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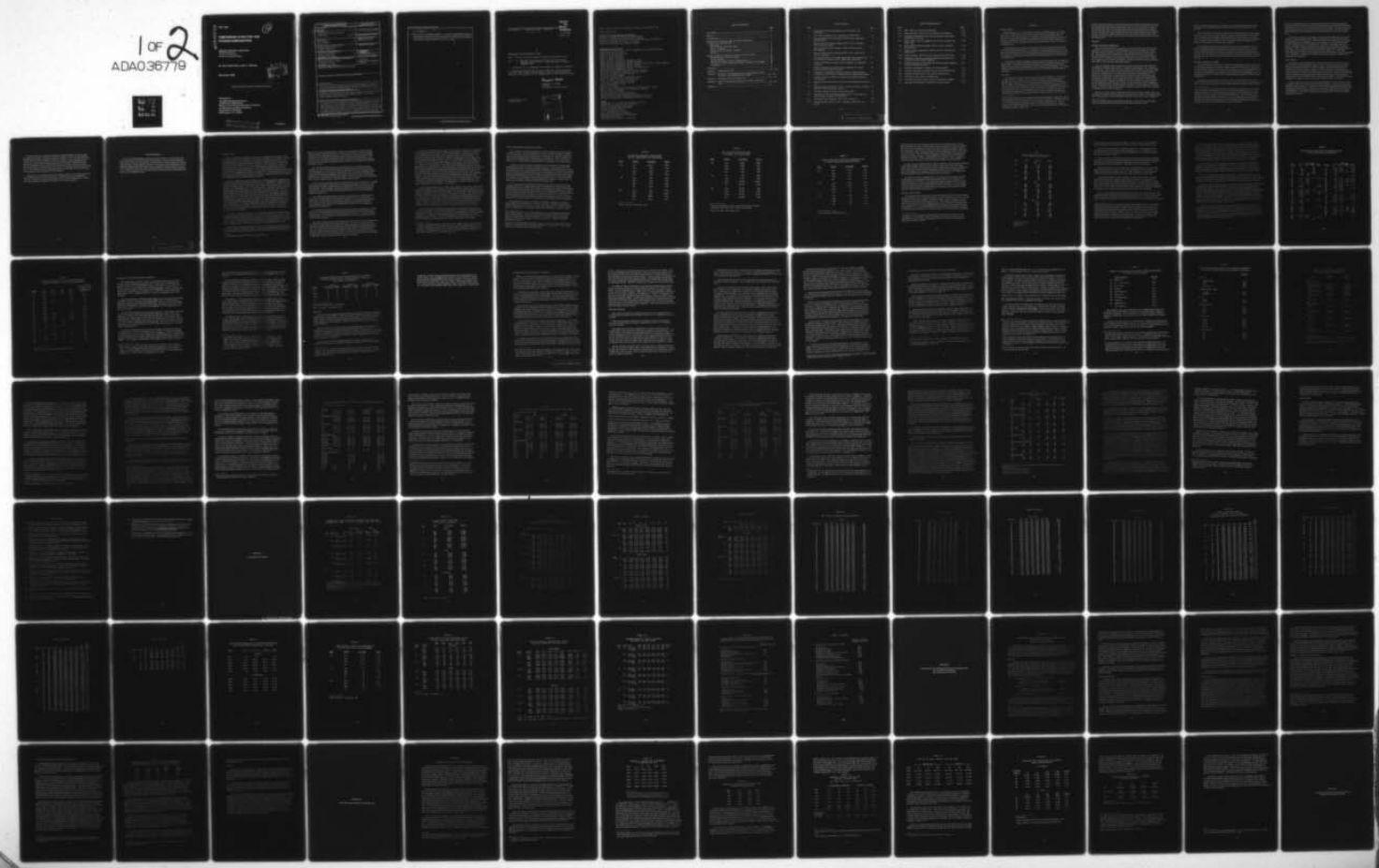

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COMPARISONS OF MILITARY AND VETERAN COMPENSATION

CENTER FOR NAVAL ANALYSES
1401 Wilson Boulevard
Arlington, Virginia 22209
Institute of Naval Studies

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This paper provides an empirical comparison of veteran earnings and military compensation. The 1969-1974 Regular Military Compensation (RMC) received by a cohort of enlisted men who entered service between 1963 and 1967 was estimated. These RMC figures were compared to the 1969-1974 covered Social Security earnings of a cohort of veterans who left service in FY 1969; nearly all of these veterans had also entered service between 1963 and 1967. Estimates of military-civilian pay ratios were made for various sub-groups categorized by education, mental ability,

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race, service, and military occupation. A separate but complementary analysis of the civilian sector payoff to military occupational training was also performed. The likelihood of veterans using that training in the civilian sector was examined along with the earnings effect due to use of such training.

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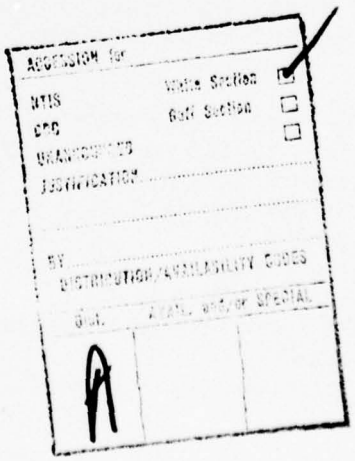

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SUMMARY

INTRODUCTION

Personnel turnover is a source of great concern to military planners. At current pay levels, the services may not be able to retain enough of the men they want in the career force. The ratio of military to civilian pay is an important determinant of retention, but little is known about the comparative earnings of career service men and veterans. In particular, there has been no detailed study of the effects of personal characteristics, such as occupation, education, mental ability, and race, on careerist-veteran pay ratios.

This study was able to make such an analysis, using a cohort of men who entered the service between 1963 and 1967. It compares the earnings of men who stayed in the service and men who left in FY 1969, taking their personal characteristics into account. The military-civilian pay ratios for various groups of these men provide evidence about the adequacy of current military compensation for retaining the kinds of men wanted in the career force.

The payoff to military occupational training in the civilian sector also was analyzed. This is relevant to turnover, because in-service training may enhance civilian earning opportunities. The 1970-1974 earnings of veterans in civilian jobs related to their former military jobs are compared with those of veterans in unrelated jobs. The effects of different types of military occupational training on subsequent civilian earnings are estimated.

THE DATA

To analyze these topics, data sets were developed for individuals -- both enlisted men and veterans. The data set of enlisted men consisted of those approximately 140,000 men on active duty on 31 December 1974 who had entered service between 1963 and 1967. The data for each man included the information in his Enlisted Master Record (EMR) and his reconstructed 1969-74 Regular Military Compensation (RMC).[1] The data set of veterans consisted of a 10 percent sample of enlisted men who separated from active duty, with a reserve obligation, in FY 1969. This sample was further sub-divided into approximately 35,000 veterans who had used GI Bill training benefit entitlements (users) and 35,000 who had not (non-users) as of 1974. The non-users

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[1] RMC consists of basic pay, allowances for quarters and subsistence (rations), and the tax advantage arising from the tax-free nature of those allowances. The RMC estimates for each man are based on information on his paygrade, promotion data, length of service, and dependency status from EMRs for several different years. Adequate information on special and incentive pays was not available; therefore the comparisons cited here are based on RMC only.

served as the control group for the comparisons described below, because their earnings histories (obtained from Social Security records) do not contain the periods of zero or low earnings associated with school attendance which occur for many users. Many of the users also had little or no earnings between military discharge and the commencement of training; indeed, unemployment may have provided the impetus to enter training. Overall, non-users had higher incomes than users for every year from 1969 to 1974, although one group of users, those in on-the-job training, had incomes above the average for all non-users.

FINDINGS

Military-Veteran Pay Comparisons

When the earnings of various sub-groups of military personnel and veterans were compared, the military pay for most sub-groups was found to be higher than civilian earnings of similar veterans. Moreover, RMC, which was used to measure military pay, understates military compensation by excluding Proficiency Pay and Variable Re-enlistment Bonuses, while the civilian earnings used in the comparisons were only for non-users of the GI Bill, whose earnings were higher than those of users. These facts suggest that the monetary advantage of a military career may be even greater than these RMC-civilian earnings comparisons suggest.

Generally speaking, those factors which are usually found to produce significant differences in earnings among civilians -- education, mental ability, race, experience, and occupation -- were found to have much smaller effects on RMC for those who remain in service. Specifically, with one exception, differences in RMC across education or AFQT score categories are very small, usually less than 2 percentage points.[1] (If special and incentive pays are correlated with AFQT scores and education, greater differences in total pay than in RMC would be observed.) Second, the negative effect on earnings of being black, nearly always large in the civilian sector, is non-existent for the enlisted men. (In fact, among Navy men, blacks earn more than non-blacks in the same education-AFQT category.) Third, returns to additional years of experience are only about one-third to one-half those for civilians at a similar stage in the careers. Fourth, variations in RMC across military occupations are much smaller than variations in earnings across civilian occupations.

Because of the much smaller dispersion in RMC than in civilian earnings, abler men earn more as civilians, while the less able earn more in the military. For example, RMC in 1974 was lower than civilian earnings for men with one or more years of college and

[1] The one exception exists for non-blacks in the Navy; in 1974, Navy men with higher AFQT scores earned about 10 percent more than those with lower scores.

higher for high school drop-outs. Similarly, men in such skilled occupations as data processing or accounting and finance could earn much more as civilians than in the military.

Between 1970 and 1974, increases in RMC for the enlisted men were much steadier from year to year than for civilian earnings, which were more sensitive to the business cycle. Because of this, although a relative advantage of military pay over civilian is observed in all years, it is greater in recession years than in years with low unemployment. In addition, between 1970 and 1974, the growth in RMC was greater than the growth in the earnings of the civilian control group.[1]

The protection military service offers from the effects of the business cycle was found to be especially valuable to blacks and less able, less educated men. Because there is less differentiation in RMC than in civilian pay by ability level and by race, less advantaged individuals have a greater incentive to stay in service; because blacks and less able, less educated men are often the first to become unemployed in a business downturn, they are even more likely than others to want to stay in the service during a recession.

Post-Service Effects of Training

The most important determinant of whether a veteran chooses a civilian job related to his military training is the military occupation in which he was trained. While over 15.4 percent of all veterans who did not use the GI Bill are in civilian occupations related to their military occupations, the ratios are much higher for some occupations. For example, more than half of the veterans who were Scientific and Engineering Aides, Data Processing Specialists, or ADP Computer Repairmen were employed in related civilian occupations.

Other factors, such as service, education, and race were found to have a much smaller influence on the likelihood that individuals will go into related civilian occupations. Men in the Air Force and those with some college education are more likely than others

[1] The occurrence of a large extra increase in Basic Pay in November 1971, in connection with the shift to an All-Volunteer Force, does not make the period from 1970 to 1974 atypical and invalid for use in generalizations, because those increases affected only men with less than 2 years in service or paygrade below E5. Only 5 percent of these men had not reached paygrade E5 by 1974. Even those men whose pay was affected at the time of the 1971 increase received the same pay increase over the entire period that they would have if the increase had not occurred (they experienced a smaller increase subsequent to November 1971 than they otherwise would have).

to go into related civilian jobs. It seems possible that more of these men received training in an area in which they already had some training and interest before entering military service. If, in the current All-Volunteer Force milieu, more men receive the type of training which they desire than was the case in the 1960s, the extent of future training usage could be much higher for the current population of first-term enlisted men.

