LOOKING FOR A FEW GOOD MEN?:

PREDICTING PATTERNS OF RETENTION, PROMOTION, AND ACCESSION OF MINORITY AND WOMEN OFFICERS

James B. Stewart and Juanita M. Firestone

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Introduction

This paper is concerned with social representativeness in the officer corp. We briefly review the literature on officer accession, retention and promotion, that documents the conventional wisdom that officers are predominantely white males. This may in turn, sustain a process in which white males are stereotyped as having the attributes of successful officers; hence more white males will be sought to fill force requirements. In view of this possibility, it is of special interest to see how well minorities and women fare in the officer accession process.

Review of Literature

The "democratization" of the U.S. military's officer corps envisioned by Janowitz in 1971 was reinforced by the genesis of the All Volunteer Force (AVF) in 1973. By "democratization" Janowitz meant that the social background of military officers would broaden to include increasing proportions of 1) individuals with working class backgrounds; 2) self-recruits from enlisted/noncommissioned parentage; 3) individuals claiming religious affiliations such as Baptist, Methodist, and Roman Catholic as opposed to Presbyterian, and 4) minority group service academy graduates (Janowitz, 1971: xvii-xviii). The shift to a

voluntary military reinforced these trends by emphasizing the monetary rewards of military service over the intrinsic rewards of duty and service to country (Moskos, 1977; Fitzgerald, 1981).

Whether characterized as a change from institutional to occupational utilities (Moskos, 1977), professional to occupational values (Janowitz, 1977), or divergence to convergence with civilian norms (e.g., civilianization; Huntington, 1957; Biderman & Sharp, 1968; Cotton, 1988), researchers agree that the change from conscription to a voluntary military system transformed both the cultural definition of military service and the organizational outcomes of that transformation. Put simply, the voluntary military must compete with civilian organizations for participants. Among the most important outcomes associated with this change are member recruitment, retention and promotion.

A. Recruitment

Over the past 15 years, the military response to recruitment focused on monetary rewards as well educational programs and equal opportunity initiatives for minorities, to compete with civilian employers for members. As a result, recruitment of enlisted personnel has been sensitive to economic conditions of society in general as well as unemployment rates (Snyder, 1984; see Brown, 1985; Ash, Udis & McNown, 1983 for alternative views). Recruitment of officers, on the other hand, appears less sensitive to prevalent economic trends. Because military officers must have at least a baccalaureate (BA) degree or equivalent, recruitment appears more closely associated with need for financial aid during college

(Snyder, 1984). While many of the issues affiliated with civilian recruitment also apply to the military, there are important differences. Most importantly, personnel strengths as well as pay levels of the military are established by Congressional decree and based on national security needs rather than market incentives (i.e., profitability). Thus, as the male cohort on which the AVF has typically relied for volunteers (ages 17-24) shrinks, the cost to procure recruits will increase. One way around this problem has been to increase the participation of minority group members and women, often through initiating and/or emphasizing equal opportunity programs (EO). The 1979-1989 cohort data analyzed for this report are particularly relevant, because significant cutbacks in personnel and monetary support for EO programs have occurred during this period.

Turning to officer recruitment, it is important to note that all services currently support specific affirmative action programs to increase minority and female representation among officers in spite of resource constraints which necessitated scaling down equal opportunity programs in FY 88 (Dept. of the Army, 1988; Department of the Navy, 1988). The Army and Navy programs illustrate such initiatives. New promotion guidance designed to emphasize equitable selection rates for all officers considered was provided for the Army promotion boards in 1989. In addition, procedures for branching of officers to achieve representative minority/female distribution across occupations are under review.

The Navy now seeks to commission annually at least 7% Black

and 4% Hispanic officers. The Navy also has a special program to provide upward mobility for disadvantaged students desiring a naval commission. Changes to increase the number of minorities/women in designated career fields, most notably aviation, and insure their representative selection for service schools and colleges for postgraduate education have been initiated.

Despite these efforts, officers remain less socially representative than enlisted personnel. Minority and women officers remain underrepresented in all services, especially among field grade officers and above (Quarterly Statistical Profile, 1989).

As in the civilian market, military recruiters typically have limited information on which to base their decision to accept individuals into the organization. "Objective" criteria (such as various test scores), as well as aggregate information about specific categories of individuals are often used to proxy information about individual competence or precise job requirements, because complete background information on individual applicants is too costly. The effect of this process can be to discriminate against individuals based on group characteristics and to perpetuate stereotypes. For example, the U.S. officer corps is still overrepresented by white men, and this pattern increases with higher rank cohorts. Thus the characteristics associated with success as an officer may be identified with those stereotyped as white, male characteristics (Heilman, 1983). This, in turn, can lead to less priority for the recruitment of minorities and women

into officer accession programs (e.g., ROTC, OCS/OTS, Service Academies).

Until recent cutbacks, the combined effect of equal employment opportunity (EEO) legislation and affirmative action programs (such as Title IX) has been to counter stereotypes and create a more heterogeneous work force (for example, Fernandez, 1981). Certainly, the military has been on the vanguard of the EO/AAP programs, especially with regard to the enlisted force. Information presented in this paper, suggest that the officer corps of all services are still predominantly white male and will remain so unless there is continued focus on recruitment of minority group members and women.

B. Retention

Unlike, the original decision to join the military, the decision to remain a member after initial obligation has always been voluntary (Quester & Thomason, 1984). Attrition of first term enlistees as well as midcareer noncommissioned officers and officers has increased with the advent of the AVF (Moskos & Faris, 1982; Moskos, 1988; Faris, 1984). The "easy-out" system associated with voluntary service and market utilities reflects the fact that a sense of obligation to the service has been replaced with criteria emphasizing organizational "fit" with individual motivations and skills (Eitelberg & Binkin, 1982). In other words, individuals no longer presume an obligation to fulfill commitments unless they perceive economic/occupational benefits accruing from completing their tour of duty (Moskos, 1988).

