816         |
| KIDS     | 1  | 0.6877                | 0.6017            | 1.3061             | 0.2531             | 0.119169                 | 1.989         |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 54.5% | Somers' D = 0.180 |
| Discordant = 36.5% | Gamma = 0.198     |
| Tied = 9.0%        | Tau-a = 0.076     |
| (47905 pairs)      | c = 0.590         |



TABLE A.2.D LOGIT RESULTS FOR CAPTAIN DATA SET - PILOTS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1374  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 751   |
| 2                | 1       | 623   |

WARNING: 144 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept      |                          | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
|           | Intercept Only | Intercept and Covariates |                              |
| AIC       | 1894.827       | 1903.793                 | .                            |
| SC        | 1900.052       | 1961.273                 | .                            |
| -2 LOG L  | 1892.827       | 1881.793                 | 11.034 with 10 DF (p=0.3549) |
| Score     | .              | .                        | 10.922 with 10 DF (p=0.3637) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.0980            | 1.3549         | 0.0052          | 0.9424          | .                     | 0.907      |
| MALE     | 1  | -0.8598            | 1.1660         | 0.5438          | 0.4609          | -0.025549             | 0.423      |
| WHITE    | 1  | 0.6749             | 0.5757         | 1.3745          | 0.2410          | 0.036037              | 1.964      |
| FFGE     | 1  | -0.1518            | 0.1652         | 0.8445          | 0.3581          | -0.029034             | 0.859      |
| SCHOLAR  | 1  | 0.1201             | 0.2172         | 0.3057          | 0.5803          | 0.016884              | 1.128      |
| HIQUAL   | 1  | 0.4118             | 0.2155         | 3.6505          | 0.0561          | 0.060340              | 1.510      |
| USNA     | 1  | 0.0878             | 0.1238         | 0.5034          | 0.4780          | 0.021955              | 1.092      |
| PRIENL   | 1  | -0.1931            | 0.3089         | 0.3908          | 0.5319          | -0.018753             | 0.824      |
| TECHMAJ  | 1  | -0.1485            | 0.1442         | 1.0607          | 0.3031          | -0.032446             | 0.862      |
| MARRIED  | 1  | 0.3975             | 0.4125         | 0.9288          | 0.3352          | 0.062360              | 1.488      |
| KIDS     | 1  | 0.4846             | 0.3743         | 1.6762          | 0.1954          | 0.083829              | 1.623      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 43.6% | Somers' D = 0.084 |
| Discordant = 35.2% | Gamma = 0.107     |
| Tied = 21.1%       | Tau-a = 0.042     |
| (467873 pairs)     | c = 0.542         |

TABLE A.2.E LOGIT RESULTS FOR CAPTAIN DATA SET - NAVAL FLIGHT OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 325  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 133     |
|                  |       | 192     |

WARNING: 352 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 441.775        | 439.982                  | .                           |
| SC        | 445.559        | 477.820                  | .                           |
| -2 LOG L  | 439.775        | 419.982                  | 19.794 with 9 DF (p=0.0192) |
| Score     | .              | .                        | 18.599 with 9 DF (p=0.0288) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -1.9095            | 1.5667         | 1.4855          | 0.2229          | .                     | 0.148      |
| MALE     | 0  | 0                  | .              | .               | .               | .                     | .          |
| WHITE    | 1  | 0.5799             | 1.2059         | 0.2313          | 0.6306          | 0.035305              | 1.786      |
| FFGE     | 1  | -0.3231            | 0.3318         | 0.9484          | 0.3301          | -0.070955             | 0.724      |
| SCHOLAR  | 1  | 0.4560             | 0.4346         | 1.1013          | 0.2940          | 0.069502              | 1.578      |
| HIQUAL   | 1  | 0.3438             | 0.3600         | 0.9122          | 0.3395          | 0.063032              | 1.410      |
| USNA     | 1  | 0.3564             | 0.2739         | 1.6931          | 0.1932          | 0.089771              | 1.428      |
| PRIENL   | 1  | -1.1212            | 0.8158         | 1.8889          | 0.1693          | -0.106914             | 0.326      |
| TECHMAJ  | 1  | -0.8521            | 0.3320         | 6.5868          | 0.0103          | -0.196367             | 0.427      |
| MARRIED  | 1  | 0.4452             | 1.1838         | 0.1414          | 0.7068          | 0.068981              | 1.561      |
| KIDS     | 1  | 1.1191             | 1.1058         | 1.0241          | 0.3115          | 0.191549              | 3.062      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 55.7% | Somers' D = 0.271 |
| Discordant = 28.6% | Gamma = 0.321     |
| Tied = 15.7%       | Tau-a = 0.131     |
| (25536 pairs)      | c = 0.635         |

TABLE A.2.F LOGIT RESULTS FOR CAPTAIN DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS  
(1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 668  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 293     |
|                  |       | 375     |

WARNING: 14 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept      |                          | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
|           | Intercept only | Intercept and Covariates |                              |
| AIC       | 917.953        | 911.568                  | .                            |
| SC        | 922.458        | 961.115                  | .                            |
| -2 LOG L  | 915.953        | 889.568                  | 26.385 with 10 DF (p=0.0033) |
| Score     | .              | .                        | 26.107 with 10 DF (p=0.0036) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 0.1892             | 0.4285         | 0.1950          | 0.6588          | .                     | 1.208      |
| MALE     | 1  | -0.5198            | 0.2821         | 3.3946          | 0.0654          | -0.120797             | 0.595      |
| WHITE    | 1  | -0.5520            | 0.3952         | 1.9508          | 0.1625          | -0.062068             | 0.576      |
| FFGE     | 1  | 0.7926             | 0.1673         | 22.4432         | 0.0001          | 0.217447              | 2.209      |
| SCHOLAR  | 1  | -0.0687            | 0.2170         | 0.1002          | 0.7516          | -0.014356             | 0.934      |
| HIQUAL   | 1  | 0.0771             | 0.2682         | 0.0827          | 0.7736          | 0.012869              | 1.080      |
| USNA     | 1  | 0.0242             | 0.2658         | 0.0083          | 0.9275          | 0.004111              | 1.024      |
| PRIENL   | 1  | -0.0851            | 0.4117         | 0.0427          | 0.8363          | -0.009244             | 0.918      |
| TECHMAJ  | 1  | -0.2103            | 0.3481         | 0.3650          | 0.5457          | -0.026878             | 0.810      |
| MARRIED  | 1  | 0.0667             | 0.3123         | 0.0456          | 0.8309          | 0.012505              | 1.069      |
| KIDS     | 1  | 0.1863             | 0.3161         | 0.3473          | 0.5557          | 0.045521              | 1.205      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 56.5% | Somers' D = 0.217 |
| Discordant = 34.8% | Gamma = 0.238     |
| Tied = 8.7%        | Tau-a = 0.107     |
| (109875 pairs)     | c = 0.609         |

TABLE A.3.A LOGIT RESULTS FOR COMMANDER DATA SET - POOLED DESIGNATORS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 6220  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 4596  |
| 2                | 1       | 1624  |

WARNING: 1664 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates     |
|-----------|----------------|--------------------------|-------------------------------|
| AIC       | 7145.015       | 6954.826                 | .                             |
| SC        | 7151.750       | 7028.917                 | .                             |
| -2 LOG L  | 7143.015       | 6932.826                 | 210.188 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 207.165 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.3226            | 0.2001         | 2.5998          | 0.1069          | .                     | 0.724      |
| MALE     | 1  | 0.0684             | 0.1283         | 0.2843          | 0.5939          | 0.009243              | 1.071      |
| WHITE    | 1  | 0.5490             | 0.1659         | 10.9585         | 0.0009          | 0.048214              | 1.732      |
| FFGE     | 1  | 0.4783             | 0.0773         | 38.3100         | 0.0001          | 0.110006              | 1.613      |
| SCHOLAR  | 1  | 0.5769             | 0.1010         | 32.6270         | 0.0001          | 0.107000              | 1.781      |
| HIQUAL   | 1  | -0.0302            | 0.1063         | 0.0808          | 0.7763          | -0.004496             | 0.970      |
| USNA     | 1  | 0.3783             | 0.0711         | 28.2879         | 0.0001          | 0.096474              | 1.460      |
| PRIENL   | 1  | -0.5706            | 0.1203         | 22.4872         | 0.0001          | -0.070824             | 0.565      |
| TECHMAJ  | 1  | 0.00628            | 0.0732         | 0.0074          | 0.9316          | 0.001502              | 1.006      |
| MARRIED  | 1  | 0.4201             | 0.1183         | 12.6097         | 0.0004          | 0.084502              | 1.522      |
| KIDS     | 1  | 0.6251             | 0.1055         | 35.1361         | 0.0001          | 0.148067              | 1.868      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 57.1% | Somers' D = 0.228 |
| Discordant = 34.3% | Gamma = 0.249     |
| Tied = 8.6%        | Tau-a = 0.088     |
| (7463904 pairs)    | c = 0.614         |