Post-service earnings were analyzed to determine whether individuals who go into civilian occupations related to their military occupation earn more than those who go into unrelated civilian occupations. For all non-users of the GI Bill, being in a related civilian occupation raised 1970 earnings on the average by 8.4 percent (about $503) and 1974 earnings by 4.3 percent (about $374). However, the earnings effect due to being in a related civilian occupation varied considerably among military occupation categories. Those occupation categories in which the largest positive earnings effects were found were, generally speaking, the most highly skilled (e.g., Electronics Equipment Repair). Among veterans trained in less skilled military occupation categories (e.g., Supply/Service Handler) the earnings effects due to being in a related civilian occupation were negligible.

CONCLUSIONS

On average, between 1970 and 1974, military men with 3 to 11 years in service were not paid less than comparable veterans. However, because of the much smaller dispersion in military RMC than in civilian earnings, less able military men were earning more than they could as civilians, while the more able men earned less (at least in terms of RMC) than they could have earned as civilians. This pattern provided a larger incentive to remain in the military for less able men, relative to more able men. Unless substantial levels of special and incentive pays are paid to the most capable young men, they are not likely to choose a career in the military. The relative earnings advantage of a military career is also greater for blacks than for non-blacks.

The fact that many veterans use their military training in civilian jobs and receive a significant return on it may be a good recruiting incentive. However, this also highlights the costs of turnover: it is men in the most skilled occupations who gain the most by leaving the Armed Forces. Moreover, it is not clear whether giving men the type of training they want will increase turnover, because of the applicability of this training to civilian jobs, or reduce it, because men are doing the kind of work in the military which interests them.

When the adequacy of military compensation is being assessed, not only its level (and dispersion) but also its stability should be considered. One of the most striking characteristics of RMC, compared to veterans' earnings, is that it increased each year by from 10 to 14 percent, while the veterans were subject to high unemployment and diminished growth in annual earnings during the 1974 recession. Between 1970 and 1973 the percentage increases in veterans' earnings were about the same as those in RMC for the military cohort studied. In contrast, 1974 earnings were only 0 to 3 percent above 1973 earnings for various sub-groups of non-black veterans and were lower than 1973 earnings for most sub-groups of black veterans.

During the 1970-74 period studied for this report, military men in their second and third enlistments fared rather well in terms of monetary income, as compared to veterans. However, in a period without high levels of civilian unemployment, military pay might have lagged behind pay of veterans or of civilians in general.

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We wish to acknowledge the cooperation of several agencies, without which this pay comparability study could not have been performed. Data used in developing the data set for veterans were provided by the Social Security Administration, the Veterans Administration, and the Manpower Resources Data Analysis Center (MARDAC) of DoD. Data tapes containing the information used to reconstruct military earnings were provided by MARDAC, which also made computer facilities for the data analysis available to us. Helpful comments were also received from several members of the QRMC staff and from our colleagues at CNA.

INTRODUCTION

The level of military compensation relative to compensation in the civilian sector is of obvious significance to millions of active duty personnel, retired military personnel, and their dependents. The structure of the military compensation system has an important effect on the quality and quantity of manpower resources that the military will be able to attract and retain. The resource allocation which results from a given compensation structure affects both the cost of maintaining our national defense and the level of taxes paid by the general public. Because decisions about the trade-offs between the level of military preparedness and tax burdens are both critical and controversial, the issue of the comparability of military compensation is of continuing interest, and there has been a great need for refined measures of relative compensation between the military and civilian sectors and among the different services.

This study contributed to our knowledge of these important issues by analyzing longitudinal data on earnings of enlisted men and veterans. A longitudinal earnings file on a 10 percent sample of veterans who separated from active duty during FY 1969[1] had been created for another project. Nearly all of these veterans had entered military service in calendar years 1963 through 1967. For the present study, a data file was created which contained information about all men on active duty as of 31 December 1974 who also entered military service in calendar years 1963 through 1967. Of course, most of the Army and Marine Corps men with 1963 Basic Active Service Dates (BASDs) probably reenlisted prior to FY 1969 while most of the Air Force men with 1966 and 1967 BASDs reenlisted after FY 1969; however, it was believed that on average this group of men would provide an appropriate comparison group. The effect of using the 1963-67 BASD year, rather than the FY 1969 reenlistment date (data on the first reenlistment dates were not available), as a selection criterion is discussed in appendix C; a sensitivity analysis has shown that the possible slight "mismatching" of veterans' and enlisted men's End of Active Obligated Service (EAOS) dates does not affect civilian-military pay comparisons significantly.

The sample of veterans consisted of nearly 35,000 men who used GI Bill training benefits and nearly 35,000 who did not. The Manpower Resources Data Analysis Center (MARDAC) provided information about these men from End of Active Service and Post-Service Files; the information included education, Armed Forces Qualifying Test (AFQT) score, and race. The Veterans Administration provided information on use of the GI Bill. Earnings figures for these men were obtained from Social Security records.

Most of the comparisons in this study were made with the group of veterans who did not use the GI Bill. The earnings patterns of men who had taken training under the Bill were disrupted by the training during these early post-service years. Users of the GI

[1] A more detailed description is contained in reference 1.

Bill for on-the-job training had higher earnings on average than non-users; but those attending college under the Bill and those in vocational, technical, and other training averaged lower earnings than non-users. Many of the men in these types of training had experienced substantial unemployment before entering training programs. The relative income positions of the groups of users and non-users probably will continue, except that college graduates should eventually do better on the average than non-users. (See reference 2.)

After eliminating observations for non-users because of missing data on race, education, or AFQT score (the last was not available for any veterans of the Marine Corps) and because of a year or more between 1969 and 1974 with no reported earnings, over 26,000 observations remained. Observations with a year of zero earnings were eliminated on the assumption that the man was in a type of employment not covered by Social Security or that he had a chronic disability or was in some other way unemployable. Men were not excluded because of shorter spells of unemployment.

The data file for the enlisted men was created as part of the current study by merging information from enlisted master files for four points in time (see appendix B). From this the Regular Military Compensation from 1969 through 1974 for each enlisted man was estimated. Thus estimates of the annual earnings for each individual in the two groups are available from 1969, the approximate date of his first term reenlistment decision, through 1974.

The comparisons reported below do not focus on the question of whether persons with similar characteristics have earned more as civilians or as members of the military; for everyone in the control group of civilians is a veteran of military service. The analysis is more useful for answering the question, "Would people with these characteristics have earned more if they had left the military after one enlistment rather than remaining in it?"

We measured the differences in both level and dispersion of compensation. Earlier studies of civilian earnings functions have already determined which personal characteristics have a major effect on the level of individuals' earnings. The most important characteristics are (1) education, (2) mental ability, (3) race, (4) experience or seniority, and (5) occupation.

Our central finding was that, even 5 years after leaving active duty, most sub-groups of veterans were earning less than the enlisted men. If lower pay for veterans had been observed only in the period immediately following military discharge, this might have been attributed to temporary disruptions in civilian labor force attachment; but our data show that the differential persists long after the veterans re-entered the labor force and sufficient time had elapsed for them to settle into permanent jobs. Moreover, the differential was found even though there were two factors introducing biases that tend to understate military earnings and overstate civilian earnings.

One source of bias was that the group of veterans used for most of the comparisons was the group who never used their GI Bill training benefits. Generally, among otherwise comparable veterans, users of the GI Bill have lower earnings than non-users. Men with better labor force opportunities appear less likely to use the GI Bill. The second source of bias was the use as a measure of enlisted men's pay of Regular Military Compensation (RMC), not total income. The use of RMC, in lieu of total pay, as a measure of military earnings was dictated by shortcomings in the data available to us. However, even if total pay figures could be reconstructed, they might not be as appropriate as the RMC amounts. Total military pay includes payments received for disamenities associated with military careers (sometimes referred to as the "X Factor"). Thus, although RMC does not include special and incentive payments such as sea duty pay, hostile fire pay, or pay for high risk occupations such as diving, this omission actually makes RMC a preferable measure for comparisons of military and civilian pay. However, omission of Proficiency Pay and Variable Re-enlistment Bonuses (VRB) cannot be justified on these grounds; therefore use of RMC as the measure of military compensation introduces a downward bias in the military/civilian pay ratios for 1969-74. As the Proficiency Pay program is being phased out, however, RMC may more closely measure full military income in the future. [1]

A second important finding was that education, ability (as measured by AFQT scores and mental category), race, experience, and occupation have a much smaller effect on military compensation than on civilian earnings. The most striking difference between the military and civilian sectors was in the effect of race on earnings. In the civilian sector, earnings of blacks are much less than those of non-blacks of similar education and ability. In the military, there are no significant differences in black/non-black earnings except in the Navy, where blacks earn more than non-blacks, especially in the lower mental categories (see CRC 316). The positive effects of higher education attainment, ability, seniority, or skill level of occupation are much weaker in the military, resulting in much less dispersion in military compensation than in civilian earnings.

These and subsidiary findings and qualifications are discussed in more detail in the rest of this report. The evidence supporting the conclusions is presented in tables accompanying the text; many of the text tables are complemented by more detailed tables in appendix A. The data in these appendix tables provide additional evidence of the patterns noted in the report. They are included also so that the reader may make comparisons and examine relationships which may not be described in this report.

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[1] A Selective Re-enlistment Bonus (SRB) program has replaced VRBs. Since 1974 fewer men have been eligible for these bonuses, but the size of the average bonus has increased. Predictions of future trends in SRB are difficult without projections of civilian economic conditions, for SRBs are given more generously when unemployment falls and less generously when unemployment rises.

RACE, EDUCATION, AND MENTAL ABILITY

Race, education, and ability generally are found to explain much of the variation in civilian incomes. In order to determine the effects of these variables on military incomes, men were cross-classified by race, education level, and AFQT score[1] and their average Regular Military Compensation was calculated. Table 1 contains estimates of 1974 Regular Military Compensation for enlisted men in the Army, Navy, and Air Force. (AFQT scores were not available for members of the Marine Corps.)

A study of a sample of veterans of military service (reference 2) had estimated their earnings by race, education, and AFQT score also. Their earnings for 1974 are presented in table 2. Among the sample of veterans, who entered military service at about the same time as these enlisted men, 1974 earnings are affected more strongly by race, education, and AFQT score, except in some groups with small sample sizes.[2] Higher educational attainment and AFQT score are positively correlated with earnings for veterans, but the relation is much weaker for men in military service; the excess of non-black over black earnings within education/AFQT categories, ranges from 4 to 24 percent for veterans, but is non-existent for military men.

Table 3 compares 1974 earnings for those veterans who had not used any GI Bill training benefits with 1974 RMC estimates for the enlisted men. Black veterans earn less than blacks in the military in all categories except for those with high AFQT scores whose education equaled or exceeded 12 years. The earnings advantage in the Armed Forces is as high as 50 percent for low education/low AFQT blacks. Among non-blacks, non-high-school-graduates fare better in the military; those with more than a high school education earn more as civilians; and high school graduate civilians earn about the same as or (for high AFQT scores) slightly more than their military counterparts.