Research on civilian manager retention supports the contention that minority and women managers are more likely than comparably situated white men to leave their jobs because they perceive a lack of challenging/interesting assignments or lack of career opportunities/advancements (Fernandez, 1981). Similarly, Kim (1982) found that job satisfaction was the only significant variable associated with commitment to military service; with good pay, learning valuable skills, and pleasant physical surroundings (listed in order of importance) as the most important components of job satisfaction.

Apparently, pay has little direct effect on commitment, but operates indirectly through job satisfaction, and this effect is stronger for officers than enlisted members (Faris, 1984). Furthermore, because the military has offered equal pay for equal rank as well as nontraditional opportunities for minorities and women, Black men and women have shown increasingly high levels of retention (i.e., Butler & Holmes, 1983; Shields, 1988). Thus, of critical importance to the retention of military officers within the market structure of voluntary benefits may be a value system stressing duty and obligation over and above the contractual relationships (Korb, 1981; Faris, 1984) as well as a concentrated effort to support and retain minority and women officers.

C. Promotion

The present "up or out" system of officer retention means that if an officer is passed over twice for promotion, regardless of the reason, s/he must exit the service. Thus, to some extent,

promotion rates must be correlated with the structure of the military force. Also, because promotion to the next grade depends on subjective as well as objective criteria (for example, promotion boards still require a photograph of the candidate included in the applicant file), rates may vary on the basis of individual characteristics (race, ethnicity, sex) and membership in upper grades may reflect underlying stereotypes about which individuals make better officers.[1]

In the past, empirical analyses reflect lower promotion rates of Black officers (Moskos, 1988) as well as women officers (Thomas, 1987) relative to white men. Recent EO/AAP programs in the military have attempted to rectify this situation with some success, most notably in the lower enlisted and company grade ranks. Gains are less apparent for high level NCOs and field grade officers and higher. This situation is in part due to the structure of entry and promotion in the military. That is everyone (with the exception of medical officers) enter the military at the lowest rank and are promoted internally. Thus, if the number of women and minority officers in the company grade ranks was minimal, they can not be represented in field grade ranks now. This circumstance may further reflect the fewer numbers of Black and women officers relative to White male officers as well as their over representation in enlisted ranks. For example, Blacks comprise only 6.6% of all DOD officers; Hispanics, comprise only 1.9% of all DOD officers; and women comprise only 11.4% of all officers (Quarterly Statistical Profile, 1989). These numbers vary

somewhat by branch of service and considerably by grade and occupation. For example, Blacks are 7.7% of all those holding grade O1, 7.3% of those in grade O2, and 8.4% of those in grade O3 (Quarterly Statistical Profile, 1989). Women are 15.6% of grade O1; 15% of grade O2; 12.8% of grade O3; 9.7% of grade O4, and 4.9% of grade O5 (Quarterly Statistical Profile, 1989).

Furthermore, Black men officers are concentrated in the technical/operational occupational category (35.3%) and most women officers are concentrated in the medical/dental category (41.8%), with most of the latter found in the field of nursing (29%) (Firestone, 1989). Because real numbers of Blacks and women officers are quite low, excluding those occupations with high representation, both groups may lack the critical mass to significantly increase their representation at higher levels of command without institutional intervention.

While sources other than military academies will continue to provide the bulk of officers, the relative under- representation of women and minorities at the academies has critical implications for promotion patterns and the demographic profile of the career officers corps. Snyder (1976) has suggested that a significant gap exists in the degree of preparation for military service between the academies and ROTC programs. Snyder suggests that ROTC graduates are particularly deficient in familiarity with the overall range of service activities. Rose and Dougherty (1976) note that service academy graduates are likely to obtain more positive early Officer Effectiveness Reports which constitute the

primary criteria for assignments selection and shape an individual's initial career pattern.

Increasingly, promotion to higher grades is tied to the attainment of post-baccalaureate degrees in addition to successful completion of professional military training. In examining the 1973 Officer Graduate Education Study, Rose and Dougherty (1976) found that 21% of all graduate degrees in the officer corps of all services were held by service academy graduates even though they constituted only 10% of all active duty officers. Moreover, they note that the present system of selecting attendees at the intermediate and Senior Service Schools discriminates against "late bloomers" and inadequately reflects the nonlinear growth and developmental patterns of individuals.

Objectives

In the context of the preceding perspectives the present study examines the extent to which differences exist across race, sex, and service group in rates of retention and promotion of officers. Models of retention and promotion are developed and estimated using cohort data for the period 1979-1988. The empirical results are used to develop predictions of the degree of representation and the distribution of individuals across ranks for the cohorts over the next decade.

Data, Variable Construction, and Selected Descriptive Statistics

The data analyzed in this study were taken from a special DOD tabulation containing original accessions and retentions of commissioned officers by service group, race, and sex for 10

cohorts (1979-1988), as of September, 1988. The numbers of retainees by grade and the overall retention rate were also provided by cohort. The original tabulations were provided by the Defense Manpower Data Center (DMDC) to the Defense Equal Opportunity Management Institute (DEOMI), Patrick AFB, FL. Several adjustments to these original data were made to facilitate analysis.

Warrant officers and officers of unknown rank were subtracted from the number of original accessions and retainees. This algorithm permitted parallel treatment of each service group given the absence of the rank of warrant officer in the Air Force. The procedure introduced some imprecision because the numbers of original warrant officer accessions were not available.[2]

The racial-ethnic groups for which data were available are Whites, Blacks/African-Americans, Hispanics, Native Americans, Asian/Pacific Islanders, and Unknown. Individuals classified as "Unknown" were excluded from all phases of the investigation. This exclusion introduced no bias because accession and retention information are tabulated separately for each group. Although data for Native Americans were originally included in the detailed analyses described in the methods section, the small numbers necessitated exclusion of Native Americans in the final iterations.

Complete information was available for the Army, Navy, Marines, and Air Force. However, significant differences in the typical timing of promotion from rank to rank between the Marines and the other service groups necessitated the exclusion of Marine

cohorts from the statistical analyses.