TABLE A.3.B LOGIT RESULTS FOR COMMANDER DATA SET - SURFACE WARFARE OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1699  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 1233    |
|                  |       | 466     |

WARNING: 237 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 1998.218       | 1942.175                 | .                            |
| SC        | 2003.656       | 2001.991                 | .                            |
| -2 LOG L  | 1996.218       | 1920.175                 | 76.043 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 73.639 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.2790            | 1.2334         | 0.0512          | 0.8211          | .                     | 0.757      |
| MALE     | 1  | 0.0688             | 1.1937         | 0.0033          | 0.9540          | 0.001840              | 1.071      |
| WHITE    | 1  | 0.3854             | 0.3054         | 1.5921          | 0.2070          | 0.035572              | 1.470      |
| FFGE     | 1  | 0.8363             | 0.1410         | 35.2025         | 0.0001          | 0.212101              | 2.308      |
| SCHOLAR  | 1  | 0.5051             | 0.2076         | 5.9186          | 0.0150          | 0.082268              | 1.657      |
| HIQUAL   | 1  | 0.1242             | 0.2069         | 0.3603          | 0.5484          | 0.018335              | 1.132      |
| USNA     | 1  | 0.2004             | 0.1231         | 2.6513          | 0.1035          | 0.053845              | 1.222      |
| PRIENL   | 1  | -0.6531            | 0.2122         | 9.4701          | 0.0021          | -0.087876             | 0.520      |
| TECHMAJ  | 1  | -0.0946            | 0.1395         | 0.4599          | 0.4977          | -0.022662             | 0.910      |
| MARRIED  | 1  | 0.3517             | 0.2259         | 2.4244          | 0.1195          | 0.069601              | 1.421      |
| KIDS     | 1  | 0.6345             | 0.1922         | 10.8935         | 0.0010          | 0.148192              | 1.886      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 59.1% | Somers' D = 0.258 |
| Discordant = 33.4% | Gamma = 0.278     |
| Tied = 7.5%        | Tau-a = 0.103     |
| (574578 pairs)     | c = 0.629         |

TABLE A.3.C LOGIT RESULTS FOR COMMANDER DATA SET - SUBMARINE OFFICERS  
PRE-DRAWDOWN (1981-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 520  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 453     |
| 2                | 1     | 67      |

WARNING: 179 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 401.555        | 377.040                  | .                           |
| SC        | 405.809        | 419.578                  | .                           |
| -2 LOG L  | 399.555        | 357.040                  | 42.515 with 9 DF (p=0.0001) |
| Score     | .              | .                        | 45.996 with 9 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 23.7039            | 0.5515         | 1847.5553       | 0.0001          | .                     | 999.000    |
| WHITE    | 0  | -23.7238           | .              | .               | .               | .                     | 0.000      |
| FFGE     | 1  | -0.6990            | 0.4237         | 2.7212          | 0.0990          | -0.100392             | 0.497      |
| SCHOLAR  | 1  | 0.1562             | 0.2948         | 0.2806          | 0.5963          | 0.042501              | 1.169      |
| HIQUAL   | 1  | 0.2331             | 0.4548         | 0.2626          | 0.6083          | 0.036160              | 1.262      |
| USNA     | 1  | 1.3499             | 0.3123         | 18.6885         | 0.0001          | 0.362758              | 3.857      |
| PRIENL   | 1  | -0.8296            | 0.5853         | 2.0086          | 0.1564          | -0.079059             | 0.436      |
| TECHMAJ  | 1  | 0.5219             | 0.3022         | 2.9819          | 0.0842          | 0.131734              | 1.685      |
| MARRIED  | 1  | 0.7951             | 0.5304         | 2.2471          | 0.1339          | 0.169553              | 2.215      |
| KIDS     | 1  | 1.1014             | 0.4738         | 5.4033          | 0.0201          | 0.259729              | 3.008      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 71.6% | Somers' D = 0.473 |
| Discordant = 24.2% | Gamma = 0.494     |
| Tied = 4.2%        | Tau-a = 0.106     |
| (30351 pairs)      | c = 0.737         |

TABLE A.3.D LOGIT RESULTS FOR COMMANDER DATA SET - PILOTS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 2222  
Link Function: Logit

| Response Profile |       |         |       |
|------------------|-------|---------|-------|
| Ordered          | Value | LOGPROM | Count |
| 1                | 1     | 0       | 1683  |
| 2                | 2     | 1       | 539   |

WARNING: 347 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 2464.105       | 2447.714                 | .                            |
| SC        | 2469.811       | 2510.482                 | .                            |
| -2 LOG L  | 2462.105       | 2425.714                 | 36.391 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 35.219 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 22.2979            | 0.4474         | 2483.9121       | 0.0001          | .                     | 999.000    |
| MALE     | 0  | -22.4295           | .              | .               | .               | .                     | 0.000      |
| WHITE    | 1  | 0.5214             | 0.4002         | 1.6968          | 0.1927          | 0.032070              | 1.684      |
| FFGE     | 1  | 0.0556             | 0.1583         | 0.1236          | 0.7251          | 0.010337              | 1.057      |
| SCHOLAR  | 1  | 0.6989             | 0.2505         | 7.7842          | 0.0053          | 0.093951              | 2.011      |
| HIQUAL   | 1  | -0.1614            | 0.1934         | 0.6961          | 0.4041          | -0.022258             | 0.851      |
| USNA     | 1  | 0.2700             | 0.1166         | 5.3626          | 0.0206          | 0.068220              | 1.310      |
| PRIENL   | 1  | -0.3291            | 0.2552         | 1.6631          | 0.1972          | -0.033190             | 0.720      |
| TECHMAJ  | 1  | -0.1806            | 0.1208         | 2.2350          | 0.1349          | -0.042835             | 0.835      |
| MARRIED  | 1  | 0.7743             | 0.2407         | 10.3482         | 0.0013          | 0.145292              | 2.169      |
| KIDS     | 1  | 0.7408             | 0.2041         | 13.1754         | 0.0003          | 0.158459              | 2.098      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 49.9% | Somers' D = 0.154 |
| Discordant = 34.5% | Gamma = 0.182     |
| Tied = 15.6%       | Tau-a = 0.057     |
| (907137 pairs)     | c = 0.577         |

TABLE A.3.E LOGIT RESULTS FOR COMMANDER DATA SET - NAVAL FLIGHT OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 561  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 406   |
| 2                | 1       | 155   |

WARNING: 833 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates   |
|-----------|-------------------|--------------------------------|-----------------------------|
| AIC       | 663.326           | 661.534                        | .                           |
| SC        | 667.656           | 704.831                        | .                           |
| -2 LOG L  | 661.326           | 641.534                        | 19.792 with 9 DF (p=0.0192) |
| Score     | .                 | .                              | 19.296 with 9 DF (p=0.0228) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | -0.1259               | 0.6796            | 0.0343             | 0.8531             | .                        | 0.882         |
| MALE     | 0  | 0                     | .                 | .                  | .                  | .                        | .             |
| WHITE    | 1  | 0.0278                | 0.5735            | 0.0024             | 0.9613             | 0.002475                 | 1.028         |
| FFGE     | 1  | 0.3663                | 0.2895            | 1.6012             | 0.2057             | 0.076754                 | 1.442         |
| SCHOLAR  | 1  | 0.8051                | 0.4272            | 3.5517             | 0.0595             | 0.124276                 | 2.237         |
| HIQUAL   | 1  | 0.2607                | 0.3062            | 0.7251             | 0.3945             | 0.046658                 | 1.298         |
| USNA     | 1  | 0.5857                | 0.2246            | 6.7997             | 0.0091             | 0.153341                 | 1.796         |
| PRIENL   | 1  | -0.5157               | 0.4424            | 1.3590             | 0.2437             | -0.057590                | 0.597         |
| TECHMAJ  | 1  | -0.1545               | 0.2428            | 0.4050             | 0.5245             | -0.037251                | 0.857         |
| MARRIED  | 1  | 0.7378                | 0.4617            | 2.5531             | 0.1101             | 0.139331                 | 2.091         |
| KIDS     | 1  | 0.8625                | 0.3963            | 4.7381             | 0.0295             | 0.185647                 | 2.369         |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 56.3% | Somers' D = 0.242 |
| Discordant = 32.1% | Gamma = 0.273     |
| Tied = 11.6%       | Tau-a = 0.097     |
| (62930 pairs)      | c = 0.621         |