The monetary advantage of remaining in the military is probably even greater than it appears in this comparison. The ratio of military to civilian compensation is probably understated for two reasons. First, RMC understates total military compensation. As noted earlier, it excludes special and incentive pays. Moreover, RMC

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[1] The AFQT categories -- low, < 31st percentile; med., 31st through 46th percentile; high, > 46th percentile -- were chosen to facilitate comparisons with results from a study of veterans which used those categories. Low AFQT corresponds to mental category IV (and V); med., roughly to "lower III"; and high, roughly to "upper III" and categories II and I.

[2] Cells with fewer than 60 observations were black, education < 12, high AFQT; black, education > 12, medium AFQT; and black, education > 12, high AFQT. The smallest cell size for military men was 292 observations.

TABLE 1

1974 REGULAR MILITARY COMPENSATION
BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	Non-blacks	Blacks
< 12	Low	$9639	$9739
	Med.	9828	9909
	High	9921	9892
	All	9824	9814
12	Low	9417	9736
	Med.	9688	9810
	High	9894	9828
	All	9806	9784
> 12	Low	9755	9970
	Med.	9829	10008
	High	10036	9996
	All	10014	9991

[a] Low, < 31; med., 31-46; high, > 46.

TABLE 2

1974 VETERAN EARNINGS BY RACE, EDUCATION, AND AFQT SCORE[a]

Educ.	AFQT[b]	Non-blacks	Blacks
<12	Low	$8035	$6486
	Med.	8401	7562
	High	8734	6451
	All	8303	6704
12	Low	9399	8242
	Med.	9711	8788
	High	10,404	10,034
	All	10,099	8641
>12	Low	10,379	9499
	Med.	11,517	8408
	High	12,399	11,439
	All	12,262	9680

[a] Veterans separated from active duty in FY 1969 with a reserve obligation, who did not use GI Bill education benefits.

[b] Low, < 31; med., 31-46; high, > 46.

TABLE 3

RATIO OF MILITARY TO VETERAN EARNINGS IN 1974, BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	Non-blacks	Blacks
< 12	Low	1.20	1.50
	Med.	1.17	1.31
	High	1.14	1.53
	All	1.18	1.46
12	Low	1.00	1.18
	Med.	1.00	1.12
	High	.95	.98
	All	.97	1.13
> 12	Low	.94	1.05
	Med.	.85	1.19
	High	.81	.87
	All	.82	1.03

[a] Low, <31; med., 31-46; high, > 46.

does not include the value of purchase discounts and of the greater chance to avoid paying state and local taxes. RMC probably undervalues quarters provided to enlisted men; for it uses the cash Basic Allowance for Quarters (BAQ) that is paid if quarters are not provided. While the BAQ exceeds the value of quarters provided to single men, it is less than the value of housing provided to men with dependents; and most of these men were married. The calculated tax advantage included in RMC is understated in multiple-job military families. Fringe benefits are omitted from both civilian and military pay estimates. This omission biases RMC more than civilian earnings, as military medical, retirement, and similar fringe benefits are more generous.[1]

A second source of downward bias in table 3's ratios may arise from the comparison of RMC with earnings of non-users of the GI Bill. Both because RMC understates total military pay and because military men are compared with a group of veterans who were earning more than all veterans during these first years after separation from active duty, total pay may be higher in the Armed Forces than for the veterans even among sub-groups where RMC is lower than veterans' earnings.

The final two columns of appendix table A-1 contain the 1974 earnings estimates for veterans who had obtained post-service training, financed by the GI Bill, and compare them with 1974 RMC. In all categories military earnings exceeded civilian, even though the former did not include special pay and allowances. Of course, these civilians, although no longer training under the GI Bill, may still have been investing in their earnings capacity; thus their earnings in the future may exceed those of the men who remained in the Armed Forces.

SERVICE, OCCUPATION

The veterans and the military men in each race/education/AFQT cell were further sub-classified by service to facilitate military-civilian comparisons by service, holding constant the other three variables. The ratios of RMC to veteran earnings for men in each of the 54 categories are listed in table 4. (The average earnings for military men in each category are listed in appendix table A-2; for veterans, in appendix table A-3.) Because this level of disaggregation (by four variables) yields many cells with few observations -- 25 cells have fewer than 35 observations, for veterans -- analysis of these data would not produce very reliable results. It may be noted that the patterns

[1] The Bureau of Labor Statistics estimates that fringe benefits for federal civilian employees, as a percentage of income, exceeded those for other civilians by more than 10 percent, and military fringe benefits are almost certainly more generous than those for federal civilians.

TABLE 4

RATIO OF MILITARY TO VETERAN EARNINGS IN 1974, BY RACE, EDUCATION, AFQT SCORE, AND SERVICE

Educ.	AFQT[a]	Non-Blacks	Blacks
		Army	
<12	Low	1.20	1.51
	Med.	1.16	1.33
	High	1.12	1.73
	All	1.19	1.50
12	Low	1.03	1.19
	Med.	1.02	1.16
	High	.96	1.04
	All	.99	1.17
>12	Low	.91	1.06
	Med.	.82	1.18
	High	.79	.91
	All	.79	1.04
		Navy	
<12	Low	1.13	1.12
	Med.	1.11	.71*
	High	1.20	1.17**
	All	1.15	.97
12	Low	.99	1.23
	Med.	.98	1.23
	High	.98	1.00
	All	.98	1.18
>12	Low	1.02	1.01**
	Med.	.96	***
	High	.81	.90*
	All	.82	.94
		Air Force	
<12	Low	1.04*	1.81**
	Med.	1.22	1.48*
	High	1.01	.88**
	All	1.09	1.37
12	Low	.94	1.14
	Med.	1.00	1.07
	High	.91	.90
	All	.93	1.04
>12	Low	.37**	.68**
	Med.	.94*	1.46**
	High	.76	.64**
	All	.75	.79*

[a]Low, <31; med., 31-46; high, >46.

* Fewer than 10 veterans.

** Fewer than 5 veterans.

***No veterans.

of ratios in table 3 and for the Army in table 4 are quite similar. This reflects the fact that 66 percent of the veterans of all four services are veterans of the Army.

To circumvent the problem of inadequate sample sizes, the observations were re-classified, this time only by service, occupation, and -- for veterans -- race. The race variable was not used for enlisted men because it had already been seen to have little or no effect on RMC.

Average RMC was calculated for each service for each DoD two-digit occupation (table A-4). Classification at the three-digit level would have produced more earnings profiles than could be reasonably assimilated and yielded profiles based on too few observations for statistical reliability. (See table A-11 for occupations.)

Earnings profiles were also calculated for veterans who had not used the GI Bill. They were categorized by race, service, and occupation while in the military. The results are presented in appendix table A-5. The comparisons in this section are based on these data for non-users and on the RMC estimates for enlisted men.

In examining earnings for the two groups, the reader should bear in mind that the military men may be a slightly "older" group in terms of work experience; at least, on the average they entered military service earlier.[1] (See table A-6.) However, since more of them were enlistees than inductees, compared with the veterans, they may have been younger when they began military duty and not have more experience. In any case, this does not seriously affect comparisons between occupations of military/civilian pay ratios, because any bias will occur similarly in all occupations.

As usual, special Reenlistment Bonuses and Proficiency Pay are not included. For comparing current (1974) pay and projecting future ratios, this exclusion is less critical than for earlier years; for Proficiency Pay is being phased out. The comparisons in table A-5 would be appropriate for projections if both Pro Pay and bonuses were eliminated.

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[1] Army enlisted men had a median enlistment date approximately 5/8 of a year earlier than Army veterans; Navy enlisted men entered service approximately 3/8 of a year earlier than Navy veterans; Marine Corps enlisted men and veterans had about the same median active duty date; enlisted men in the Air Force began active duty about 1/2 year later than Air Force veterans. Thus, Air Force men may have a little less experience than the veterans they are compared with. A sensitivity analysis found that the distribution of BASD years did not significantly alter military/civilian pay ratios within racial-education-AFQT categories (see appendix C).

The first five columns of figures in table A-5 give the annual earnings, 1970 to 1974, for FY 1969 separatees from the enlisted ranks who did not use GI Bill training benefits. Data are presented only for sub-groups with more than 30 observations. In the civilian sector, unlike the military, black pay and non-black pay are very different; therefore the civilian figures were computed separately by race. The other classificatory variables are the service and occupation of the veteran when he was in service. The final two columns in table A-5 repeat the 1974 RMC values from table A-4 and then give the percentage that 1974 civilian pay was of 1974 RMC. A value of less than 1 means that RMC exceeds civilian pay for men who were in that occupation.

There are too few service-occupation categories among blacks for much useful analysis. It is clear however that blacks fare much worse in civilian, relative to military, pay than do whites in the same service and occupation. The relative monetary disadvantage to leaving the military appears to be somewhat less for blacks who had been in the Air Force than for those who had been in the Army or Marine Corps.

The 1974 pay ratios for non-blacks in table A-5 are summarized in table 5, and some of the occupations with the most extreme ratios are listed in table 6. The final column in table 6 gives the percentage of veterans (non-users of GI Bill training benefits) trained in that military occupation who were working in a related civilian occupation.

Relative to those who left the service, men in the Marine Corps appear to be highest paid (military occupation held constant), followed by men in the Army and the Navy, and then, lowest paid, Air Force men. Army Scientific and Engineering Aides and Data Processors, Navy Data Processors and men in Accounting, Finance, and Disbursing, and Air Force Data Processors appear to have the most to gain by leaving the Armed Forces. They are closely followed by Army men in Military Intelligence, Technical Medical Services, and Accounting. . . and Air Force electronics equipment repairmen (10, 16, 19), Radar and Air Traffic Controllers, men in Accounting . . ., and Utilities Craftsmen. These are among the more technical occupations, and most of them have closely related civilian occupations which pay well.

Army Musicians fared much better economically than those who left the Army. Among Navy occupations, Gunners and Barbers and Laundrymen gained the least by leaving the service. The best paid Marine Corps occupations, relative to the earnings of those who left the Corps, were Infantry, Personnel, Wiremen, and Food Services. The best paid Air Force specialty, relative to civilian opportunities, was Forward Area Equipment Support. These occupations either have no close civilian equivalent or are in the low-paying personal services industries.