Four independent measures were developed from the modified data for each race/ethnic-sex cohort; (1) the retention rate (RETRATE), (2) the proportion of retainees promoted to grade 03 or higher (PRO-03+), (3) the proportion of retainees promoted to grade 04 or higher (PRO-04+), and (4) the proportion of retainees promoted to grade 05 or higher (PRO-05+). The computation of each measure was straightforward, defined simply as the number of individuals fitting each classification divided by the number of original accessions (adjusted). It will be noted that for a given cohort measure (4) is a subset of the data used to compute measure (3), and measures (3) and (4) are included in the computation of measure (2). Each is examined independently so that problems of colinearity do not arise.

The principal goals of the study are again to determine the extent to which systematic differences in each of the four measures of retention and promotion exist across race, sex, service group, and cohort, and to use the results to predict future retention and promotion profiles of cohorts.

Methods

The first phase of the study involved the development of estimates of the year-to-year retention and promotion rates for individual cohorts. In the second phase of the study the predicted retention and promotion rates are used to forecast likely patterns of retention and promotion of race/ethnic/gender cohorts over the next decade.

The logic associated with the first phase of the study can be illustrated by referring to Table 1 which contains the actual retention rates for White males in the Army for each cohort. The retention rates can be described as "well-behaved," (i.e. they decline monotonically as length of time since accession for each cohort increases). The characterization "well-behaved" is meant to imply that the pattern is consistent with a priori expectations that normal patterns of voluntary and involuntary attrition should result in cohorts of more recent vintage having a higher proportion of original accessions surviving than older ones.

The period of time over which an observed pattern is "well-behaved" is especially critical. Because data were available for only 10 cohorts, the extremely important phenomenon of attrition of career officers completing 20+ years of service could not be examined. This is because the pattern of retention differs dramatically in that time range. Longer term analyses of retention patterns focusing on officer retention have, however, been undertaken. An example is provided by the Fifth Quadrennial Review of Military Compensation (DOD, 1984). Fiscal and force-strength impacts of alternative retirement compensation schemes were examined using, among other tools, the Annualized Cost of Leaving (ACOL) model. In the ACOL model retention rates are assumed to be functionally related to the differences in compensation between the military and civilian alternatives. Seven-year average retention rates covering FY76-FY82 were used.

The level of detail necessary to undertake a comparable

investigation in this study was unavailable, as noted previously. The retention rates examined here, however, cover a more recent and longer period of time. In the absence of the capability of underaking civilian-military compensation comparisons, systematic errors would be introduced by attempting to develop out-of-sample predictions for cohorts approaching the 20 years of service plateau. The problem is reflected in Figure 1 which presents a graphic representation of the desired force profiles for both officers and enlisted personnel. It is important to note that the slope of the retention-years of service profile for officers changes in the 10-year range and shifts again in the 20-year range. As a consequence, predictions in this study are restricted to periods less than 10 years. The basic approach is illustrated in the example below.

Referring again to Table 1, suppose it were desired to predict the retention rate for the 1988 cohort that would be observed in 1991 (3 years in the future). Ideally, it would be desirable to have retention data available for each cohort for every year to facilitate predictions. Unfortunately, the only information available to undertake the present analysis is for a single year (i.e., 1988). As a consequence, it is necessary to use the experiences of individual cohorts measured in 1988 as a proxy for time series information about each cohort. The cautions necessary in using such an approach for both retention and promotion analyses are discussed in Stewart and Firestone (1989).

In the present study an especially critical problem is the

small numbers of Black, Hispanic, and Asian officers. This problem is exacerbated for women officers. The small numbers can produce dramatic fluctuations in the year-to-year retention and promotion rates. This phenomenon can be seen from Table 2, which contains actual retention rates for Black women Army officers. The retention rate for the 1983 cohort in Table 2 is lower than that for the 1982 cohort. Similarly, the rate for the 1981 cohort is larger than for the 1982 cohort. Such patterns would not occur in time series cohort data.

For large cohorts it is reasonable to assume that the probabilities of retention (or promotion) for individuals in a given cohort are normally or log-normally distributed allowing clear inferences to be drawn about population characteristics from the analysis of a sample distribution of mean cohort retention (promotion) rates. Those assumptions are obviously problematic for cohorts of small size, introducing potential bias in statistical analyses.

To address the various estimation problems, three separate statistical models were developed to examine the retention and promotion experience of men and women in the 10 cohorts. The models differ in the treatment of the possible effects of race/ethnicity on variation in retention and promotion rates. The models are termed "statistical" rather than "behavioral" because no information about the mean background characteristics of cohorts is available that could be used to test hypotheses about factors accounting for observed differences in retention and promotion

rates.

The detailed specifications for each model are presented below. In general terms Model 1 treats differences in retention and promotion rates across race/ethnic collectives as being invariant across cohorts and service groups. Variation across service group and cohort is treated as being unrelated to race/ethnicity.

Model 2 allows for the possibility that the experience of each race/ethnic collective differs systematically for each service group. Race/ethnicity is not allowed to affect retention and promotion rates independently. Variation across cohorts is again assumed to be unrelated to race/ethnicity.

In contrast to the other models, Model 3 allows race/ethnicity to directly influence the retention/promotion experience of each individual cohort. Variation across service groups is assumed to be unrelated to race/ethnicity.

Ordinary least squares reqression (OLS) was used to estimate each model and generate the predicted retention and promotion rates. Using the predicted rates generated through regression analysis can smooth out some of the distortion that would occur by using actual rates for individual cohorts to predict the subsequent experience of other cohorts.