TABLE A.3.F LOGIT RESULTS FOR COMMANDER DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1218  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 821     |
| 2                | 1     | 397     |

WARNING: 68 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 1539.771       | 1462.751                 | .                            |
| SC        | 1544.876       | 1518.906                 | .                            |
| -2 LOG L  | 1537.771       | 1440.751                 | 97.020 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 92.221 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.2621            | 0.2891         | 0.8219          | 0.3646          | .                     | 0.769      |
| MALE     | 1  | -0.2511            | 0.1810         | 1.9241          | 0.1654          | -0.064604             | 0.778      |
| WHITE    | 1  | 0.5880             | 0.2640         | 4.9600          | 0.0259          | 0.074971              | 1.800      |
| FFGE     | 1  | 1.1249             | 0.1461         | 59.3068         | 0.0001          | 0.299885              | 3.080      |
| SCHOLAR  | 1  | 0.3489             | 0.1749         | 3.9806          | 0.0460          | 0.076427              | 1.418      |
| HIQUAL   | 1  | -0.2404            | 0.2264         | 1.1275          | 0.2883          | -0.036235             | 0.786      |
| USNA     | 1  | -0.1239            | 0.2505         | 0.2445          | 0.6209          | -0.018236             | 0.883      |
| PRIENL   | 1  | -0.3873            | 0.2232         | 3.0121          | 0.0826          | -0.060732             | 0.679      |
| TECHMAJ  | 1  | -0.4558            | 0.2523         | 3.2656          | 0.0707          | -0.062284             | 0.634      |
| MARRIED  | 1  | 0.0413             | 0.2016         | 0.0419          | 0.8377          | 0.009293              | 1.042      |
| KIDS     | 1  | 0.4561             | 0.2063         | 4.8907          | 0.0270          | 0.122984              | 1.578      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 64.9% | Somers' D = 0.348 |
| Discordant = 30.1% | Gamma = 0.367     |
| Tied = 5.0%        | Tau-a = 0.153     |
| (325937 pairs)     | c = 0.674         |

TABLE A.4.A LOGIT RESULTS FOR CAPTAIN DATA SET - POOLED DESIGNATORS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1913  
Link Function: Logit

| Response Profile |       |         |       |
|------------------|-------|---------|-------|
| Ordered          | Value | LOGPROM | Count |
| 1                | 0     | 1051    |       |
| 2                | 1     | 862     |       |

WARNING: 207 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 2635.278       | 2611.179                 | .                            |
| SC        | 2640.834       | 2672.300                 | .                            |
| -2 LOG L  | 2633.278       | 2589.179                 | 44.099 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 43.538 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.4330            | 0.6179         | 0.4912          | 0.4834          | .                     | 0.649      |
| MALE     | 1  | 0.0744             | 0.3792         | 0.0385          | 0.8445          | 0.005497              | 1.077      |
| WHITE    | 1  | 0.0623             | 0.5279         | 0.0139          | 0.9060          | 0.003031              | 1.064      |
| FFGE     | 1  | -0.1582            | 0.1182         | 1.7913          | 0.1808          | -0.035745             | 0.854      |
| SCHOLAR  | 1  | 0.1894             | 0.1485         | 1.6261          | 0.2022          | 0.034405              | 1.208      |
| HIQUAL   | 1  | 0.1482             | 0.1584         | 0.8751          | 0.3496          | 0.024667              | 1.160      |
| USNA     | 1  | 0.5191             | 0.1073         | 23.3963         | 0.0001          | 0.132337              | 1.681      |
| PRIENL   | 1  | -0.5976            | 0.2821         | 4.4876          | 0.0341          | -0.055069             | 0.550      |
| TECHMAJ  | 1  | 0.1910             | 0.1253         | 2.3237          | 0.1274          | 0.040902              | 1.210      |
| MARRIED  | 1  | 0.0482             | 0.2953         | 0.0267          | 0.8703          | 0.006741              | 1.049      |
| KIDS     | 1  | 0.3534             | 0.2521         | 1.9655          | 0.1609          | 0.060930              | 1.424      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 51.1% | Somers' D = 0.167 |
| Discordant = 34.4% | Gamma = 0.195     |
| Tied = 14.5%       | Tau-a = 0.083     |
| (905962 pairs)     | c = 0.584         |

TABLE A.4.B LOGIT RESULTS FOR CAPTAIN DATA SET - SURFACE WARFARE OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 513  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 281   |
| 2                | 1       | 232   |

WARNING: 36 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept      |                          | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
|           | Intercept only | Intercept and Covariates |                             |
| AIC       | 708.482        | 689.834                  | .                           |
| SC        | 712.722        | 732.237                  | .                           |
| -2 LOG L  | 706.482        | 669.834                  | 36.648 with 9 DF (p=0.0001) |
| Score     | .              | .                        | 33.373 with 9 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 24.7760            | 0.4016         | 3805.7786       | 0.0001          | .                     | 999.000    |
| MALE     | 0  | 0                  | .              | .               | .               | .                     | .          |
| WHITE    | 0  | -25.1307           | .              | .               | .               | .                     | 0.000      |
| FFGE     | 1  | 0.2704             | 0.2301         | 1.3810          | 0.2399          | 0.068273              | 1.311      |
| SCHOLAR  | 1  | 0.1312             | 0.3845         | 0.1164          | 0.7330          | 0.017760              | 1.140      |
| HIQUAL   | 1  | 0.0763             | 0.2883         | 0.0700          | 0.7914          | 0.013719              | 1.079      |
| USNA     | 1  | 0.5996             | 0.2122         | 7.9860          | 0.0047          | 0.154801              | 1.821      |
| PRIENL   | 1  | -2.5582            | 1.0722         | 5.6925          | 0.0170          | -0.195177             | 0.077      |
| TECHMAJ  | 1  | 0.00382            | 0.2685         | 0.0002          | 0.9887          | 0.000812              | 1.004      |
| MARRIED  | 1  | -0.7012            | 0.5343         | 1.7221          | 0.1894          | -0.097570             | 0.496      |
| KIDS     | 1  | 0.3769             | 0.3999         | 0.8883          | 0.3459          | 0.068729              | 1.458      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 54.9% | Somers' D = 0.242 |
| Discordant = 30.8% | Gamma = 0.282     |
| Tied = 14.3%       | Tau-a = 0.120     |
| (65192 pairs)      | c = 0.621         |

TABLE A.4.C LOGIT RESULTS FOR CAPTAIN DATA SET - SUBMARINE OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 269  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 192   |
| 2                | 1       | 77    |

WARNING: 23 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates  |
|-----------|----------------|--------------------------|----------------------------|
| AIC       | 324.130        | 336.242                  | .                          |
| SC        | 327.725        | 372.189                  | .                          |
| -2 LOG L  | 322.130        | 316.242                  | 5.889 with 9 DF (p=0.7510) |
| Score     | .              | .                        | 5.946 with 9 DF (p=0.7453) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.0734            | 1.4593         | 0.0025          | 0.9599          | .                     | 0.929      |
| WHITE    | 1  | 0.2779             | 1.2406         | 0.0502          | 0.8228          | 0.016117              | 1.320      |
| FFGE     | 1  | -0.2511            | 0.5015         | 0.2507          | 0.6166          | -0.037211             | 0.778      |
| SCHOLAR  | 1  | -0.2260            | 0.2956         | 0.5843          | 0.4446          | -0.060675             | 0.798      |
| HIQUAL   | 1  | -0.0291            | 0.4976         | 0.0034          | 0.9534          | -0.005195             | 0.971      |
| USNA     | 1  | 0.5729             | 0.3926         | 2.1291          | 0.1445          | 0.147116              | 1.773      |
| PRIENL   | 1  | -0.7205            | 0.8650         | 0.6938          | 0.4049          | -0.058769             | 0.487      |
| TECHMAJ  | 1  | 0.4940             | 0.3497         | 1.9957          | 0.1577          | 0.130092              | 1.639      |
| MARRIED  | 1  | 0.8112             | 0.9918         | 0.6691          | 0.4134          | 0.105983              | 2.251      |
| KIDS     | 1  | 0.2708             | 0.7720         | 0.1230          | 0.7258          | 0.042640              | 1.311      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 51.2% | Somers' D = 0.148 |
| Discordant = 36.3% | Gamma = 0.170     |
| Tied = 12.5%       | Tau-a = 0.061     |
| (14784 pairs)      | c = 0.574         |