TABLE 5

RATIO OF NON-BLACK VETERAN EARNINGS TO RMC IN 1974, BY SERVICE AND OCCUPATION

Occup.	Service A	N	MC	AF	Occup.	Service A	N	MC	AF
01	.97		.89		53	1.28	1.40		1.48
02	.92		.93		54	1.21	1.34		1.24
03	.90		.96		55	.97	1.15	1.05	1.10
04	.92	.89	1.03		56	1.08			
06	.98	.94			58	.96			1.09
10	1.12	1.04	1.14	1.22	60	.99	1.02	.99	1.10
11		.99			61	.98	.97	1.07	1.02
12	1.01	1.15			62	.98	1.07	.88	1.05
13		.99			63		1.05		
16	1.07			1.23	64	.98	1.08	.97	1.07
19	1.08			1.23	65	.91	1.00		
					66	.96	1.09		1.09
20	1.06	1.01	.91		68		1.20		
22	1.06	1.00		1.23	69	.99			
23	1.15	1.17		1.06					
24	1.23				70	1.06	1.05		1.08
25	1.02				71	.90	1.14		1.03
					72	1.03	.95	.97	1.24
30	.98	.92		1.02	73	1.00	1.04		
31	1.21				74	1.09			
33	.99				78		.95		1.03
40	.93			.98	80	.93	.99	.89	.98
41	1.17				81	1.00		.91	1.02
44	1.78				82	.91	1.02	1.00	1.02
45	.75				83	1.11			1.03
					84	1.00	.82		
50	1.11	1.15			86				.88
51	1.11	1.03		1.10					
52			.87						

TABLE 6

RATIO OF NON-BLACK VETERAN EARNINGS TO RMC IN 1974, BY SERVICE FOR SELECTED OCCUPATIONS

Occup.	A	N	MC	AF	% of veterans[a] in related civilian occupations
10	1.12	1.04	1.14	1.22	29.8
16	1.07	–	–	1.23	23.3
19	1.08	–	–	1.23	10.5
22	1.06	1.00	–	1.23	9.5
24	1.23	–	–	–	9.6
31	1.21	–	–	–	46.8
44	1.78	–	–	–	76.9
53	1.28	1.40	–	1.48	62.7
54	1.21	1.34	–	1.24	30.2
72	1.03	.95	.97	1.24	37.2
01	.97	–	.89	–	1.1
04	.92	.89	1.03	–	7.0
45	.75	–	–	–	28.9
52	–	–	.87	–	11.7
62	.98	1.07	.88	1.05	18.2
80	.93	.99	.89	.98	12.7
84	1.00	.82	–	–	0.0
86	–	–	–	.88	6.6

[a] All services, non-users of GI Bill training benefits.

BUSINESS CYCLES AND INFLATION, SENIORITY

Even though table 3's ratios of military to veteran pay almost certainly understate the monetary advantage of a military career in terms of 1974 earnings, it is possible that 1974 is not a representative year. It was chosen for the comparison because it is the most recent year for which data are available. It was a year of recession conditions, when civilian workers were disadvantaged relative to military men, who are better insulated from the business cycle. Therefore similar comparisons were made for 1973. The analysis for 1973, in table A-7, parallels that for 1974, in table 3.

The ratios of RMC to civilian earnings are lower in 1973, but many of the changes are small. The 1973 ratios are within 5 percentage points of the 1974 ratios for categories containing 59 percent of the enlisted men. However, for black high school drop-outs, the advantage of remaining in the military was significantly more in 1974 than in 1973. These are, of course, the men expected to be most susceptible to job loss in a recession.

The 1973 and 1974 patterns are not grossly dissimilar. In 1973 blacks still earned more in the Armed Forces unless they had high AFQTs and at least a high school education. Non-black high school drop-outs still fare better in the military, while those with some college appear to earn more as civilians; but it is not clear whether non-black high school graduates were better off in service in 1973, for we do not have a measure of RMC's understatement of total earnings. If the ratio of RMC to civilian earnings is only a little less than 1.0, the ratio of total military pay to civilian earnings probably exceeds 1.0.

As the longitudinal data in table A-8 show, 1973 was an unusually good year for civilian earnings, while 1974 was atypically bad. However, the monetary advantage to most groups of remaining in the military did not disappear in 1973. This points up one of the advantages of a military career which we have not been able to value directly--namely, that down-turns in business conditions do not result in significant numbers of layoffs.[1] Thus it appears that although a rather sizable minority of men may earn

[1] Part of the reduction of 1974 earnings below the trend of earlier years resulted from smaller increases in wage rates and part was caused by rising unemployment rates. We cannot separate the effects of these two phenomena in our sample of veterans, nor can we determine the extent to which economic conditions affected the probability of a military man not being allowed to re-enlist.

more as civilians when unemployment rates are low, in less prosperous times nearly all (except the most capable non-blacks) will earn more on average in the Armed Forces.

The more detailed earnings data presented in tables A-9 and A-10 were used to compare longitudinal earnings profiles of veterans and enlisted men. As expected, the RMC profiles climb at a steadier rate than the civilian earnings profiles; as noted above, the latter are somewhat more subject to fluctuations in the business cycle, growing at a greatly diminished rate, for example, between 1973 and 1974. Also, comparing high school graduates by race and AFQT, where all sample sizes are large, we see that in each of the race/AFQT sub-groups military compensation increased faster than civilian between 1970 and 1974. Some of this may have been due to the adjustment in the military pay scale accompanying the shift to an all-volunteer force.

The differences in RMC described in the preceding paragraph reflect in part shifts in pay scales in response primarily to inflation and in part the increasing experience level of seniority of men in the sample. In order to observe the effect of seniority alone on RMC, the data in tables 1 and A-9 were further broken down by service and by the year of entry to active duty, or Basic Active Service Date (BASD). CRC 316 reports the earnings profiles for high school graduates in the Army, the Navy, and the Air Force. The 1974 RMCs for the earliest and latest cohorts were compared, and the percentage differences are presented in table 7.

The effect of seniority on RMC varies somewhat across the three services. In the Air Force the oldest cohort (BASD=1963) earned 8 or 9 percent more than the youngest (BASD=1967); in the Army the differences were 12 or 13 percent; in the Navy the oldest non-blacks received 11 to 17 percent more than the youngest. The seniority differentials for blacks were lower (9 to 11 percent). These returns to an increase in seniority from 7 years to 11 years are small. By contrast, the regression equation estimated by Mincer for 1959 annual earnings of non-farm men (reference 3) yields a 24 percent return to an increase in seniority from 7 to 11 years.[1]

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[1] Using equation P1 on page 92, $\ln Y = 6.20 + .107$ educ. $+ .081$ exper. $- .0012$ $(\text{exper.})^2$, the percentage change in income (Y) from a change in experience (exper.) from 7 to 11 is approximately 24 percent: $.081 \times 4 - .0024 \times 4 \times 9 = .2376$. In as yet unpublished work, Chiswick, using 1969 data and including a slightly different set of variables, found coefficients which produce an estimate of 21 percent. (Personal communication with Barry Chiswick, Council of Economic Advisors, 21 July 1976.)

TABLE 7

PERCENTAGE DIFFERENCE IN 1974 RMC BETWEEN HIGH SCHOOL GRADUATES WITH 7 AND 11 YEARS IN SERVICE,[a] BY RACE, AFQT SCORE, AND SERVICE

AFQT[b]	Army		Navy		Air Force	
	Non-black	Black	Non-black	Black	Non-black	Black
Low	13	13	14	11	9	9
Med.	13	12	17	11	8	8
High	12	12	11	9	9	9
All	12	13	13	10	9	9

[a] 1967 and 1963 BASD years, respectively.

[b] Low, < 31; med., 31-46; high, > 46.

SUMMARY

In most of the demographic categories studied for this report, military compensation exceeds civilian cohort earnings. There also is less variation in RMC than in civilian cohort earnings, whether these comparisons are made by race, educational attainment, mental ability, or military occupation. In fact, RMC differences by education are almost nonexistent, and differences in RMC by race and by AFQT score are observed only in the Navy.[1]

Between 1970 and 1974, RMC increased by about 50 percent for men who entered the military in 1963 and by from 60 to 80 percent for 1967 entrants. Increases in RMC by occupation from 1970 to 1974 averaged around 55 or 60 percent. The earnings increases attributable to seniority were small in the military compared with the civilian sector -- as low as 2 percent per year in the Air Force, compared with an estimated 5.5 percent for all civilian men.

Even though the more demanding and technical military occupations receive somewhat more RMC than less skilled occupations, compared with veterans' earnings

[1] Blacks in the Navy are paid more than non-blacks of the same education and AFQT category. For both blacks and non-blacks in the Navy, there is a positive correlation between RMC and AFQT score, and the effect of AFQT is stronger among the non-blacks. (See CRC 316.)

military pay is low for technical skills and high for non-technical and service-industry skills. Those occupations with the lowest ratio of military to civilian pay are also often the specialties where military training is most often utilized in post-service civilian jobs. Thus, the military is providing a smaller incentive, in RMC relative to civilian earnings, to stay in the Armed Forces to those very men whom it has trained in skills most readily salable in the civilian sector.

INTRODUCTION AND SUMMARY OF FINDINGS

Military occupational training clearly adds to the stock of military sector "human capital." That is, military occupational training raises a trainee's productivity in his military occupation. Does military occupational training add, however, to the stock of civilian sector human capital? To what extent are skills acquired in the military sector being utilized in the civilian sector and to what extent does military occupational training enhance an individual's post-service earnings capacity? These are the questions addressed in this chapter.[1]

The questions are important. Since an enormous amount of training occurs in the U.S. military establishment, the contribution of the military sector to the civilian sector human capital stock may be considerable. Because of the large turnover of military-trained individuals, the military sector may indeed influence the stock of civilian sector human capital to a much greater degree than any single civilian sector training institution can.

These questions are not only important from a general social viewpoint, but are important from the standpoint of military manpower policy. The turnover of military manpower may depend crucially upon the extent to which skills acquired via military occupational training are saleable in the civilian sector. Military recruiting policy, the military wage structure, the timing of training, and reenlistment bonus policy are all influenced directly by the turnover of personnel, and therefore indirectly by the transferability of skills acquired in military service to the civilian sector.

The goal of this section is to answer the following two questions. First, what factors determine the likelihood, or probability, that a veteran will choose a civilian occupation which is related to his military occupation? Second, does military occupational training enhance a veteran's civilian earnings capacity? In the empirical analysis we explore whether different types of military occupational training have differential effects on veterans' civilian earnings capacities. Some types of training may be more beneficial than other types of training, and we attempt to identify which military occupation categories have substantial impacts on civilian earnings capacity.

To answer these questions, we examined the post-service occupational choices and the 1970-74 earnings of our cohort of veterans that terminated service in FY 1969. This cohort has been described in the previous chapter. The analysis was restricted to veterans who never used the GI Bill, but who went directly into the labor force after

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[1] The historical trend in the military occupation mix suggests that much more military training has civilian sector applicability today than in the past. Whether military-acquired skills which have civilian sector applicability are being <u>used</u> in the civilian sector is one question addressed here.

service. Analysis was restricted to non-users of the GI Bill for two reasons. First, the civilian occupation was not available for GI Bill users who were using the GI Bill 10 months after service, the time at which the Department of Defense Post-Service Information Survey was administered to veterans. Second, because training acquired under the GI Bill will also affect earnings capacity, disentangling the earnings effect of military occupational training and the earnings effect of the GI Bill training would be exceedingly difficult. Therefore, analysis was limited to non-users of the GI Bill.