Specification of Model 1

The specification of Model 1 took the form:

$$(1)\quad Y_i = a_0 + a_1\ \text{NAVY} + a_2\ \text{AIRFORCE} + a_3\ \text{BLACK} + a_4\ \text{HISP} + a_5\ \text{ASIAN} + b_i\ \text{YR}_i + u$$

In (1) Y_{ij} denotes the dependent variables RETRATE, PRO-03+, PRO-04+, and PRO-05+ defined previously with the subscript i referring to a given cohort. The error term is denoted by u. NAVY and AIRFORCE are service group dummy variables assigned the value 1 if a cohort is associated with that service group and zero otherwise. No dummy variable is created for the Army because it is the reference service group. BLACK, HISP, and ASIAN are also dummy variables assigned the value 1 if measurement Y_i is for that particular racial/ethnic group and zero otherwise. No dummy variable is created for Whites because this is the reference racial ethnic/group. Note that this specification requires the influence of race/ethnicity per se to be constant across both service groups and cohorts.

YR is a vector of nine dummy variables each indicating a particular cohort year from 1980 to 1988. Each dummy variable is assigned the value 1 if the measurement of Y_i is for that year and zero otherwise. No dummy variable is created for 1979 because this year serves as the reference cohort. Thus this formulation treats Whites in the 1979 Army cohort as the reference group whose experience is reflected in the constant term.

Specification of Model 2

The specification of Model 2 parallels that of Model 1. Equation (2) differs from Equation (1) in the substitution of dummy variables that are constructed by interacting the race group with the service group. Thus, unlike the specification in Equation (1) the effect of race/ethnicity per se

is not constrained to be constant across service groups. To maintain the convention of using the constant term to capture the experience of White officers in the 1979 Army cohort it is necessary to create interaction dummy variables for White officers in the other service groups. In this formulation it is also necessary to create a dummy variable ARMY defined analogously to the other service group dummy variables to allow the creation of the race-army interactions for racial groups other than Whites.

$$(2)\ Y_i = d_0 + d^1\ \text{WHITE} * \text{NAVY} + d_2\ \text{WHITE} * \text{AIRFORCE} + d_3\ \text{BLACK} * \text{ARMY} + d_4\ \text{BLACK} * \text{NAVY} + d_5\ \text{BLACK} * \text{AIRFORCE} + d_6\ \text{HISP} * \text{ARMY} + d_7\ \text{HISP} * \text{NAVY} + d_8\ \text{HISP} * \text{AIRFORCE} + d_9\ \text{ASIAN} * \text{ARMY} + d_{10}\ \text{ASIAN} * \text{NAVY} + d_{11}\ \text{ASIAN} * \text{AIRFORCE} + e_i\ YR_i + v$$

As in (1) a vector of dummy variables designating particular cohorts is included and v is an error term. This specification retains the convention of (1) where race/ethnicity per se is not allowed to have different effects for different cohorts.

Specification of Model 3

The specification of Model 3 in (3) treats service groups in a manner identical to the treatment in (1). Unlike the case in (1) and (2), the effect of race/ethnicity, per se, is allowed to vary across each individual cohort.

$$(3)\ Y_i = f_0 + f_1\ \text{NAVY} + f_2\ \text{AIRFORCE} + g_i\ \text{WHITE}*YR_i + h_i\ \text{BLACK}*YR_i + m_i\ \text{HISP}*YR_i + n_i\ \text{ASIAN}*YR_i + w$$

Separate dummy interaction terms are introduced for each race/ethnic cohort with the exception of Whites in 1979. This convention again uses the experiences of the 1979 cohort of White Army officers as the reference. It should be noted that the race-cohort interaction vectors for the groups other than Whites have 10 elements unlike in (1) and (2).

Each of the three models was estimated to obtain sets of predicted year-to-year retention and promotion rates. Information for all cohort years was not used in the estimation of equations (1), (2), and (3) for promotion rates (PRO-03+, PRO-04+, PRO-05+). In the estimation of (1), (2), and (3) with PRO-03+ as the dependent variable only the data for relatively newer cohorts (i.e. those acceding in 1983 or earlier) was used. Conversely, in the estimations with PRO-04+ and PRO-05+ as the dependent variables only data for relatively older cohorts was examined (i.e. those cohorts acceding in 1986 or before). The cutoff points, selected arbitrarily, were designed to reflect the typical temporal pattern of promotions to the ranks in question. In addition, the convention serves to reduce distortions caused by the fact that some direct appointments to higher ranks are made for officers with particular specialties (e.g., physicians).

The second phase of the investigation entailed using the different sets of predicted retention and promotion rates to calculate ranges of future numbers of retainees and promotees in current cohorts. The procedure is straightforward, simply involving multiplication of the original cohort size by the

appropriate retention or promotion rate. However, the more critical task involved assessing the reasonableness and comparative accuracy of the alternative predictions.

The large volume of intermediate results for retention and promotion rates and predictions of numbers of retainees and promotees generated cannot be presented in total. As a consequence, only selected results for phases (1) and (2) are presented in the next section.

Results

Patterns of Retention and Promotion

The predictions of year-to-year retention rates for White and Black men for all three service groups generated by each estimation method are presented in Table 3 along with the actual rates. The rates are computed using the coefficients of appropriate variables in the regression equation that were significant at the 80% level of confidence or higher. Comparable information for Hispanic and Asian males is contained in Table 4.

Table 5 presents the predicted year-to-year retention rates for White and Black women and Table 6 contains the results for Hispanic and Asian women. In Tables 3-6 rows (a)-(c) contain the predictions generated by estimating equations (1) - (3) respectively. Row (d) contains the actual adjusted retention rates.[3]

The overall fit of the models of retention rates is good as reflected by the R^2 values indicated in the tables. Several general observations can be made about the results. First, the

models exhibit significantly greater explanatory power for men than for women. This reflects, in part, the problem of small cohort sizes noted previously. In addition, however, the underlying structural constraints affecting retention (and also promotion) probably differ. Evidence can be seen by comparing the actual retention profiles of White men and women in the Army shown in Table 7. As can be seen, in the early years the retention rate for women officers approximates that for men. However, after the intial service obligation has been met the retention rate of women falls significantly below that for men.