TABLE A.4.D LOGIT RESULTS FOR CAPTAIN DATA SET - PILOTS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 727  
Link Function: Logit

| Response Profile |       |         |       |
|------------------|-------|---------|-------|
| Ordered          | Value | LOGPROM | Count |
| 1                | 1     | 0       | 408   |
| 2                | 2     | 1       | 319   |

WARNING: 32 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 998.913        | 1005.401                 | .                           |
| SC        | 1003.502       | 1051.290                 | .                           |
| -2 LOG L  | 996.913        | 985.401                  | 11.512 with 9 DF (p=0.2422) |
| Score     | .              | .                        | 10.355 with 9 DF (p=0.3225) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -24.9525           | 0.5653         | 1948.3485       | 0.0001          | .                     | 0.000      |
| MALE     | 0  | 0                  | .              | .               | .               | .                     | .          |
| WHITE    | 0  | 24.7542            | .              | .               | .               | .                     | 999.000    |
| FFGE     | 1  | -0.3675            | 0.2284         | 2.5887          | 0.1076          | -0.071264             | 0.692      |
| SCHOLAR  | 1  | 0.0452             | 0.2805         | 0.0259          | 0.8721          | 0.006804              | 1.046      |
| HIQUAL   | 1  | 0.3821             | 0.3090         | 1.5293          | 0.2162          | 0.054327              | 1.465      |
| USNA     | 1  | 0.2546             | 0.1808         | 1.9821          | 0.1592          | 0.060741              | 1.290      |
| PRIENL   | 1  | -0.2485            | 0.3557         | 0.4880          | 0.4848          | -0.028947             | 0.780      |
| TECHMAJ  | 1  | 0.1429             | 0.2101         | 0.4629          | 0.4963          | 0.030126              | 1.154      |
| MARRIED  | 1  | 0.4227             | 0.6279         | 0.4531          | 0.5009          | 0.059559              | 1.526      |
| KIDS     | 1  | 0.4083             | 0.5655         | 0.5214          | 0.4703          | 0.063830              | 1.504      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 45.4% | Somers' D = 0.127 |
| Discordant = 32.6% | Gamma = 0.163     |
| Tied = 22.0%       | Tau-a = 0.063     |
| (130152 pairs)     | c = 0.564         |

TABLE A.4.E LOGIT RESULTS FOR CAPTAIN DATA SET - NAVAL FLIGHT OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 150  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 68    |
| 2                | 1       | 82    |

WARNING: 110 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates   |
|-----------|-------------------|--------------------------------|-----------------------------|
| AIC       | 208.636           | 201.583                        | .                           |
| SC        | 211.646           | 231.689                        | .                           |
| -2 LOG L  | 206.636           | 181.583                        | 25.053 with 9 DF (p=0.0029) |
| Score     | .                 | .                              | 22.005 with 9 DF (p=0.0089) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | 0.0276                | 1.9739            | 0.0002             | 0.9888             | .                        | 1.028         |
| MALE     | 0  | 0                     | .                 | .                  | .                  | .                        | .             |
| WHITE    | 1  | 0.1865                | 1.4334            | 0.0169             | 0.8965             | 0.011833                 | 1.205         |
| FFGE     | 1  | -0.7915               | 0.6033            | 1.7207             | 0.1896             | -0.160505                | 0.453         |
| SCHOLAR  | 1  | -0.3972               | 0.8283            | 0.2299             | 0.6316             | -0.059610                | 0.672         |
| HIQUAL   | 1  | -0.4430               | 0.5226            | 0.7186             | 0.3966             | -0.083300                | 0.642         |
| USNA     | 1  | 0.9711                | 0.5230            | 3.4471             | 0.0634             | 0.214874                 | 2.641         |
| PRIENL   | 1  | -1.3890               | 1.1711            | 1.4068             | 0.2356             | -0.137930                | 0.249         |
| TECHMAJ  | 1  | -2.1661               | 0.7105            | 9.2954             | 0.0023             | -0.453574                | 0.115         |
| MARRIED  | 1  | -0.4318               | 1.5447            | 0.0782             | 0.7798             | -0.062274                | 0.649         |
| KIDS     | 1  | -0.0276               | 1.3771            | 0.0004             | 0.9840             | -0.004443                | 0.973         |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 60.8% | Somers' D = 0.426 |
| Discordant = 18.2% | Gamma = 0.539     |
| Tied = 20.9%       | Tau-a = 0.213     |
| (5576 pairs)       | c = 0.713         |

TABLE A.4.F LOGIT RESULTS FOR CAPTAIN DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS  
PRE-DRAWDOWN (1981-1989)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 254  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 102   |
| 2                | 1       | 152   |

WARNING: 6 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 344.212        | 349.403                  | .                           |
| SC        | 347.749        | 384.776                  | .                           |
| -2 LOG L  | 342.212        | 329.403                  | 12.809 with 9 DF (p=0.1714) |
| Score     | .              | .                        | 12.742 with 9 DF (p=0.1746) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.9352            | 1.2834         | 0.5310          | 0.4662          | .                     | 0.393      |
| MALE     | 1  | -0.6429            | 0.6291         | 1.0445          | 0.3068          | -0.122417             | 0.526      |
| WHITE    | 1  | 0.0801             | 1.2845         | 0.0039          | 0.9503          | 0.004778              | 1.083      |
| FFGE     | 1  | 0.6841             | 0.2774         | 6.0829          | 0.0136          | 0.186106              | 1.982      |
| SCHOLAR  | 1  | 0.6129             | 0.4192         | 2.1373          | 0.1438          | 0.109275              | 1.846      |
| HIQUAL   | 1  | 0.4964             | 0.4269         | 1.3520          | 0.2449          | 0.085876              | 1.643      |
| USNA     | 1  | -0.0231            | 0.4195         | 0.0030          | 0.9561          | -0.004172             | 0.977      |
| PRIENL   | 0  | 0                  | .              | .               | .               | .                     | .          |
| TECHMAJ  | 1  | 0.6448             | 0.6211         | 1.0776          | 0.2992          | 0.075568              | 1.906      |
| MARRIED  | 1  | 0.1457             | 0.6572         | 0.0492          | 0.8245          | 0.021178              | 1.157      |
| KIDS     | 1  | 0.6625             | 0.6471         | 1.0482          | 0.3059          | 0.138507              | 1.940      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 54.4% | Somers' D = 0.242 |
| Discordant = 30.2% | Gamma = 0.286     |
| Tied = 15.4%       | Tau-a = 0.117     |
| (15504 pairs)      | c = 0.621         |

TABLE A.5.A LOGIT RESULTS FOR COMMANDER DATA SET - POOLED DESIGNATORS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 3742  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 2557    |
| 2                | 1     | 1185    |

WARNING: 746 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates     |
|-----------|----------------|--------------------------|-------------------------------|
| AIC       | 4674.547       | 4546.118                 | .                             |
| SC        | 4680.774       | 4614.619                 | .                             |
| -2 LOG L  | 4672.547       | 4524.118                 | 148.429 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 147.342 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.2270            | 0.1915         | 1.4054          | 0.2358          | .                     | 0.797      |
| MALE     | 1  | 0.2496             | 0.1207         | 4.2740          | 0.0387          | 0.043987              | 1.284      |
| WHITE    | 1  | 0.1355             | 0.1560         | 0.7552          | 0.3848          | 0.016769              | 1.145      |
| FFGE     | 1  | 0.4873             | 0.0886         | 30.2519         | 0.0001          | 0.116028              | 1.628      |
| SCHOLAR  | 1  | 0.2447             | 0.0902         | 7.3536          | 0.0067          | 0.056304              | 1.277      |
| HIQUAL   | 1  | 0.3888             | 0.1195         | 10.5782         | 0.0011          | 0.067454              | 1.475      |
| USNA     | 1  | 0.5801             | 0.0913         | 40.4142         | 0.0001          | 0.144982              | 1.786      |
| PRIENL   | 1  | -0.6110            | 0.1234         | 24.4948         | 0.0001          | -0.094212             | 0.543      |
| TECHMAJ  | 1  | -0.0872            | 0.0827         | 1.1124          | 0.2916          | -0.022453             | 0.916      |
| MARRIED  | 1  | 0.3883             | 0.1332         | 8.4947          | 0.0036          | 0.082836              | 1.474      |
| KIDS     | 1  | 0.4272             | 0.1170         | 13.3296         | 0.0003          | 0.107139              | 1.533      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 59.7% | Somers' D = 0.237 |
| Discordant = 36.0% | Gamma = 0.248     |
| Tied = 4.3%        | Tau-a = 0.103     |
| (3030045 pairs)    | c = 0.618         |