Our analysis reveals considerable variation between different groups in the proportion of veterans employed in civilian occupations related to their military occupation. The most important factor related to the proportion of veterans in related civilian jobs is military occupation. Other factors, such as education level and branch of service, have smaller influences on this proportion. Further, in the analysis of post-service earnings, veterans trained in four one-digit military occupation groups (Electronics Equipment Repair, Communications/Intelligence, Administrative/Clerical, and Craftsmen) who went into related civilian occupations were found to earn at least 8 percent more, in both 1970 and 1974, than veterans trained in the same occupation groups who went into unrelated civilian occupations. These earnings effects are larger than those found in previous studies.

PREVIOUS FINDINGS

Several previous studies have examined the post-service occupational choices of veterans and the extent to which training received in service enhances post-service earnings.

Winkler and Thompson (reference 4), Richardson (reference 5), Weinstein (reference 6), and Giesecke (reference 7) examined the post-service occupational choices of veterans.

The notable feature of these occupational choice studies is that they do not generally find a very high percent of veterans in related civilian occupations. Collectively, however, these studies have found that the percent of veterans in related civilian occupations varies by such factors as (1) military occupation (2) reason for service, (3) branch of service, and (4) race. First, analyzing the DoD Post-Service File for Air Force veterans, Winkler and Thompson (reference 4, table 4), found a higher percent of veterans trained in high-skilled technical occupations in related civilian jobs than veterans trained in lower skilled jobs such as protective services.

Second, findings by reason of service have been mixed. Jurkowitz (reference 8, p. E69), as part of the Weinstein study, found a higher percent of draftees in related civilian jobs. However, more recently, Giesecke (reference 7, table 7) has examined the Post-Service File data for Army veterans and found a higher percentage of enlistees in related civilian jobs.

The findings of Richardson, coupled with those of Weinstein, suggest considerable inter-service variation in the percent of veterans in related civilian occupations. Air Force veterans have the highest percent, Navy veterans the second highest percent, and Army veterans the lowest percent.

Giesecke found that other factors had slight influences on the percent of Army veterans in related occupations. These included age, race, education level and AFQT score.

There is a methodological shortcoming in these studies. Most of these studies examine post-service occupational choice behavior looking at only one factor at a time. In examining the influence of one factor at a time on the percent of veterans in related civilian occupations, other factors are not controlled for which should be controlled for. For example, much of the inter-service difference in the percent of related civilian occupations may be accounted for by inter-service differences in the military occupational distribution of the veterans. Not controlling for the military occupation of the veterans, as well as other factors, may lead one to overstate the inter-service differences. The same comments may be made about findings with respect to race, reason for service, and other factors. Using appropriate statistical techniques, the occupational choice analysis in the next section corrects for biases implicit in these previous studies.

Previous studies of the earnings effects of military occupational training include those of Cutright (reference 9), Jurkowitz, Massell, and Nelson (reference 10), Giesecke (reference 7), and Norrblum (reference 11). Evidence on the earnings effects of such training is rather mixed. The earliest study, that of Cutright, found that a cohort of Korean War veterans earned less than a cohort of men who took the Armed Forces Qualification Test (AFQT) during this era but who did not enter service. Most of the earnings difference was found to be due to the shorter labor force experience of the veteran cohort. This study did not provide a fair test of potential earnings effects due to military occupational training, since veterans who used their training when they returned to the civilian sector were neither compared with other veterans who did not use their training or non-veterans in similar civilian occupations.

Jurkowitz examined the 1965 earnings of 1,941 Army veterans and found that veterans who found jobs in related civilian occupations earned approximately $180 more than similar veterans in unrelated jobs. Jurkowitz failed to test the hypothesis that some types of occupational training add more to earnings capacity than others. He found that military occupation did not explain any of the variation in civilian earnings, but he did not control for whether veterans were in related civilian jobs when examining whether military occupation explains any of the variation in post-service earnings.

Massell and Nelson performed two analyses. In the first analysis, separate earnings regressions were estimated for Army, Navy, and Air Force personnel among a cohort of enlisted veterans terminating service in 1971. Only in the case of Air Force personnel did military occupation explain any of the variation in civilian earnings. However, these regressions again did not control for whether the veteran's civilian occupation was related to his military occupation. In a second set of regressions, the relatedness between military and civilian occupation was controlled for. For a cohort of Army veterans in white collar professional and technical occupations, it was found that those individuals who received electronics training in service earned 8.9 percent more than those who did not. However, an analysis of veterans in blue collar electronics jobs failed to detect an earnings difference due to electronics training.

Giesecke has also examined the earnings ten months after service of a cohort of Army veterans who terminated service in FY 1969. In most cases he found insignificant earnings differences between veterans in related civilian jobs and veterans in unrelated civilian jobs.

Finally, Norrblum examined the earnings of a cohort of Army veterans who left service in 1971 who were employed in three civilian occupations after service; electronics, mechanics, and medical care. Each additional year of formal training in a military occupation which is related to the individual's civilian occupation was found to add 11.82 percent to civilian earnings. However, additional informal training or experience in a related military occupation did not enhance civilian earnings. Norrblum did not address the issue of whether the earnings effects of military training depends upon the type of training received; that is, whether the earnings effects were different for those trained in electronics, mechanics, and medical care.

A basic problem in research on the question of the earnings effects of military occupational training is the data problem. Most of these previous studies have been hampered by two data problems. First, most of these studies have been based on rather small sample sizes, and previous researchers have been able to examine only one or several military occupations at a time. Second, most of these studies have not had good earnings data. The earnings observations in these studies are often drawn very close to the date at which the veteran terminated service and the observations are for only one point in time. These studies could not examine whether earnings effects due to training diminish or increase as the time since termination from service increases. Further, the earnings data are drawn from mail surveys of veterans, and may be suspect.

This study overcomes some of these data problems. Our sample size is very large, and we will be able to estimate earnings effects for all nine DoD occupation groups. Our earnings data are much more reliable and cover five years after termination from service. We will therefore be able to examine the temporal effects of military occupational training, something these earlier studies were unable to do.[1]

[1]Our data does have one flaw. We are unable to examine the relationship between pre-service and post-service occupation. With small sample, Norrblum (reference 11) was able to go to each veteran's service jacket and determine the veteran's pre-service occupations and time spent in each of these occupations. With our large data set, such an undertaking was not possible.

DETERMINANTS OF POST-SERVICE OCCUPATIONAL CHOICE

This section analyzes the post-service occupational choice behavior of the veterans in the data set. The first part of this section estimates the influence of various factors on the probability of being in a related civilian occupation. This is followed by an interpretation of the results.

From the responses to the Post-Service Information File survey, the Department of Defense determined each individual's three-digit civilian occupation code. Using a cross-classification of these civilian occupation codes and two-digit military occupation codes, it was determined whether each individual was in a civilian occupation highly or somewhat related to his military occupation. [1]

Table 8 presents the percent of veterans employed in highly or somewhat related civilian occupations by one-digit DoD occupation category, while table 9 presents this percent by (1) service, (2) draftee-enlistee status, (3) race, (4) education level, (5) AFQT score, and (6) highest pay grade. Overall, the percent of separatees in related civilian occupations, 15.4 percent, is not very high. However, as table 8 indicates, there is considerable variation across the one-digit occupation categories.

These percentages for one-digit occupation categories mask considerably higher percentages in some of the two-digit categories. Some examples are 46.8 percent for Technical Medical Specialists (31), 52.5 percent for ADP Computer Repairmen (15), 62.7 percent for Data Processing Specialists (53), and 76.9 percent for Scientific and Engineering Aides (44). [2]

Table 9 indicates that the percent of veterans employed in related civilian occupations also varies by factors other than military occupation. At this point it is necessary to determine whether the data in tables 8 and 9 provide unbiased estimates of how the probability of being in a related civilian occupation is affected by differences in military occupation category, service, race, etc. While it is possible to use the percentages in tables 8 and 9 to estimate how the probability of being employed in a related civilian occupation is affected by changes in the factors in these tables, these

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[1] A list of related military and civilian occupations is available upon request.

[2] The percent in related civilian occupations for each two-digit occupation group is presented in appendix A, table A-11.

data will yield unbiased estimates only if the various factors are independent of one another. Evidence suggests that this is not the case, however.[1]

Because the various factors in tables 8 and 9 are not independent of one another, the percentages in tables 8 and 9 will give biased estimates of how the probability of being employed in a related civilian occupation is affected by changes in the factors in these tables. To obtain unbiased estimates, two alternative statistical procedures were applied to the data. The first was to regress a binary dependent variable for whether or not each individual was employed in a related civilian occupation on dummy variables for the various factors in tables 8 and 9. Because of certain econometric difficulties inherent in this regression procedure, the logit procedure was also applied.[2] In this procedure, the individuals are grouped into cells according to the categories in tables 8 and 9, the proportion (P) of individuals in related occupations in each cell is computed, and $y = \ln\left(\frac{P}{1-P}\right)$ is regressed on dummy variables for the various explanatory (independent) variables.[3] Table 10 gives the results which were obtained when these alternative procedures were applied to the data.

For a given variable, the difference in the coefficients for any two levels of the variable represents the estimated difference in the probability of being in a related civilian occupation, other factors held constant. Thus, using the binary regression results, Air Force veterans have a .050 higher probability than Army veterans and a .029 higher probability than Navy veterans of being in a related civilian occupation, ceteris parabus.

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[1] There are, for instance, significant differences between military occupation categories in the distribution of separatees by education level and AFQT score. For example, 72.8 percent of separatees in Electronics Equipment Repair had AFQT scores above 60, whereas only 26.6 percent of Infantry-trained separatees had such scores. Generally speaking, more of the separatees in occupations showing a larger percent in related civilian occupations had high AFQT scores and/or education levels. Also, significant differences in the military occupation distribution of separatees were found by race, reason for service, and branch of service.

[2] Kmenta (reference 12, pp. 425-528) provides a good discussion of regression on a binary dependent variable and problems with the procedure. The two inherent difficulties are (1) the regression may predict a probability outside the bounds of 0 and 1 and (2) the error term is heteroskedastic and therefore the parameter estimates may be inefficient.

[3] For a discussion of the theory and an empirical example of the logit procedure, see Theil (reference 13, pp. 632-636).

TABLE 8

PERCENT OF SEPARATEES IN RELATED CIVILIAN OCCUPATIONS, BY 1 DIGIT DOD OCCUPATION

	1 digit occupation	Percent
(0)	Infantry etc.	2.8
(1)	Elec. Equip. Repair	22.1
(2)	Comm/Intell	6.8
(3)	Medical	12.8
(4)	Other Technical	32.6
(5)	Admin/Cler	23.9
(6)	E/M Equip Repair	20.2
(7)	Craftsmen	30.5
(8)	Supply/Service	13.1
	All occupations	15.4

Both regression procedures find that the most important determinant of the probability that an individual will be employed in a related civilian occupation is his military occupation. When compared to the influence of military occupation category, the other factors are seen to have much smaller influences on this probability.[1]

However, once other factors are controlled for, the probability of being employed in a related civilian occupation does vary by branch of service, being highest for Air Force veterans and second highest for Navy veterans. The probability also rises slightly with AFQT score, education level, and highest paygrade.[2]

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[1] The regression results in table 10 confirm the statement made earlier that the data in table 9 give biased estimates of the true effect of changes in the factors in that table. Once military occupation category is controlled for, the other factors are seen to have much smaller influences than the data in table 9 would indicate.