A second conclusion that can be drawn from the results is that race-specific effects are relatively limited. To illustrate, the experiences of Black men more closely approximate those of White men than do those of Hispanics or Asians. At the same time, the race-specific effects for Asian and Hispanic men appear to be service specific (Army) and to some extent cohort specific.

A third general observation is that there are systematic differences in patterns of retention across service groups. Retention rates in the Air Force are consistently higher than in the Army or the Navy.

Drawing conclusions about the relative explanatory power of the models on bases other than R^2 cannot be done by considering how well-behaved the predicted retention rates are since all models produced well-behaved rates. Estimations of equation (3) produced fewer differences among older cohorts than the other methods.

None of the models proved to be able to generate particularly

accurate predictions of promotion rates although the R^2 obtained in the analysis of promotion to grade O3 or higher were generally comparable to those obtained in the analysis of retention rates. The R^2 obtained in the estimations of equations (1), (2), (3) for promotion rates of men to grade O3 or above were respectively, .864, .855, and .846. For women the comparable statistics were .825, .826, and .789. The overall explanatory power dropped dramatically, however, when promotion rates to grade O4 and above and grade O5 or above were analyzed. To illustrate, the highest R^2 obtained in the analysis of promotion rates to O4 or higher and O5 or higher respectively were .509 (equation 2), and .487 (equation 2). The comparable results for women were .202 (equation 2), and .256 (equation 3).[3]

The relatively high degree of explanatory power of the models of retention and promotion to grade O3 or higher
provides an opportunity to test the internal consistency of each estimation approach. The predictions associated with a particular approach are internally consistent to the extent that the predicted numbers of officers retained is greater than the predicted number of officers promoted to the grade of O3 or higher. Predictions generated using equation (1) for men produced five inconsistent cases (Army--all groups, and Asians in the Navy). Predictions generated using equation (2) yielded only one inconsistent case--Asian Army officers. Estimations of equation (3) produced six cases of inconsistent predictions (Army--all groups, and Hispanics in the Navy and Air Force). Comparisons for women for equations

(1) and (3) indicated four and five inconsistent predictions respectively.[4]

A second check of internal consistency is the stability of the predictions of the numbers of officers promoted to a given grade or higher by cohort. If the estimated year-to-year promotion rates are not well-behaved the result will be that both positive and negative fluctuations in the number of officers predicted to be promoted to a given grade or higher will occur. If, however, we could observe an individual cohort over time the proportion of individuals promoted to a given rank or higher would increase monotonically.

All of the models produce internally consistent estimates in the analysis of promotion to grade 03 or higher. However, none of the models produces internally consistent estimates for promotion rates to grades 04 or higher or 05 or higher for men or women. Given these patterns only the promotion rate estimates to grade 03 or higher generated by estimating equation (2) for men and women are reported in Tables 8 and 9 respectively. In both tables the predicted promotion rates are invariant across racial groups. While greater inter-racial variation occurs in the other models, these results are useful for simple comparisons of the rates for men and women. A crossover effect can be observed whereby the predicted promotion rate for women is initially lower than, then becomes larger than, and again fall below that for men. The second crossover is likely due in part to the higher attrition rate of women officers suggested in Table 7.

The inability of the models to generate internally consistent estimates of promotion rates to grades 04 or higher and 05 or higher suggests that using cross-sectional cohort data as a substitute for time-series cohort data has fundamental limitations for analyzing promotions at these levels. There is, however, also the broader question of whether even time series cohort data are sufficiently rich to answer some of the critical questions regarding the extent to which differences exist in retention and promotion rates by race, gender, and service group. Answering many of the more interesting questions, including the impact of civilian opportunities on retirement decisions, is likely to require the analysis of individual level rather than cohort data.

Predictions of Retention and Promotion

As indicated previously, in Phase II the predicted rates were used to generate forecasts of the numbers of officers expected to be retained and promoted from each cohort in future years. Only illustrative results are presented in Table 10 since the numbers are driven by the original number of accessions and questions of reliability of the estimates are unresolved. What is shown in Table 10 are simply the estimates of the number of Black men Army officers retained from each cohort for selected years from 1989 to 1997. The blank cells reflect the decision not to attempt out of sample predictions. The presentation is simply designed to illustrate the potential usefulness of the framework for planning and monitoring purposes. Comparable predictions are presented for White women Army officers in Table 11.

Although the detailed results obtained from the prediction of numbers of officers that will be promoted to various grades are not presented, several illustrations underscore the criticality of expanded initiatives if long-term diversity is to be achieved. The maximum number of Black men officers in any service group and any cohort predicted to attain grade 05 or higher by any of the three models was 23 (Army - 1984 and 1985 cohorts). The comparable figures for Hispanic and Asian men were, respectively, 7 and 8.[5]

Information about expected retentions and promotions must be combined with information about expected accessions to determine whether force requirement shortfalls are likely to occur.

Conclusion

This analysis has demonstrated the potential and limitations of utilizing cross-sectional cohort data to examine differences in retention and promotion profiles by race and sex. Given the importance of increasing diversity in the officer corps, a number of possibilities exist for building on this preliminary effort. As a starting point, the present analysis should be replicated annually combining data from each of several years. The first step would be obtaining comparable data as of September, 1989 for the cohorts acceding from 1979 to 1989. Eventually, this process will produce a combined cross-sectional-time series data base that can generate more reliable predictions than either a cross-sectional or time series data base individually. Moreover, such a data base will enable the examination of the aggregate impact of retirement decisions on the demographic profile of the officer corps.

Simultaneously, an individual level data base should be developed that includes the complete service histories of officers and former officers so that timing of promotions can be determined. Analysis of such data using life event history analysis techniques can produce information of extensive value to planners as well as complement analyses using cohort data.

Finally, additional scrutiny should be undertaken to determine the extent to which systematic barriers to the production of minority and women officers exist in the various accession sources. Such a combined research program, will help insure that the search for officers is more than looking for a few good men.

NOTES

[1] Some of this may take place prior to the board's convening through supervisor ratings.