TABLE A.5.B LOGIT RESULTS FOR COMMANDER DATA SET - SURFACE WARFARE  
OFFICERS DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 1018  
Link Function: Logit

| Response Profile |       |       |
|------------------|-------|-------|
| Ordered          | Value | Count |
| 1                | 0     | 702   |
| 2                | 1     | 316   |

WARNING: 131 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 1263.160       | 1237.933                 | .                            |
| SC        | 1268.086       | 1292.115                 | .                            |
| -2 LOG L  | 1261.160       | 1215.933                 | 45.227 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 44.375 with 10 DF (p=0.0001) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 0.3978             | 0.4861         | 0.6698          | 0.4131          | .                     | 1.489      |
| MALE     | 1  | -0.4688            | 0.4273         | 1.2037          | 0.2726          | -0.046465             | 0.626      |
| WHITE    | 1  | 0.1590             | 0.2570         | 0.3827          | 0.5362          | 0.023327              | 1.172      |
| FFGE     | 1  | 0.5832             | 0.1752         | 11.0814         | 0.0009          | 0.142175              | 1.792      |
| SCHOLAR  | 1  | 0.0803             | 0.2087         | 0.1480          | 0.7005          | 0.015253              | 1.084      |
| HIQUAL   | 1  | 0.5034             | 0.2399         | 4.4016          | 0.0359          | 0.086196              | 1.654      |
| USNA     | 1  | 0.5653             | 0.1700         | 11.0536         | 0.0009          | 0.143101              | 1.760      |
| PRIENL   | 1  | -0.5538            | 0.2251         | 6.0532          | 0.0139          | -0.090912             | 0.575      |
| TECHMAJ  | 1  | -0.1569            | 0.1607         | 0.9535          | 0.3288          | -0.040087             | 0.855      |
| MARRIED  | 1  | 0.3548             | 0.2592         | 1.8741          | 0.1710          | 0.074343              | 1.426      |
| KIDS     | 1  | 0.5566             | 0.2228         | 6.2414          | 0.0125          | 0.138719              | 1.745      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 60.6% | Somers' D = 0.262 |
| Discordant = 34.4% | Gamma = 0.276     |
| Tied = 5.0%        | Tau-a = 0.112     |
| (221832 pairs)     | c = 0.631         |

TABLE A.5.C LOGIT RESULTS FOR COMMANDER DATA SET - SUBMARINE OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 463  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 361   |
| 2                | 1       | 102   |

WARNING: 61 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 490.271        | 475.815                  | .                           |
| SC        | 494.409        | 517.192                  | .                           |
| -2 LOG L  | 488.271        | 455.815                  | 32.456 with 9 DF (p=0.0002) |
| Score     | .              | .                        | 32.594 with 9 DF (p=0.0002) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 25.0410            | 0.4815         | 2704.5658       | 0.0001          | .                     | 999.000    |
| WHITE    | 0  | -25.2162           | .              | .               | .               | .                     | 0.000      |
| FFGE     | 1  | 0.1518             | 0.3634         | 0.1745          | 0.6761          | 0.028534              | 1.164      |
| SCHOLAR  | 1  | 0.0301             | 0.2347         | 0.0164          | 0.8980          | 0.008274              | 1.031      |
| HIQUAL   | 1  | 0.7664             | 0.3832         | 4.0004          | 0.0455          | 0.141047              | 2.152      |
| USNA     | 1  | 0.9293             | 0.2507         | 13.7366         | 0.0002          | 0.256229              | 2.533      |
| PRIENL   | 1  | -1.3171            | 0.6304         | 4.3650          | 0.0367          | -0.115503             | 0.268      |
| TECHMAJ  | 1  | 0.0600             | 0.2964         | 0.0409          | 0.8397          | 0.013417              | 1.062      |
| MARRIED  | 1  | 0.8511             | 0.4592         | 3.4354          | 0.0638          | 0.180191              | 2.342      |
| KIDS     | 1  | 0.9565             | 0.3928         | 5.9283          | 0.0149          | 0.230058              | 2.603      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 64.6% | Somers' D = 0.347 |
| Discordant = 29.9% | Gamma = 0.368     |
| Tied = 5.5%        | Tau-a = 0.120     |
| (36822 pairs)      | c = 0.674         |

TABLE A.5.D LOGIT RESULTS FOR COMMANDER DATA SET - PILOTS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 852  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 624     |
| 2                | 1     | 228     |

WARNING: 141 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 991.790        | 996.682                  | .                            |
| SC        | 996.538        | 1048.906                 | .                            |
| -2 LOG L  | 989.790        | 974.682                  | 15.108 with 10 DF (p=0.1282) |
| Score     | .              | .                        | 15.965 with 10 DF (p=0.1006) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -1.2769            | 0.8033         | 2.5270          | 0.1119          | .                     | 0.279      |
| MALE     | 1  | 0.9130             | 0.6219         | 2.1556          | 0.1421          | 0.056858              | 2.492      |
| WHITE    | 1  | 1.1507             | 0.4491         | 6.5650          | 0.0104          | 0.098423              | 3.160      |
| FFGE     | 1  | -0.1462            | 0.2463         | 0.3525          | 0.5527          | -0.026297             | 0.864      |
| SCHOLAR  | 1  | 0.4062             | 0.2384         | 2.9040          | 0.0884          | 0.079803              | 1.501      |
| HIQUAL   | 1  | -0.0386            | 0.2642         | 0.0214          | 0.8837          | -0.006521             | 0.962      |
| USNA     | 1  | 0.2240             | 0.1713         | 1.7099          | 0.1910          | 0.060512              | 1.251      |
| PRIENL   | 1  | -0.1590            | 0.4605         | 0.1192          | 0.7299          | -0.014805             | 0.853      |
| TECHMAJ  | 1  | -0.1378            | 0.1690         | 0.6650          | 0.4148          | -0.036949             | 0.871      |
| MARRIED  | 1  | 0.3857             | 0.3548         | 1.1818          | 0.2770          | 0.076269              | 1.471      |
| KIDS     | 1  | 0.1903             | 0.3000         | 0.4025          | 0.5258          | 0.043534              | 1.210      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 52.6% | Somers' D = 0.134 |
| Discordant = 39.2% | Gamma = 0.146     |
| Tied = 8.2%        | Tau-a = 0.053     |
| (142272 pairs)     | c = 0.567         |

TABLE A.5.E LOGIT RESULTS FOR COMMANDER DATA SET - NAVAL FLIGHT OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 468  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 282     |
|                  |       | 186     |

WARNING: 363 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 630.953        | 637.277                  | .                            |
| SC        | 635.101        | 682.910                  | .                            |
| -2 LOG L  | 628.953        | 615.277                  | 13.676 with 10 DF (p=0.1883) |
| Score     | .              | .                        | 13.585 with 10 DF (p=0.1928) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.1805            | 1.0151         | 0.0316          | 0.8589          | .                     | 0.835      |
| MALE     | 1  | 0.1268             | 0.8496         | 0.0223          | 0.8814          | 0.007870              | 1.135      |
| WHITE    | 1  | -0.00094           | 0.5337         | 0.0000          | 0.9986          | -0.000094537          | 0.999      |
| FFGE     | 1  | -0.3903            | 0.2551         | 2.3408          | 0.1260          | -0.083419             | 0.677      |
| SCHOLAR  | 1  | 0.1401             | 0.2898         | 0.2336          | 0.6288          | 0.026028              | 1.150      |
| HIQUAL   | 1  | 0.1969             | 0.2912         | 0.4571          | 0.4990          | 0.037574              | 1.218      |
| USNA     | 1  | 0.5689             | 0.2257         | 6.3543          | 0.0117          | 0.146004              | 1.766      |
| PRIENL   | 1  | 0.1135             | 0.5975         | 0.0361          | 0.8494          | 0.010291              | 1.120      |
| TECHMAJ  | 1  | -0.2821            | 0.2233         | 1.5958          | 0.2065          | -0.070681             | 0.754      |
| MARRIED  | 1  | 0.2525             | 0.4091         | 0.3811          | 0.5370          | 0.052727              | 1.287      |
| KIDS     | 1  | 0.4884             | 0.3573         | 1.8685          | 0.1716          | 0.117064              | 1.630      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 54.6% | Somers' D = 0.173 |
| Discordant = 37.3% | Gamma = 0.189     |
| Tied = 8.1%        | Tau-a = 0.083     |
| (52452 pairs)      | c = 0.587         |