[2] An interesting aside is to compare the logit and binary regression results. The results are fairly consistent on all variables except race and reason for service. Although the logit procedure does indicate statistically significant differences between blacks and whites and draftees and enlistees, while the binary regression indicates no differences, these differences are not very large in the logit regression.

TABLE 9

PERCENT OF SEPARATEES IN RELATED CIVILIAN OCCUPATIONS, BY VARIOUS FACTORS OTHER THAN MILITARY OCCUPATION

	Percent
Service:	
Marine Corps	6.8
Army	14.3
Navy	20.1
Air Force	23.1
Draftee-enlistee status:	
Draftee	13.8
Enlistee	18.9
Race:	
Black	15.1
White	16.0
Education level:	
< 12	11.1
12	15.8
13-15	17.4
16+	29.8
AFQT score:	
< 20	10.5
21-40	13.9
41-60	14.5
61-80	18.2
81-100	20.8
Highest paygrade:	
E3	9.6
E4	15.7
E5	14.8
E6+	17.5

TABLE 10

RESPONSE OF THE PROBABILITY OF BEING IN A RELATED CIVILIAN OCCUPATION TO CHANGES IN VARIOUS FACTORS, ESTIMATES FROM TWO REGRESSION PROCEDURES[a]

Factor	Binary regression[c]	Logit regression
Constant[b]	-.010	.028
1 digit military occupation:		
Infantry (omitted)	-	-
Electronics Equip Repair	.153 (12.70)	.189 (14.67)
Communications/Intelligence	.024 (2.27)	.057 (4.55)
Medical	.078 (5.35)	.142 (8.55)
Other Technical	.291 (15.45)	.268 (14.89)
Administrative/Clerical	.193 (23.86)	.216 (21.99)
Electrical/Mechanical Equip Repair	.173 (21.77)	.201 (20.41)
Craftsmen	.267 (22.68)	.277 (23.30)
Supply/Service Handlers	.114 (13.94)	.161 (15.46)
Race:		
White (omitted)	-	-
Black	-.008 (.86)	.031 (2.73)
Draftee-enlistee status:		
Draftee (omitted)	-	-
Enlistee	-.005 (.85)	.016 (2.30)
Service:		
Army (omitted)	-	-
Navy, Marine Corps	.021 (2.32)	.023 (2.59)
Air Force	.050 (4.30)	.041 (3.49)
AFQT score:		
<33 (omitted)	-	-
33-66	.006 (.93)	.002 (.34)
>66	.025 (3.39)	.019 (2.30)
Education level:		
<12 (omitted)	-	-
12	.012 (1.65)	.003 (.12)
>12	.053 (5.19)	.052 (4.88)
Highest paygrade:		
E4 and below (omitted)	-	-
E5 and above	.030 (5.51)	.024 (4.13)

[a] *t*-values are in parentheses.

[b] The constant is the predicted probability for individuals who fall into the cell omitted from the regression.

[c] *t*-values on variables in the binary regression are only approximate t-values since the error term in this regression is not normally distributed.

There are several possible explanations for the findings. First, there are two reasons why the probability of being employed in a related civilian occupation should vary from one military occupation category to another. One obvious reason is that varying proportions of recruits assigned to different military occupations may have received the training they preferred. Higher proportions of those assigned to certain occupations (e. g., Infantry) might have chosen other military occupations had they been given a choice.[1] Proportionately more individuals assigned to certain occupations may have been assigned to their "desired" occupation. Another reason is that veterans will be more likely to enter related civilian occupations if their expected earnings in the related civilian occupation exceed their expected earnings in an unrelated one.[2] These explanations are complementary -- the desire for a particular type of in-service training is partly dependent upon the return to that type of training in the civilian sector relative to the return in an unrelated occupation.

With the advent of the all-volunteer force, the military is paying more attention to recruits' preferences in determining military occupational assignments. For this reason, the future likelihood that veterans will choose related civilian occupations should be expected to increase in all military occupation categories, and it should become more similar across military occupation categories.

Examining the results based on education, it must be noted that education past the high school level probably reflects a specific type of training. As indicated in a footnote above, one tool of military occupational assignment policy in the past has been the individual's educational background, and individuals with higher education levels were more likely to get in-service training which complemented pre-service education. Therefore, the finding that the probability of being employed in a related civilian occupation rises with pre-service education level may be explained on the grounds that more highly educated individuals got the in-service training they wanted.

The positive correlation between the likelihood of being employed in a related civilian occupation and AFQT score may be rationalized two ways. First, like more highly educated individuals, individuals with high AFQT scores may have been more likely to have their military occupational preferences realized than individuals with low AFQT scores. Second, civilian sector employers may screen out individuals with low AFQT scores and thus these individuals may be prevented from using their training in the civilian sector, even if they want to.

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[1] It has been pointed out to us by Mr. Fred Suffa, OSD (M&RA), that military occupational assignments were not generally made on the basis of recruit preferences in this era, but were made on the basis of test scores and educational background. Further, this held true for both enlistees and draftees.

[2] Evidence supporting this hypothesis is provided in the next section.

Even after controlling for military occupational category, inter-service differences are found. These differences might be expected to the extent that (1) the occupational preferences of recruits of some services are better realized than those in other services, or (2) civilian sector employers consider individuals trained in some services more employable than individuals trained in other services. Although individual preferences were not, in general, catered to in making occupational assignments in the middle 1960's, the fact that the Air Force and Navy were composed, to a greater extent, of true volunteers might imply that occupational preferences were better accommodated in these services.

There is one warning that must be issed about the results. Since the estimates of the probability of using training in the civilian sector are based upon non-users of the GI Bill, inclusion of data on GI Bill users might cause the estimated probabilities to rise or fall. It is not clear what sort of bias exclusion of data on GI Bill users may have introduced into the results. If GI Bill users are, for the most part, receiving training which complements their military occupational training, the probabilities for the different military occupational categories may have understated the probability that a veteran will eventually be employed in a related civilian occupation. At this point, there is no evidence which would indicate whether training acquired under the GI Bill tends to complement or be unrelated to military occupational training. [1]

THE EFFECT OF MILITARY OCCUPATIONAL TRAINING ON CIVILIAN SECTOR EARNINGS

In this section we explore the question of whether the occupational training received in military service enhances post-service earnings capacity. We distinguish between the various types of training and explore whether training received in different military occupations differentially enhances civilian earnings capacity. Does, for example, training as an Electronics Equipment Repairman add to civilian earnings capacity, and, if so, does it add more than other types of training? These are the questions addressed in this section.

To examine the earnings effects of military occupational training, we compare the 1970-74 earnings of the veterans employed in civilian jobs related to their military jobs

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[1] O'Neill and Ross (reference 2) have examined the likelihood of using the GI Bill and found it to vary by military occupational category. They found, for instance, that those trained as Medical Specialists were 8 percent more likely to use the GI Bill than those trained as Infantrymen. To the extent that those trained as Medical Specialists were obtaining further medical training and will eventually find employment in the medical field after completing GI Bill training, we may have understated the probability that those trained as Medical Specialists will find related civilian jobs when analyzing only non-users of the GI Bill. At this point, however, it is not clear whether exclusion of GI Bill users will have caused the probability estimates to be biased upward or downward.

with the 1970-74 earnings of similarly trained veterans employed in unrelated civilian jobs. To the extent that the earnings of veterans in related jobs exceed the earnings of otherwise similar veterans in unrelated civilian jobs, there would exist evidence that military training contributes to civilian earnings capacity. In this procedure, veterans in unrelated civilian jobs are surrogates for individuals who have never had military occupational training.

Three different empirical procedures are employed to make these earnings comparisons. In the first procedure, the observations on all 16,540 veterans in the sample are pooled together in a single regression, and the logarithm of annual earnings is regressed against the following variables: 1) education level, 2) AFQT score, 3) highest paygrade achieved in service, 4) branch of service, 5) reason for service, 6) military occupation category, and 7) military-civilian occupational relatedness.[1]

A separate regression is estimated for each of the years 1970-74. In each regression, the coefficient for occupational relatedness gives the average (fractional) earnings effect due to being employed in a related civilian occupation.

To determine whether the earnings effect due to being in a related civilian job depends upon the military occupation in which the individual was training, these pooled regressions may be re-estimated to include interactions between military occupation category and occupational relatedness. If different types of training differentially enhance civilian earnings, there will be significant differences between military occupations in the earnings effects due to occupational relatedness. That is, the interaction terms will be significantly different between military occupation categories. The 1970-74 results of this first procedure, in which earnings regressions are first estimated without, and then with, interactions, are reported in table 11.

The second procedure is to estimate separate earnings regressions for those in related and those in unrelated civilian jobs. One would estimate separate regressions to determine whether the earnings effects of such variables as education level, AFQT score, or race are different for veterans in related civilian jobs and veterans in unrelated jobs. These separate regressions will include variables for military occupation category. If training enhances earnings, and if the earnings effect of training depends upon the type of training received, the military occupation category variables will be expected to explain a significant portion of the variation in civilian earnings of

[1] Mincer (reference 3) shows that the semi-logarithmic functional form used here is the appropriate functional form in earnings analysis.

TABLE 11

EARNINGS REGRESSIONS WITH THOSE IN RELATED AND UNRELATED OCCUPATIONS POOLED TOGETHER

Dep. var. = natural log of yearly earnings

Independent variable	1970		1974	
	No interactions	Interactions	No interactions	Interactions
Ed	.0576 (16.33)	.0577 (16.28)	.0674 (15.44)	.0671 (15.33)
AFQT	.0012 (5.47)	.0011 (5.31)	.0017 (6.27)	.0016 (6.17)
Highest paygrade achieved in service				
E3	.2659 (6.75)	.2658 (6.75)	.2633 (5.40)	.2642 (5.42)
E4	.3676 (10.24)	.3674 (10.23)	.3695 (8.32)	.3700 (8.33)
E5	.4596 (12.72)	.4590 (12.70)	.4672 (10.45)	.4677 (10.46)
E6+	.4722 (8.41)	.4703 (8.37)	.4846 (6.91)	.4816 (6.93)
Branch of Service				
Army	-.1132 (5.37)	-.1110 (5.26)	-.0924 (3.54)	-.0903 (3.46)
Navy	.0148 (.66)	.0153 (.68)	.0232 (.84)	.0220 (.79)
MC	-.1037 (2.92)	-.1033 (2.98)	-.0692 (1.61)	-.0695 (1.62)
Enlistee	-.0992 (7.92)	-.0989 (7.90)	-.0971 (6.27)	-.0966 (6.24)
Black	-.1379 (7.00)	-.1377 (6.99)	-.1320 (5.43)	-.1317 (5.41)
Military occupation (MO)				
OCC1=EER	.0461 (2.05)	.0188 (.77)	.0797 (2.87)	.0651 (1.71)
OCC2=C/I	-.0061 (.31)	-.0152 (.75)	.0430 (1.75)	.0265 (1.06)
OCC3=Medical	-.0495 (1.82)	-.0563 (1.97)	-.0572 (1.70)	-.0639 (1.80)
OCC4=OT	.0702 (1.98)	.0816 (1.92)	-.0189 (.43)	.0131 (.25)
OCC5=AD/CL	.0151 (.97)	.0109 (.66)	.0256 (1.33)	.0060 (.29)
OCC6=E/MER	.0386 (2.56)	.0306 (1.92)	.0348 (1.86)	.0318 (1.61)
OCC7=Craftsmen	.0252 (1.15)	.0191 (.76)	.0472 (1.74)	.0299 (.97)
OCC8=S/SH	.0419 (2.72)	.0450 (2.80)	.0320 (1.68)	.0369 (1.85)
In a related occupation				
REL	.0840 (6.36)	-.0730 (1.23)	.0432 (2.64)	-.1922 (2.62)
Interactions between MO and REL				
OCC1xREL		.2729 (3.58)		.3446 (3.65)
OCC2xREL		.2532 (2.66)		.4296 (3.65)
OCC3xREL		.1808 (1.86)		.2397 (2.00)
OCC4xREL		.1124 (1.22)		.1238 (1.08)
OCC5xREL		.1571 (2.43)		.2913 (3.65)
OCC6xREL		.1760 (2.72)		.2197 (2.75)
OCC7xREL		.1637 (2.26)		.2722 (3.05)
OCC8xREL		.0979 (1.43)		.1422 (1.70)
Constant	7.664	7.668	7.866	7.8755
Std. Dev.	.5925	.5923	.7328	.7324
R^2	.0665	.0671	.0535	.0547
NOBS	16,540	16,540	16,540	16,540