[2] Subtraction of retained warrant officers (and officers of unknown rank) from the original accessions implies de facto a retention rate of 100% for this (these) category (ies) for all cohorts. The degree of imprecision introduced is limited by the relatively small number of warrant officers. The maximum effect occurs for older cohorts. In the 1982 cohort of White men army officers there were 865 warrant officers remaining out of 5,848 original accessions. Remaining warrant officers thus accounted for slightly under 15% of original accessions.

[3] As noted previously the data were tabulated as of September, 1988. This meant that the retention rate for 1988 was less than 100%. The 1988 retention rate was included in the data base but in the calculation of predicted retainees and promotees the coefficient associated with the 1987 cohort is used as the one year rate. This convention has the effect of assuming a September to September measurement for the various variables.

[4] For equation (1) all the inconsistent predictions were obtained for the Army. For equation (3) all groups except Asians had inconsistent predictions for the Army and Hispanics had inconsistent predictions for the Navy and Air Force.

[5] The highest predictions for Hispanics were generated for the 1988 Army cohort, the 1988 Navy cohort, the 1986 Navy cohort, and the 1985 Air Force cohort. The highest predictions for Asians were for the 1988 and 1986 Army cohorts.

TABLE 1
ACTUAL ADJUSTED RETENTION RATES BY COHORT
WHITE, MEN ARMY OFFICERS
AS OF 9/88

Accession Year	Retention Rate
1987	.983
1986	.939
1985	.821
1984	.663
1983	.606
1982	.563
1981	.509
1980	.483
1979	.474

Source: Computed from data provided by the Defense Manpower Data Center (DMDC)

TABLE 2
ACTUAL ADJUSTED RETENTION RATES BY COHORT
BLACK, WOMEN ARMY OFFICERS
AS OF 9/88

Accession Year	Retention Rate
1987	.974
1986	.931
1985	.741
1984	.676
1983	.504
1982	.531
1981	.552
1980	.533
1979	.430

Source: computed from data provided by the Defense manpower Data Center (DMDC)

TABLE 3
RETENTION RATE PREDICTIONS GENERATED
EXCLUDING MARINES AND NATIVE AMERICANS

YEARS IN	WHITE MEN			BLACK MEN		
	Army	Navy	Air Force	Army	Navy	Air Force
1 (a)	.920	.966	1.000	.920	.966	1.000
(b)	.933	.933	1.000	.933	.933	1.000
(c)	.909	.955	1.000	.900	.946	1.000
(d)	.983	.963	.955	.988	.912	.974
2 (a)	.894	.940	1.000	.894	.940	1.000
(b)	.907	.907	1.000	.907	.907	.995
(c)	.883	.929	1.000	.860	.906	.987
(d)	.939	.946	.937	.926	.887	.939
3 (a)	.817	.863	.990	.817	.863	.990
(b)	.830	.830	.933	.830	.830	.918
(c)	.817	.863	.944	.760	.806	.887
(d)	.821	.898	.906	.752	.811	.888
4 (a)	.692	.738	.865	.692	.738	.865
(b)	.705	.705	.808	.705	.705	.793
(c)	.698	.744	.825	.681	.727	.808
(d)	.663	.774	.831	.658	.747	.811
5 (a)	.584	.630	.757	.584	.630	.757
(b)	.596	.596	.699	.596	.596	.684
(c)	.630	.676	.757	.604	.650	.731
(d)	.606	.678	.779	.642	.603	.738
6 (a)	.569	.615	.742	.569	.615	.742
(b)	.582	.852	.685	.582	.582	.670
(c)	.478	.524	.605	.478	.524	.605
(d)	.563	.598	.729	.588	.488	.668
7 (a)	.497	.543	.670	.497	.543	.470
(b)	.510	.510	.613	.510	.510	.598
(c)	.478	.524	.605	.478	.524	.605
(d)	.509	.515	.661.	.500	.470	.607

8	(a)	.497	.543	.670	.497	.543	.670
	(b)	.510	.510	.613	.510	.598	.598
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.474	.484	.649	.518	.452	.658
9	(a)	.497	.543	.670	.497	.543	.670
	(b)	.510	.510	.613	.510	.510	.598
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.474	.484	.649	.518	.452	.658

R^2(a)= .882 N = 120
(b)= .893
(c)= .864

TABLE 4
RETENTION RATE PREDICTIONS GENERATED EXCLUDING MARINES AND NATIVE AMERICANS

YEARS IN		HISPANIC MEN			ASIAN MEN		
		Army	Navy	Air Force	Army	Navy	Air Force
1	(a)	.920	.966	1.000	.881	.927	1.000
	(b)	.933	.933	1.000	.837	.933	1.000
	(c)	.863	.909	.990	.884	.930	1.000
	(d)	.991	.905	.914	.968	.934	.985
2	(a)	.894	.940	1.000	.855	.901	.982
	(b)	.907	.907	1.000	.811	.907	.985
	(c)	.863	.909	.990	.884	.930	1.000
	(d)	.905	.929	.929	.927	.959	.938
3	(a)	.817	.863	.990	.778	.824	.905
	(b)	.830	.830	.930	.734	.830	.908
	(c)	.805	.851	.932	.798	.844	.925
	(d)	.789	.878	.920	.741	.911	.916
4	(a)	.692	.738	.865	.653	.699	.780
	(b)	.808	.808	.908	.609	.609	.705
	(c)	.668	.714	.795	.631	.677	.758
	(d)	.628	.731	.813	.545	.773	.747
5	(a)	.584	.630	.757	.545	.591	.672
	(b)	.699	.699	.799	.500	.596	.674
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.519	.559	.748	.214	.644	.690
6	(a)	.569	.615	.742	.530	.576	.657
	(b)	.582	.852	.682	.486	.582	.660
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.500	.571	.727	.480	.619	.729
7	(a)	.497	.543	.670	.458	.504	.585
	(b)	.510	.510	.610	.414	.510	.588
	(c)	.500	.571	.727	.480	.619	.729
	(d)	.439	.460	.733	.414	.566	.714