TABLE A.5.F LOGIT RESULTS FOR COMMANDER DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 941  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 588   |
| 2                | 1       | 353   |

WARNING: 50 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates     |
|-----------|----------------|--------------------------|-------------------------------|
| AIC       | 1247.190       | 1163.191                 | .                             |
| SC        | 1252.037       | 1216.508                 | .                             |
| -2 LOG L  | 1245.190       | 1141.191                 | 103.998 with 10 DF (p=0.0001) |
| Score     | .              | .                        | 99.359 with 10 DF (p=0.0001)  |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.0481            | 0.2993         | 0.0258          | 0.8724          | .                     | 0.953      |
| MALE     | 1  | 0.1380             | 0.1722         | 0.6421          | 0.4229          | 0.037374              | 1.148      |
| WHITE    | 1  | -0.2466            | 0.2650         | 0.8663          | 0.3520          | -0.036617             | 0.781      |
| FFGE     | 1  | 1.2339             | 0.1543         | 63.9509         | 0.0001          | 0.337100              | 3.434      |
| SCHOLAR  | 1  | 0.1616             | 0.1595         | 1.0256          | 0.3112          | 0.041499              | 1.175      |
| HIQUAL   | 1  | 0.5107             | 0.2447         | 4.3565          | 0.0369          | 0.084467              | 1.666      |
| USNA     | 1  | 0.3333             | 0.3785         | 0.7753          | 0.3786          | 0.039231              | 1.396      |
| PRIENL   | 1  | -0.6837            | 0.1879         | 13.2402         | 0.0003          | -0.145101             | 0.505      |
| TECHMAJ  | 1  | -0.6272            | 0.2996         | 4.3841          | 0.0363          | -0.081167             | 0.534      |
| MARRIED  | 1  | 0.4006             | 0.2248         | 3.1754          | 0.0748          | 0.092786              | 1.493      |
| KIDS     | 1  | 0.3168             | 0.2091         | 2.2947          | 0.1298          | 0.085713              | 1.373      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 67.9% | Somers' D = 0.387 |
| Discordant = 29.2% | Gamma = 0.399     |
| Tied = 2.9%        | Tau-a = 0.182     |
| (207564 pairs)     | c = 0.693         |

TABLE A.6.A LOGIT RESULTS FOR CAPTAIN DATA SET - POOLED DESIGNATORS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
POOLED DATA SET

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 2059  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 1080  |
| 2                | 1       | 979   |

WARNING: 437 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates    |
|-----------|-------------------|--------------------------------|------------------------------|
| AIC       | 2851.424          | 2843.146                       | .                            |
| SC        | 2857.054          | 2905.076                       | .                            |
| -2 LOG L  | 2849.424          | 2821.146                       | 28.277 with 10 DF (p=0.0016) |
| Score     | .                 | .                              | 28.057 with 10 DF (p=0.0018) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | -0.2405               | 0.3494            | 0.4737             | 0.4913             | .                        | 0.786         |
| MALE     | 1  | -0.1599               | 0.2227            | 0.5155             | 0.4728             | -0.020902                | 0.852         |
| WHITE    | 1  | -0.1368               | 0.2907            | 0.2216             | 0.6378             | -0.011615                | 0.872         |
| FFGE     | 1  | 0.0346                | 0.1015            | 0.1160             | 0.7334             | 0.008475                 | 1.035         |
| SCHOLAR  | 1  | 0.3729                | 0.1306            | 8.1471             | 0.0043             | 0.072743                 | 1.452         |
| HIQUAL   | 1  | 0.2431                | 0.1616            | 2.2636             | 0.1324             | 0.038341                 | 1.275         |
| USNA     | 1  | 0.2961                | 0.1006            | 8.6669             | 0.0032             | 0.078184                 | 1.345         |
| PRIENL   | 1  | -0.3952               | 0.2626            | 2.2655             | 0.1323             | -0.037825                | 0.674         |
| TECHMAJ  | 1  | -0.0583               | 0.1077            | 0.2932             | 0.5882             | -0.014067                | 0.943         |
| MARRIED  | 1  | 0.3994                | 0.2409            | 2.7472             | 0.0974             | 0.070028                 | 1.491         |
| KIDS     | 1  | 0.4988                | 0.2226            | 5.0189             | 0.0251             | 0.103196                 | 1.647         |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 52.1% | Somers' D = 0.130 |
| Discordant = 39.2% | Gamma = 0.142     |
| Tied = 8.7%        | Tau-a = 0.065     |
| (1057320 pairs)    | c = 0.565         |

TABLE A.6.B LOGIT RESULTS FOR CAPTAIN DATA SET - SURFACE WARFARE OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SURFACE WARFARE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 614  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 338     |
|                  |       | 276     |

WARNING: 39 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 846.913        | 849.654                  | .                           |
| SC        | 851.333        | 893.854                  | .                           |
| -2 LOG L  | 844.913        | 829.654                  | 15.260 with 9 DF (p=0.0840) |
| Score     | .              | .                        | 14.904 with 9 DF (p=0.0936) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -0.9027            | 0.7336         | 1.5140          | 0.2185          | .                     | 0.405      |
| MALE     | 0  | 0                  | .              | .               | .               | .                     | .          |
| WHITE    | 1  | 0.1866             | 0.5927         | 0.0991          | 0.7529          | 0.014252              | 1.205      |
| FFGE     | 1  | -0.0529            | 0.1818         | 0.0846          | 0.7711          | -0.014061             | 0.948      |
| SCHOLAR  | 1  | 0.7408             | 0.2846         | 6.7740          | 0.0092          | 0.127453              | 2.098      |
| HIQUAL   | 1  | 0.0981             | 0.3114         | 0.0994          | 0.7526          | 0.015208              | 1.103      |
| USNA     | 1  | 0.1994             | 0.1759         | 1.2852          | 0.2569          | 0.054614              | 1.221      |
| PRIENL   | 1  | -0.6251            | 0.4767         | 1.7193          | 0.1898          | -0.061229             | 0.535      |
| TECHMAJ  | 1  | -0.0376            | 0.1974         | 0.0364          | 0.8487          | -0.009172             | 0.963      |
| MARRIED  | 1  | 1.1805             | 0.5213         | 5.1287          | 0.0235          | 0.181362              | 3.256      |
| KIDS     | 1  | 0.8000             | 0.4401         | 3.3042          | 0.0691          | 0.145376              | 2.226      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 54.4% | Somers' D = 0.174 |
| Discordant = 37.0% | Gamma = 0.191     |
| Tied = 8.6%        | Tau-a = 0.086     |
| (93288 pairs)      | c = 0.587         |

TABLE A.6.C LOGIT RESULTS FOR CAPTAIN DATA SET - SUBMARINE OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
SUBMARINE OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 209  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
| 1                | 0     | 143     |
| 2                | 1     | 66      |

WARNING: 36 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 262.688        | 265.139                  | .                           |
| SC        | 266.030        | 295.220                  | .                           |
| -2 LOG L  | 260.688        | 247.139                  | 13.549 with 8 DF (p=0.0943) |
| Score     | .              | .                        | 13.908 with 8 DF (p=0.0842) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | -1.8736            | 1.2881         | 2.1155          | 0.1458          | .                     | 0.154      |
| WHITE    | 0  | 0                  | .              | .               | .               | .                     | .          |
| FFGE     | 1  | 0.3390             | 0.6962         | 0.2371          | 0.6263          | 0.043582              | 1.404      |
| SCHOLAR  | 1  | 0.2801             | 0.3190         | 0.7709          | 0.3799          | 0.077195              | 1.323      |
| HIQUAL   | 1  | 0.2315             | 0.5877         | 0.1551          | 0.6937          | 0.035888              | 1.260      |
| USNA     | 1  | 0.9212             | 0.3608         | 6.5191          | 0.0107          | 0.238526              | 2.512      |
| PRIENL   | 1  | -0.2752            | 1.4827         | 0.0344          | 0.8528          | -0.014805             | 0.759      |
| TECHMAJ  | 1  | 0.00839            | 0.3540         | 0.0006          | 0.9811          | 0.002030              | 1.008      |
| MARRIED  | 1  | 1.6110             | 1.2823         | 1.5784          | 0.2090          | 0.288923              | 5.008      |
| KIDS     | 1  | 1.9751             | 1.2155         | 2.6403          | 0.1042          | 0.377329              | 7.207      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 59.0% | Somers' D = 0.299 |
| Discordant = 29.0% | Gamma = 0.340     |
| Tied = 12.0%       | Tau-a = 0.130     |
| (9438 pairs)       | c = 0.650         |