those veterans in related civilian jobs but none of the variation in civilian earnings of those veterans in unrelated civilian jobs. The 1970 and 1974 results which are obtained when separate regressions are estimated for those in related and those in unrelated jobs are reported in table 12.

Now, both the first procedure, where all the data are pooled in a single regression, and the second procedure, in which separate regressions are estimated for those in related and unrelated jobs, entail a methodological difficulty. The estimated earnings difference between veterans that use their military occupational training in the civilian sector and those veterans that do not may not provide an unbiased estimate of the earnings effect due to training. Rather, the estimate obtained with either of the above procedures may reflect a "selectivity bias."

This bias was first examined by Gronau (reference 14) and Lewis (reference 15) in the context of analysis of racial differences in the earnings of females.[1] For a complete treatment of the problem of selectivity bias, see Maddala (reference 16). Massell and Nelson (reference 10) have recognized the implications of selectivity bias for the analysis of veterans' earnings.

The selection bias problem may be described as follows. The veterans that chose related civilian jobs did so because they could earn more in these jobs than they could in unrelated jobs. Similarly, those veterans that chose unrelated jobs did so because they could earn more in unrelated jobs. The data sample is thus sorted into one group of veterans whose best earnings opportunities were in related jobs and another group whose best earnings opportunities were in unrelated jobs.

As a result of this sorting process, the average of the observed earnings of those individuals who took related civilian jobs will be an upward biased estimate of the true average earnings opportunity available to veterans in related civilian jobs. Likewise, the average of the observed earnings of those individuals who took unrelated civilian jobs will be an upward biased estimate of the true average earnings opportunity available to veterans in unrelated civilian jobs. While these observed average earnings are both upward-biased estimates of the true earnings opportunities available to veterans in related and unrelated job, respectively, the difference in these upward-

[1] Gronau argued that if black females have lower "reservation wages," or minimum wage offers they would be willing to accept, than white females, they will be observed to have lower earnings, on average, than white females, even though the job opportunities open to each group may be the same. In this case, if the job opportunities open to each group were in fact the same but black females were observed to have lower earnings, all of the earnings difference would be due to selectivity bias rather than real differences in job opportunities.

TABLE 12

SEPARATE EARNINGS REGRESSIONS FOR THOSE IN RELATED AND THOSE IN UNRELATED JOBS

Dep. var. = natural log of yearly earnings

Independent variable	Related		Unrelated	
	1970	1974	1970	1974
Ed	.0743 (8.7)	.0698 (6.27)	.0547 (14.05)	.0669 (14.02)
AFQT	.0011 (2.1)	.0025 (3.51)	.0012 (4.92)	.0015 (5.22)
Highest paygrade				
E3	.1687 (1.51)	.1950 (1.34)	.2731 (6.46)	.2692 (5.20)
E4	.1908 (1.82)	.2786 (2.05)	.3896 (10.16)	.3799 (8.08)
E5	.2710 (2.57)	.3502 (2.57)	.4828 (12.49)	.4820 (10.18)
E6+	.3029 (2.11)	.4166 (2.23)	.4891 (7.96)	.4821 (6.40)
Branch of service				
Army	-.0945 (2.11)	-.0971 (1.66)	-.1137 (4.75)	-.0861 (2.93)
Navy	.0069 (.15)	-.0163 (.27)	.0162 (.63)	.0316 (1.00)
MC	-.1315 (1.22)	-.0558 (.40)	-.0969 (2.59)	-.0636 (1.39)
Enlistee	-.0755 (2.59)	-.0845 (2.23)	-.1029 (7.43)	-.0984 (5.80)
Black	-.1812 (3.35)	-.2313 (3.28)	-.1311 (6.18)	-.1188 (4.57)
Military occupation (MO)				
OCC1	.2789 (3.90)	.3616 (3.88)	.0204 (.84)	.0549 (1.18)
OCC2	.2239 (2.48)	.4346 (3.70)	-.0134 (.65)	.0291 (1.16)
OCC3	.1000 (1.11)	.1621 (1.39)	-.0546 (1.89)	-.0621 (1.75)
OCC4	.1592 (1.96)	.1034 (.98)	.0845 (1.97)	.0168 (.32)
OCC5	.1482 (2.43)	.2820 (3.55)	.0137 (.82)	.0077 (.38)
OCC6	.2051 (3.38)	.2369 (3.00)	.0316 (1.95)	.0336 (1.69)
OCC7	.1792 (2.74)	.2959 (3.48)	.0200 (.79)	.0312 (1.01)
OCC8	.1469 (2.31)	.1801 (2.17)	.0452 (2.78)	.0377 (1.89)
Constant	7.556	7.729	7.6836	7.8684
Std. Dev.	.5613	.7310	.5978	.7327
R^2	.0828	.0721	.0579	.0488
NOBS	2565	2565	13,975	13,975

biased earnings averages may either overstate or understate real differences in earnings opportunities. As Maddala (reference 16) shows, it is possible that no real earnings difference exists even though the data indicates a difference (in which case all the difference in observed earnings averages is due to self-selection), or it is possible that real differences exist even when the data indicate no difference. In the former case, the data contains a positive selectivity bias, while in the latter case the selectivity bias is negative.

Maddala suggests a simple technique for handling selectivity bias. This technique is discussed in appendix D. The method entails creating two variables which are functions of the probability that a veteran will choose a related civilian job. We shall call these variables U_1 and U_2.[1] The U_1 variable is then included in the earnings regression for those veterans in related jobs and the U_2 variable is included in the regression for those in unrelated civilian jobs. The U_1 and U_2 variables in in these regressions correct for the selectivity bias. To get unbiased estimates of differences in mean earnings opportunities in related civilian jobs and unrelated civilian jobs, respectively, each estimated regression equation is used to predict the earnings of a veteran with selected characteristics and then the difference in predictions is computed. Table 13 reports the regression results obtained with the method suggested by Maddala.

Let us examine the pooled regression results, those in table 11. Since the dependent variable in these regressions is the logarithm of yearly earnings, each coefficient in table 11 represents the fractional change in earnings due to a change in the variable. For the categorical variables (paygrade, branch of service, enlistee-draftee status, race, military occupation, and occupational relatedness), each coefficient in the table represents the fractional earnings difference between the category shown and the omitted category for that variable. Each coefficient multiplied by 100 may be interpreted as the percentage difference in earnings due to a change in the variable. For example, for the 1970 regression with no interactions, blacks are estimated to earn 13.79 percent less than whites, other factors held constant.

Examining the results for the occupational relatedness variable, we see that veterans in related jobs are estimated to earn, on the average, 8.4 percent more than veterans in unrelated jobs. In 1974 the veterans in related jobs are estimated to earn 4.32 percent more. To give an idea of the dollar magnitudes, 8.4 percent of the average earnings of the 16,540 individuals was $503, while 4.32 percent of 1974 average earnings was $374.

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[1] See appendix E for examples. In the work below, variables were created using the logit regression results in table 10.

TABLE 13

SEPARATE EARNINGS REGRESSIONS FOR THOSE IN RELATED AND THOSE IN UNRELATED JOBS WITH U1 AND U2 VARIABLES INCLUDED

Dep. var. = log of yearly earnings

Independent variable	Related		Unrelated	
	1970	1974	1970	1974
Ed	.0907 (8.53)	.0777 (5.16)	.0630 (14.67)	.0673 (12.76)
AFQT	.0017 (3.01)	.0028 (3.58)	.0016 (6.19)	.0016 (4.96)
Highest paygrade				
E3	.1596 (1.43)	.1906 (1.31)	.2731 (6.47)	.2692 (5.20)
E4	.1800 (1.73)	.2734 (2.01)	.3882 (10.13)	.3798 (8.08)
E5	.2600 (2.49)	.3448 (2.53)	.4818 (12.48)	.4820 (10.18)
E6	.3026 (2.11)	.4165 (2.23)	.4894 (7.97)	.4821 (6.40)
Branch of service				
Army	-.1590 (3.10)	-.1284 (1.92)	-.1675 (6.29)	-.0884 (2.71)
Navy	-.0139 (.29)	-.0265 (.43)	-.0066 (.25)	.0306 (.95)
MC	-.1514 (1.40)	-.0655 (.48)	-.1304 (3.43)	-.0650 (1.39)
Enlistee	-.0487 (1.58)	-.0715 (1.78)	-.0888 (6.27)	-.0979 (5.62)
Black	-.1200 (2.03)	-.2015 (2.62)	-.0952 (4.22)	-.1172 (4.23)
Military occupation				
OCC1	.6265 (4.11)	.5308 (2.67)	.1941 (4.30)	.0624 (1.12)
OCC2	.3175 (3.28)	.4801 (3.80)	.0181 (.84)	.0305 (1.15)
OCC3	.3609 (2.68)	.2892 (1.64)	.0501 (1.50)	-.0573 (1.23)
OCC4	.6779 (3.13)	.3559 (1.26)	.3951 (4.93)	.0303 (.34)
OCC5	.5542 (3.28)	.4796 (2.18)	.2311 (4.60)	.0172 (.28)
OCC6	.5678 (3.71)	.4136 (2.07)	.2175 (4.99)	.0417 (.78)
OCC7	.6964 (3.30)	.5477 (1.99)	.3384 (4.59)	.0451 (.49)
OCC8	.4341 (3.39)	.3199 (1.92)	.1784 (5.36)	.0435 (1.07)
U1	.5827 (2.58)	.2837 (.96)		
U2			-.8441 (4.59)	-.0367 (.16)
Constant	6.171	7.0544	7.696	7.8690
Std. Dev.	.5607	.7311	.5974	.7328
R^2	.0848	.0720	.0593	.0487
NOBS	2565	2565	2565	2565

These percentage increases in earnings due to being in a related civilian job may be considered to be the average increase across all military occupations. To answer the question of whether the earnings effect due to being in a related job varies from one occupation to another, the pooled regression was re-estimated including interactions between military occupation and occupational relatedness. The 1970 and 1974 regressions with interactions are also provided in table 11. The earnings effect due to being in a related civilian job is, for each military occupation category, the sum of the occupational relatedness coefficient and the interaction coefficient. Thus, veterans trained as Electronics Equipment Repairmen who are in related jobs are estimated to earn 19.99 percent more than otherwise similar veterans in unrelated jobs in 1970 and 15.24 more in 1974.