8	(a)	.497	.543	.670	.458	.504	.585
	(b)	.510	.510	.610	.414	.510	.588
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.308	.548	.647	.436	.443	.535
9	(a)	.497	.543	.670	.458	.504	.585
	(b)	.510	.510	.610	.414	.510	.588
	(c)	.478	.524	.605	.478	.524	.605
	(d)	.500	.514	.658	.349	.545	.590

R^2(a)= .882 N = 120
(b)= .893
(c)= .864

TABLE 5
RETENTION RATE PREDICTIONS GENERATED EXCLUDING MARINES AND NATIVE AMERICANS

YEARS IN		WHITE WOMEN			BLACK WOMEN		
		Army	Navy	Air Force	Army	Navy	Air Force
1	(a)	.910	1.000	.985	.910	1.000	.985
	(b)	.935	.935	.935	.880	.974	.955
	(c)	.917	1.000	.993	.918	1.000	.944
	(d)	.980	.970	.970	.931	.970	.908
2	(a)	.880	.974	.955	.880	.974	.955
	(b)	.905	.905	.905	.905	.985	.905
	(c)	.880	.975	.956	.879	.975	.955
	(d)	.935	.958	.917	.931	.970	.908
3	(a)	.719	.813	.794	.719	.813	.794
	(b)	.744	.744	.744	.744	.824	.824
	(c)	.711	.806	.787	.718	.814	.794
	(d)	.745	.778	.656	.718	.814	.794
4	(a)	.622	.716	.697	.622	.716	.697
	(b)	.647	.647	.647	.647	.727	.727
	(c)	.585	.681	.661	.645	.741	.797
	(d)	.595	.674	.656	.676	.740	.688
5	(a)	.534	.628	.609	.464	.558	.574
	(b)	.561	.561	.561	.561	.641	.561
	(c)	.513	.609	.589	.535	.631	.611
	(d)	.530	.594	.584	.504	.614	.656
6	(a)	.464	.558	.575	.464	.558	.575
	(b)	.489	.489	.489	.489	.569	.489
	(c)	.356	.452	.432	.549	.645	.625
	(d)	.798	.583	.526	.531	.727	.559
7	(a)	.434	.528	.509	.434	.528	.509
	(b)	.459	.459	.459	.459	.539	.459
	(c)	.356	.452	.432	.498	.594	.574
	(d)	.423	.521	.501	.552	.577	.534

8 (a)	.417	.511	.492	.417	.511	.492
(b)	.442	.442	.442	.422	.502	.422
(c)	.356	.452	.432	.356	.452	.432
(d)	.409	.498	.470	.533	.487	.591
9 (a)	.286	.380	.561	.311	.391	.311
(b)	.311	.311	.311	.311	.391	.311
(c)	.356	.452	.432	.356	.452	.432
(d)	.339	.462	.437	.430	.344	.496

R^2(a)= .858 N=119
(b)= .877
(c)= .850

TABLE 6
RETENTION RATE PREDICTIONS GENERATED EXCLUDING
MARINES AND NATIVE AMERICANS

YEARS IN		HISPANIC WOMEN			ASIAN WOMEN		
		ARMY	NAVY	AIR FORCE	ARMY	NAVY	AIR FORCE
1	(a)	.910	1.000	.985	.910	1.000	.985
	(b)	.935	.935	.935	.794	1.000	.935
	(c)	.939	.909	.926	1.000	1.000	.920
	(d)	.939	.909	.926	1.000	1.000	.920
2	(a)	.880	.974	.955	.880	.974	.955
	(b)	.905	.905	.905	.764	1.000	.905
	(c)	.855	.951	.931	.917	1.000	.993
	(d)	1.000	858	.857	.929	.944	.964
3	(a)	.719	.813	.794	.719	.813	.794
	(b)	.744	.744	.744	.603	.805	.744
	(c)	.699	.795	.775	.740	.836	.816
	(d)	.500	.941	.800	.708	.775	.806
4	(a)	.622	.647	.647	.622	.716	.697
	(b)	.690	.786	.766	.506	.748	.647
	(c)	.690	.786	.766	.552	.648	.628
	(d)	.625	.857	.759	.444	.750	.632
5	(a)	.534	.452	.432	.534	.628	.609
	(b)	.561	.61	.561	.420	.622	.561
	(c)	.356	.452	.432	.549	.645	.625
	(d)	.000	.500	.659	.400	.810	.667
6	(a)	.464	.558	.509	.464	.558	.575
	(b)	.486	.489	.489	.348	.590	.489
	(c)	.356	.452	.432	.356	.452	.432
	(d)	.600	.533	.455	..167	.500	.520
7	(a)	.434	.528	.509	.434	.528	.509
	(b)	.459	.459	.459	.317	.560	.459
	(c)	.356	.452	.432	.356	.452	.432

	(d)	.429	.375	.524	.250	.600	.552
8	(a)	.417	.511	.492	.417	.511	.492
	(b)	.442	.442	.442	.301	.543	.442
	(c)	.356	.452	.432	.356	.452	.432
	(d)	.571	.333	.522	.143	.692	.375
9	(a)	.286	.380	.361	.286	.380	.361
	(b)	.311	.311	.311	.170	.412	.311
	(c)	.356	.452	.432	.163	.259	.239
	(d)	.143	.400	.348	.000	.286	.375