TABLE A.6.D LOGIT RESULTS FOR CAPTAIN DATA SET - PILOTS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
PILOTS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 647  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 343     |
|                  |       | 304     |

WARNING: 112 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates   |
|-----------|----------------|--------------------------|-----------------------------|
| AIC       | 896.580        | 908.054                  | .                           |
| SC        | 901.053        | 957.249                  | .                           |
| -2 LOG L  | 894.580        | 886.054                  | 8.527 with 10 DF (p=0.5775) |
| Score     | .              | .                        | 8.388 with 10 DF (p=0.5910) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 0.5375             | 1.4369         | 0.1400          | 0.7083          | .                     | 1.712      |
| MALE     | 1  | -0.9648            | 1.1798         | 0.6688          | 0.4135          | -0.041726             | 0.381      |
| WHITE    | 1  | 0.0627             | 0.6430         | 0.0095          | 0.9223          | 0.004268              | 1.065      |
| FFGE     | 1  | 0.0292             | 0.2439         | 0.0144          | 0.9046          | 0.005505              | 1.030      |
| SCHOLAR  | 1  | 0.2067             | 0.3522         | 0.3445          | 0.5572          | 0.026484              | 1.230      |
| HIQUAL   | 1  | 0.4721             | 0.3083         | 2.3444          | 0.1257          | 0.071435              | 1.603      |
| USNA     | 1  | 0.0339             | 0.1768         | 0.0368          | 0.8479          | 0.008823              | 1.034      |
| PRIENL   | 1  | -0.1063            | 0.6420         | 0.0274          | 0.8685          | -0.007236             | 0.899      |
| TECHMAJ  | 1  | -0.3688            | 0.2066         | 3.1849          | 0.0743          | -0.083565             | 0.692      |
| MARRIED  | 1  | 0.3823             | 0.5524         | 0.4790          | 0.4889          | 0.065933              | 1.466      |
| KIDS     | 1  | 0.5273             | 0.5039         | 1.0950          | 0.2954          | 0.099739              | 1.694      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 47.2% | Somers' D = 0.115 |
| Discordant = 35.8% | Gamma = 0.138     |
| Tied = 17.0%       | Tau-a = 0.057     |
| (104272 pairs)     | c = 0.557         |

TABLE A.6.E LOGIT RESULTS FOR CAPTAIN DATA SET - NAVAL FLIGHT OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
NAVAL FLIGHT OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 175  
Link Function: Logit

| Response Profile |       |         |
|------------------|-------|---------|
| Ordered          | Value | LOGPROM |
|                  | 1     | 0       |
|                  | 2     | 1       |
|                  |       | Count   |
|                  |       | 65      |
|                  |       | 110     |

WARNING: 242 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept<br>Only | Intercept<br>and<br>Covariates | Chi-Square for Covariates   |
|-----------|-------------------|--------------------------------|-----------------------------|
| AIC       | 232.899           | 235.463                        | .                           |
| SC        | 236.064           | 267.111                        | .                           |
| -2 LOG L  | 230.899           | 215.463                        | 15.436 with 9 DF (p=0.0796) |
| Score     | .                 | .                              | 13.729 with 9 DF (p=0.1323) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter<br>Estimate | Standard<br>Error | Wald<br>Chi-Square | Pr ><br>Chi-Square | Standardized<br>Estimate | Odds<br>Ratio |
|----------|----|-----------------------|-------------------|--------------------|--------------------|--------------------------|---------------|
| INTERCPT | 1  | -49.5716              | 0.2679            | 34228.9551         | 0.0001             | .                        | 0.000         |
| MALE     | 0  | 0                     | .                 | .                  | .                  | .                        | .             |
| WHITE    | 0  | 23.6816               | .                 | .                  | .                  | .                        | 999.000       |
| FFGE     | 1  | -0.1547               | 0.4344            | 0.1267             | 0.7218             | -0.035906                | 0.857         |
| SCHOLAR  | 1  | 1.0188                | 0.5719            | 3.1735             | 0.0748             | 0.157691                 | 2.770         |
| HIQUAL   | 1  | 1.1268                | 0.5313            | 4.4978             | 0.0339             | 0.202457                 | 3.086         |
| USNA     | 1  | 0.3495                | 0.3643            | 0.9203             | 0.3374             | 0.093646                 | 1.418         |
| PRIENL   | 1  | -0.4025               | 1.1854            | 0.1153             | 0.7342             | -0.037075                | 0.669         |
| TECHMAJ  | 1  | -0.1344               | 0.4153            | 0.1047             | 0.7463             | -0.032930                | 0.874         |
| MARRIED  | 1  | 24.3704               | 0.6151            | 1569.8349          | 0.0001             | 3.990543                 | 999.000       |
| KIDS     | 0  | 25.1939               | .                 | .                  | .                  | .                        | 999.000       |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 58.7% | Somers' D = 0.297 |
| Discordant = 29.0% | Gamma = 0.339     |
| Tied = 12.4%       | Tau-a = 0.140     |
| (7150 pairs)       | c = 0.649         |

TABLE A.6.F LOGIT RESULTS FOR CAPTAIN DATA SET - FLEET SUPPORT AND SUPPLY OFFICERS  
DRAWDOWN PERIOD (1990-1994)

LOGIT REGRESSION PROMOTE ON SELECTED VARIABLES  
FLEET SUPPORT AND SUPPLY OFFICERS

Data Set: WORK.ALL  
Response Variable: LOGPROM  
Response Levels: 2  
Number of Observations: 414  
Link Function: Logit

| Response Profile |         |       |
|------------------|---------|-------|
| Ordered          |         |       |
| Value            | LOGPROM | Count |
| 1                | 0       | 191   |
| 2                | 1       | 223   |

WARNING: 8 observation(s) were deleted due to missing values for the response or explanatory variables.

Criteria for Assessing Model Fit

| Criterion | Intercept Only | Intercept and Covariates | Chi-Square for Covariates    |
|-----------|----------------|--------------------------|------------------------------|
| AIC       | 573.450        | 570.996                  | .                            |
| SC        | 577.476        | 615.280                  | .                            |
| -2 LOG L  | 571.450        | 548.996                  | 22.454 with 10 DF (p=0.0130) |
| Score     | .              | .                        | 21.896 with 10 DF (p=0.0156) |

Analysis of Maximum Likelihood Estimates

| Variable | DF | Parameter Estimate | Standard Error | Wald Chi-Square | Pr > Chi-Square | Standardized Estimate | Odds Ratio |
|----------|----|--------------------|----------------|-----------------|-----------------|-----------------------|------------|
| INTERCPT | 1  | 0.4346             | 0.4769         | 0.8307          | 0.3621          | .                     | 1.544      |
| MALE     | 1  | -0.5061            | 0.3258         | 2.4140          | 0.1203          | -0.126444             | 0.603      |
| WHITE    | 1  | -0.5937            | 0.4311         | 1.8964          | 0.1685          | -0.079512             | 0.552      |
| FFGE     | 1  | 0.8586             | 0.2159         | 15.8131         | 0.0001          | 0.236504              | 2.360      |
| SCHOLAR  | 1  | -0.3601            | 0.2610         | 1.9041          | 0.1676          | -0.080640             | 0.698      |
| HIQUAL   | 1  | -0.2509            | 0.3524         | 0.5071          | 0.4764          | -0.040920             | 0.778      |
| USNA     | 1  | 0.1035             | 0.3532         | 0.0859          | 0.7695          | 0.016877              | 1.109      |
| PRIENL   | 1  | -0.2007            | 0.4231         | 0.2250          | 0.6353          | -0.027353             | 0.818      |
| TECHMAJ  | 1  | -0.6443            | 0.4399         | 2.1453          | 0.1430          | -0.086287             | 0.525      |
| MARRIED  | 1  | 0.0732             | 0.3657         | 0.0400          | 0.8414          | 0.015140              | 1.076      |
| KIDS     | 1  | 0.0693             | 0.3731         | 0.0345          | 0.8527          | 0.017926              | 1.072      |