R^2 (a)= .858 N=119
(b)= .877
(c)= .850

TABLE 6-7
RETENTION RATE PREDICTIONS GENERATED EXCLUDING MARINES AND NATIVE AMERICANS

YEARS IN	HISPANIC WOMEN			ASIAN WOMEN		
	ARMY	NAVY	AIR FORCE	ARMY	NAVY	AIR FORCE
1 (a)	.910	1.000	.985	.910	1.000	.985
(b)	.935	.935	.935	.794	1.000	.935
(c)	.939	.909	.926	1.000	1.000	.920
(d)	.939	.909	.926	1.000	1.000	.920
2 (a)	.880	.974	.955	.880	.974	.955
(b)	.905	.905	.905	.764	1.000	.905
(c)	.855	.951	.931	.917	1.000	.993
(d)	1.000	858	.857	.929	.944	.964
3 (a)	.719	.813	.794	.719	.813	.794
(b)	.744	.744	.744	.603	.805	.744
(c)	.699	.795	.775	.740	.836	.816
(d)	.500	.941	.800	.708	.775	.806
4 (a)	.622	.647	.647	.622	.716	.697
(b)	.690	.786	.766	.506	.748	.647
(c)	.690	.786	.766	.552	.648	.628
(d)	.625	.857	.759	.444	.750	.632
5 (a)	.534	.452	.432	.534	.628	.609
(b)	.561	.61	.561	.420	.622	.561
(c)	.356	.452	.432	.549	.645	.625
(d)	.000	.500	.659	.400	.810	.667
6 (a)	.464	.558	.509	.464	.558	.575
(b)	.486	.489	.489	.348	.590	.489
(c)	.356	.452	.432	.356	.452	.432
(d)	.600	.533	.455	..167	.500	.520

7	(a)	.434	.528	.509	.434	.528	.509
	(b)	.459	.459	.459	.317	.560	.459
	(c)	.356	.452	.432	.356	.452	.432
	(d)	.429	.375	.524	.250	.600	.552
8	(a)	.417	.511	.492	.417	.511	.492
	(b)	.442	.442	.442	.301	.543	.442
	(c)	.356	.452	.432	.356	.452	.432
	(d)	.571	.333	.522	.143	.692	.375
9	(a)	.286	.380	.361	.286	.380	.361
	(b)	.311	.311	.311	.170	.412	.311
	(c)	.356	.452	.432	.163	.259	.239
	(d)	.143	.400	.348	.000	.286	.375

R^2(a)= .858 N=119
(b)= .877
(c)= .850

TABLE 8

PREDICTIONS* OF PROMOTION RATES TO GRADE 03 OR HIGHER GENERATED EXCLUDING NATIVE AMERICANS AND MARINES

YEARS IN	WHITE MEN ARMY	NAVY	AIR FORCE	BLACK MEN ARMY	NAVY	AIR FORCE
1	.090	.090	.090	.090	.090	.090
2	.091	.091	.091	.091	.091	.091
3	.147	.147	.147	.147	.147	.147
4	.593	.593	.593	.593	.593	.593
5	.593	.593	.593	.593	.593	.593

YEARS IN	HISPANIC MEN ARMY	NAVY	AIR FORCE	ASIAN MEN ARMY	NAVY	AIR FORCE
1	.090	.090	.090	.090	.090	.090
2	.091	.091	.091	.091	.091	.091
3	.147	.147	.147	.147	.147	.147
4	.593	.593	.593	.593	.593	.593
5	.593	.593	.593	.593	.593	.593

$R^2 = .855$

N = 72

* Computed from the results of OLS estimations of Equation (2)

TABLE 9
PREDICTIONS* OF PROMOTION RATES TO GRADE 03 OR HIGHER
GENERATED EXCLUDING NATIVE AMERICANS AND MARINES

YEARS IN	WHITE WOMEN			BLACK WOMEN		
	ARMY	NAVY	AIR FORCE	ARMY	NAVY	AIR FORCE
1	.082	.082	.082	.082	.082	.082
2	.091	.091	.091	.091	.091	.091
3	.151	.151	.151	.151	.151	.151
4	.554	.554	.554	.554	.554	.554
5	.554	.554	.554	.554	.554	.554

YEARS IN	HISPANIC WOMEN			ASIAN WOMEN		
	ARMY	NAVY	AIR FORCE	ARMY	NAVY	AIR FORCE
1	.082	.082	.082	.082	.082	.082
2	.091	.091	.091	.091	.091	.091
3	.151	.151	.151	.151	.151	.151
4	.554	.554	.554	.554	.554	.554
5	.554	.554	.554	.554	.554	.554

R^2 = .826

N = 71

*Computed from the results of OLS estimations of equation (2)

TABLE 7
ADJUSTED ACTUAL COHORT RETENTION RATES FOR
WHITE MEN AND WOMEN ARMY OFFICERS

ACCESSION YEAR	WHITE MEN	WHITE WOMEN
1987	.983	.980
1986	.939	.935
1985	.821	.745
1984	.663	.595
1983	.606	.530
1982	.536	.498
1981	.509	.423
1980	.483	.409
1979	.474	.339

Source: Computed from data provided by the Defense Manpower Defense Center (DMDC)

TABLE 10
PREDICTIONS OF BLACK MEN ARMY OFFICERS
RETAINED 1989 - 1997

COHORT	ORIGINAL ACCESSIONS	1989	1990	1991	1992	1993	1994	1995	1996	1997
1988	563	525	511	467	397	336	336	328	287	287
1987	580	526	481	409	346	338	296	296	296	
1986	634	526	447	378	369	323	323	323		
1985	742	523	442	432	378	378	378			
1984	728	434	424	371	371	371				
1983	408	237	208	208	208					
1982	437	223	223	223						
1981	426	217	217							
1980	461	235								
1979	465									

TABLE 11
PREDICTIONS OF WHITE WOMEN ARMY OFFICERS
RETAINED 1989 - 1997

COHORT	ORIGINAL ACCESSIONS	1989	1990	1991	1992	1993	1994	1995	1996	1997
1988	947	868	833	673	554	486	337	337	337	337
1987	1034	910	735	605	530	368	368	368	368	
1986	1078	766	631	553	384	384	384	384		
1985	1196	700	614	426	425	426	426			
1984	1187	609	423	423	423	423				
1983	702	250	250	250	250					
1982	818	291	291	291						
1981	1053	375	375							
1980	987	351								
1979	961									

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