Association of Predicted Probabilities and Observed Responses

|                    |                   |
|--------------------|-------------------|
| Concordant = 59.4% | Somers' D = 0.251 |
| Discordant = 34.4% | Gamma = 0.267     |
| Tied = 6.2%        | Tau-a = 0.125     |
| (42593 pairs)      | c = 0.625         |

## APPENDIX B. CHOW TEST RESULTS

The Chow test (Gujarati, 1988) is a method to test for differences between two or more OLS regression equations. It consists of combining the  $N_1$  and  $N_2$  observations of the two (or more) categories and running a single, "pooled" OLS regression. From this regression, obtain the residual sum of squares (RSS), called  $S_1$ , with degrees of freedom (df) =  $N_1 + N_2 - k$ , where  $k$  is the number of parameters estimated. Perform these same procedures for each of the individual regressions and obtain their RSS's ( $S_2$  and  $S_3$ ) with  $df = N_1 - k$  and  $N_2 - k$ , respectively. Sum these RSS's to form  $S_4$  which will have  $df = N_1 + N_2 - 2k$ . Obtain a difference RSS ( $S_5$ ) by subtracting  $S_4$  from  $S_1$ . Then apply the F test as follows:

$$F_{\text{computed}} = \frac{(S_5 / k)}{S_4 / (N_1 + N_2 - 2k)} \quad \text{with } df = k, N_1 + N_2 - 2k.$$

If the computed F exceeds the critical F (from F distribution tables), reject the hypothesis that the two regressions are the same. (Gujarati, p. 444)

Table B.1.B presents the data used to compute F values for all Chow tests performed in this thesis.

|            | S1       | k1 | S2       | k2 | N1   | S3      | k3 | N2   | S4       | S5     | Fcomp |
|------------|----------|----|----------|----|------|---------|----|------|----------|--------|-------|
| CDR        | 1948.343 | 10 | 1160.018 | 10 | 6219 | 777.856 | 10 | 3741 | 1937.873 | 10.469 | 5.37  |
| CDR SWO    | 533.644  | 10 | 323.528  | 10 | 1698 | 208.411 | 10 | 1017 | 531.939  | 1.705  | 0.864 |
| CDR SUB    | 129.629  | 9  | 53.204   | 9  | 519  | 73.930  | 9  | 462  | 127.135  | 2.494  | 2.099 |
| CDR PILOT  | 567.716  | 10 | 401.782  | 10 | 2221 | 163.857 | 10 | 851  | 565.638  | 2.078  | 1.121 |
| CDR NFO    | 222.279  | 10 | 108.316  | 9  | 560  | 108.824 | 10 | 467  | 217.140  | 5.139  | 2.386 |
| CDR SUPP   | 450.354  | 10 | 247.339  | 10 | 1217 | 197.287 | 10 | 940  | 444.626  | 5.728  | 2.753 |
| CAPT       | 972.257  | 10 | 462.803  | 10 | 1912 | 506.514 | 10 | 2058 | 969.317  | 2.939  | 1.198 |
| CAPT SWO   | 272.359  | 9  | 118.813  | 9  | 512  | 148.247 | 9  | 613  | 267.060  | 5.300  | 2.441 |
| CAPT SUB   | 97.757   | 9  | 53.744   | 9  | 268  | 42.153  | 8  | 208  | 95.897   | 1.860  | 0.989 |
| CAPT PILOT | 337.812  | 10 | 176.476  | 9  | 726  | 159.073 | 10 | 646  | 335.549  | 2.263  | 0.912 |
| CAPT NFO   | 74.076   | 9  | 31.720   | 9  | 149  | 37.652  | 9  | 174  | 69.372   | 4.704  | 2.298 |
| CAPT SUPP  | 158.055  | 10 | 57.977   | 9  | 253  | 97.404  | 10 | 413  | 155.418  | 2.637  | 1.098 |

Table B.1.B F-computations for Chow tests



## LIST OF REFERENCES

- Barron, *Barron's Profiles of American Colleges*, 18th ed., Barron's Educational Series, Inc., Happpage, NY, 1991.
- Bowman, William R., "Enhancing the Net Returns to NPS Graduate Programs to Attract High Quality URL Navy Officers" unpublished, U.S. Naval Academy, May 1995.
- Bowman, William R., "Do Engineers Make Better Naval Officers?" *Armed Forces and Society*, vol.16, no. 2, pp. 271-286, Winter 1990.
- Cymrot, Donald J. "Graduate Education and the Promotion of Officers," Center for Naval Analyses, Alexandria, VA, March 1986.
- Gujarati, D. N., *Basic Econometrics*, 2nd ed., McGraw-Hill, Inc., 1988.
- Jordan, Susan S., "An Analysis of the Impact of Graduate Education on the Performance and Retention of general Unrestricted Line Officers" Master's Thesis, Naval Postgraduate School, December 1991.
- Mehay, Stephen L. and William R. Bowman, "Graduate Degrees and Job Performance: Evidence from Military Officers," Technical Report, Naval Postgraduate School, May 1995.
- Nolan, Joseph F., "An Analysis of Surface Warfare Officer Measures of Effectiveness as Related to Commissioning Source, Undergraduate Education, and Navy Training" Master's Thesis, Naval Postgraduate School, March 1993.
- Talaga, Michael T., "A Multivariate Analysis of the Effects of Graduate Education on Promotion and Retention of Surface Warfare Officers" Master's Thesis, Naval Postgraduate School, March 1994.
- U.S. Department of the Navy, Chief of Naval Operations, "Graduate Education Policy," CNO Itr Ser 00/4U500182 of 27 July, 1994.
- Wise, David A., "Academic Achievement and Job Performance," *American Economic Review*, vol. 65, no. 3, pp. 350-366, 1975.
- Woo, Jennie H., "Graduate Degrees and Job Success: Managers in One U.S. Corporation," *Economics of Education Review*, vol. 5, no. 3, pp. 227-237, 1986.



## INITIAL DISTRIBUTION LIST

|                                                                                                                                  | No. Copies |
|----------------------------------------------------------------------------------------------------------------------------------|------------|
| 1. Defense Technical Information Center<br>Cameron Station<br>Alexandria, VA 22304-6145                                          | 2          |
| 2. Library, Code 52<br>Naval Postgraduate School<br>Monterey, CA 93943-5101                                                      | 2          |
| 3. Department Chairman, Code SM<br>Department of Systems Management<br>Naval Postgraduate School<br>Monterey, CA 93943-5000      | 1          |
| 4. Dr. Stephen L. Mehay (Code SM/Mp)<br>Department of Systems Management<br>Naval Postgraduate School<br>Monterey, CA 93943-5103 | 3          |
| 5. LCDR Julie Dougherty (Code SM/Dg)<br>Department of Systems Management<br>Naval Postgraduate School<br>Monterey, CA 93943-5103 | 2          |
| 6. Dr. Richard S. Elster, Code 06<br>Dean of Instruction<br>Naval Postgraduate School<br>Monterey, CA 93943-5103                 | 1          |
| 7. Office of Education Analysis, Code 63<br>Naval Postgraduate School<br>Monterey, CA 93943-5103                                 | 1          |
| 8. Chief of Naval Personnel for Career Development (Pers 2)<br>2 Navy Annex<br>Washington, D.C. 20370-5000                       | 1          |
| 9. Dr. William R. Bowman<br>Economics Department<br>U.S. Naval Academy<br>Annapolis, MD 21402                                    | 1          |



- |                                                                                                                                |   |
|--------------------------------------------------------------------------------------------------------------------------------|---|
| 10. Dr. Greg Hildebrandt (Code SM/Hi)<br>Systems Management Department<br>Naval Postgraduate School<br>Monterey, CA 93943-5103 | 1 |
| 11. Mr. Harold F. Buterbaugh<br>1602 Sullivan Drive<br>Blue Bell, PA 19422                                                     | 1 |
| 12. LCDR Thomas A. Buterbaugh<br>Executive Officer<br>USS FIFE (DD 991)<br>FPO AP 96665-1229                                   | 2 |