The regression results in table 11 indicate that the civilian earnings effect due to military occupational training varies considerably across military occupation categories. Training as Electronics Equipment Repairmen, Communications/ Intelligence Specialists, Administrative/Clerical Specialists, and Craftsmen is estimated to add at least 8 percent to civilian earnings capacity in both 1970 and 1974.

Among those trained as Medical Specialists and Electrical/Mechanical Equipment Repairmen, those that found related civilian jobs are estimated to have about 10.5 percent more than those in unrelated jobs in 1970. However, the estimated 1974 earnings difference is only 4.75 percent for those trained as Medical Specialists and 2.75 percent for those trained as Electrical/Mechanical Equipment Repairmen.

For the Other Technical and Supply/Service Handler occupations, there is no discernible difference in the 1970 earnings of those in related jobs and those in unrelated jobs. Indeed, for 1974, those veterans trained in these occupations who found related civilian jobs are estimated to earn less than veterans that found unrelated jobs. However, the estimated differences are not statistically significant, and one cannot reject the hypothesis that, for these two occupations, there is no difference between the earnings of veterans in related jobs and veterans in unrelated jobs.[1]

One important result in table 11 is that the veteran's military occupation, in and of itself, does not explain much of the variation in civilian earnings in either 1970 or 1974. The coefficients on the occupation variables are small and, in most cases, statistically insignificant. These results indicate that training received in different military occupations does not differentially influence civilian earnings, if that training is not used in the civilian sector. These results are consistent with those of

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[1] The findings of no earnings effect for those in the Other Technical occupation can be rationalized. This occupation is almost entirely composed of individuals who are college graduates. No additional in-service training may have been acquired in this occupation.

Jurkowitz (reference 8) and Massell and Nelson (reference 10). These results are important because they indicate that the potential civilian earnings effects of occupational training received in military service hinge upon whether veterans use this training after service. In addition, the basic assumption of this research, that veterans in unrelated jobs are good surrogates for individuals who have not received military occupational training, appears to be a reasonable assumption.

When the sample is split and separate regressions are estimated for those in related and those in unrelated jobs, results are obtained which are consistent with the results obtained in the pooled regression. In table 12, for those in related occupations, there are large and statistically significant differences in civilian earnings between veterans trained in different military occupations. Thus, those veterans trained as Electronics Equipment Repairmen who are in related civilian jobs are estimated to have earned 27.89 percent more in 1970 and 36.16 percent more in 1974 than otherwise similar veterans trained in the Combat occupation who are also in related civilian jobs. Again, the results indicate that the potential civilian earnings effects of military occupational training depend crucially upon the type of training received in service.

As before, it is found that the military occupation in which the veteran was trained does not explain much of the variation in civilian earnings among veterans in unrelated jobs. This group of veterans appears to be a homogeneous group once factors other than military occupation are controlled for.

Table 13 shows the results when the method for controlling for selectivity bias is applied to the data.

The U_1 and U_2 variables explain a significant portion of the variation in earnings of those in related jobs and those in unrelated jobs, respectively, in 1970, but they do not perform as well in the 1974 equations. To compare the results with each method and to determine whether the selectivity bias problem was important in our data, the regressions estimated with each method were used to predict the earnings of a "typical" veteran. Predictions are made by military occupation category, first for those in related jobs and then for those in unrelated jobs. Then the difference in earnings predictions is computed. If there was a positive selectivity bias in the data, the method which controls for selectivity bias would yield smaller earnings differences than the other two methods. Larger differences with this method would indicate negative selectivity bias. The "typical" veteran is a white high school graduate who was drafted into the Army who scored 50 on the AFQT and who reached the paygrade of E4 in service. The predicted 1970 and 1974 earnings of this typical veteran are shown in table 14. M1 refers to the pooled regression method, M2 refers to the split sample method without variables which control for selectivity bias, and M3 refers to the split sample method where the variables which control for selectivity bias are included.

TABLE 14

PREDICTED EARNINGS OF A TYPICAL VETERAN[a]
THREE METHODS

Code	Occupation	1970 R	1970 UR	1970 Difference	1974 R	1974 UR	1974 Difference
0	Combat						
	M1[b]	5425	5835	- 410	6961	8346	- 1475
	M2[c]	5425	5859	- 434	7137	8266	- 1129
	M3[d]	5572	5881	- 309	7216	8474	- 1258
1	Electronics Equipment Repair						
	M1	7262	5945	1317	10343	8881	1462
	M2	7170	5979	1191	10246	8733	1513
	M3	7407	6121	1286	10389	8959	1430
2	Communications/Intelligence						
	M1	6882	5747	1135	10984	8663	2321
	M2	6786	5871	915	11022	8510	2512
	M3	7013	5799	1214	11177	8724	2453
3	Medical						
	M1	6143	5516	627	8299	7914	385
	M2	5995	5547	448	8393	7769	624
	M3	6228	5588	640	8533	7967	566
4	Other Technical						
	M1	6585	6331	254	7982	8548	- 566
	M2	6361	6376	- 15	7914	8406	- 492
	M3	6646	6660	- 14	8068	8633	- 565
5	Administrative/Clerical						
	M1	6416	5898	518	9371	8487	884
	M2	6292	5940	352	9462	8331	1131
	M3	6506	6128	378	9599	8550	1049
6	Electrical/Mechanical Equipment Repair						
	M1	6674	6016	658	8952	8708	244
	M2	6659	6047	612	9045	8549	496
	M3	6688	6165	523	9146	8770	376
7	Craftsmen						
	M1	6512	5946	566	9417	8692	725
	M2	6489	5978	511	9595	8527	1068
	M3	6661	6186	475	9698	8755	943
8	Supply/Service Handlers						
	M1	6262	6104	158	8327	8753	- 426
	M2	6284	6130	154	8546	8584	- 38
	M3	6473	6219	254	8652	8804	- 152

[a]The typical veteran is a white high school graduate drafted into the army who scored 50 on the AFQT and reached the paygrade E4 in service.

[b]M1 predictions derived from table 11 regressions.

[c]M2 predictions derived from table 12 regressions.

[d]M3 predictions derived from table 13 regressions.

Let us compare the results in table 14. For 1970, M3 gives smaller earnings effects due to being in a related civilian job than M1 does, in four occupations. These are Other Technical, Administrative/Clerical, Electrical/Mechanical Equipment Repair, and Craftsmen. For those trained in the Combat occupation, the M3 estimate of negative effect due to being in a related civilian job is smaller than the M1 estimate. For two occupations, Electronics Equipment Repair and Medical, the earnings effects estimated by M1 and M3 are virtually indistinguishable. M3 gives larger earnings effects in only two occupations, and the differences in predictions are not large.

For 1974, M3 yields smaller differences in earnings between those in related and those in unrelated jobs than M2. However, in some cases M3 yields somewhat larger differences than M1. In most cases, earnings differences obtained with these three methodologies are not drastically different from one another.

The basic similarity of results between the three methods gives us confidence that the earnings differences found here between veterans in related jobs and veterans in unrelated jobs represent real earnings differences due to training and are not due solely to job selectivity. Regardless of the particular empirical methodology, four military occupation groups are identified as occupations where military training significantly enhances post-service earnings capacity. These are Electronics Equipment Repair, Communications/Intelligence, Administrative/Clerical, and Craftsmen.

Let us examine the relationship between military-civilian occupational relatedness and variables other than military occupation. This discussion will rely upon the regression results in table 13. First, it is apparent that the effect of pre-service education level on post-service earnings is stronger for those in related jobs than those in unrelated jobs. An additional year of education raised the 1970 earnings of those in related jobs by 9.07 percent, while an additional year of education raised the 1970 earnings of those in unrelated jobs by only 6.3 percent. These results may reflect the fact that among those veterans in related civilian jobs military occupational training is more likely to be complimentary with and a continuation of specific pre-service job training. On the other hand, among veterans in unrelated civilian jobs, military service is more likely to represent a break in specific job training. For this group, the depreciation in job skills acquired prior to service which occurs during service is therefore expected to result in less variation in earnings of individuals of different education levels.

A second important result is that the post-service earnings difference between enlistees and draftees is somewhat smaller for those in related civilian jobs than those in unrelated jobs. This result probably indicates that, among those veterans choosing related civilian jobs, there was less difference between enlistees and draftees in pre-service human capital investments than among those veterans choosing unrelated civilian jobs. That is, draftees choosing unrelated jobs probably were individuals who

had made substantial training investments in a civilian occupation unrelated to their military occupation. One would therefore expect our finding that there is a larger draftee-enlistee earnings difference among veterans in unrelated jobs than among veterans in related jobs.

The racial differences in earnings between those in related civilian jobs and those in unrelated jobs are more difficult to explain. Among those in unrelated jobs, blacks are estimated to earn 9.52 percent less than whites in 1970. However, among those in related jobs, blacks are estimated to earn 12.0 percent less. Although the following explanation is somewhat speculative, we may reconcile these results as follows. Because of discrimination and lower quality educations, blacks generally have fewer job skills (human capital) than whites. Military occupational training is one vehicle by which blacks improve their job skills. The blacks that used their military-acquired job skills when they returned to the civilian sector were probably the ones that had acquired very few job skills prior to entering service, while those blacks that chose unrelated jobs were probably ones that had acquired more job skills prior to service. It is likely therefore that the blacks in related jobs had fewer job skills relative to the whites in related jobs than the blacks in unrelated jobs had relative to the whites in unrelated jobs. If this speculation is correct, one would expect a larger racial difference in earnings among veterans in related civilian jobs than among veterans in unrelated civilian jobs.

Branch of service differences in post-service earnings do not appear to be related to whether the veteran is in a related or unrelated civilian job. There is a statistically significant difference between the earnings of Air Force veterans and Army veterans. However, there is no discernible difference between the earnings of Navy veterans and Air Force veterans. The results for Marine Corps veterans are harder to interpret. While the estimated earnings differences between Marine Corps and Air Force veterans appear to be large, only one is statistically significant. If a real difference does exist, it is diminishing. The 1974 coefficient is about half the size of the 1970 coefficient.

The final variables we may examine are the paygrade variables. The effect of highest paygrade on post-service earnings is larger for those in unrelated jobs than those in related jobs. Highest paygrade reflects both absorption of job skills and more experience (since longer time in service is required to reach higher paygrades).[1]

[1] Massell (reference 17) offers a third reason why paygrade ought to be positively related to post-service earnings. Individuals in higher paygrades will require a higher civilian wage offer in order to leave military service than individuals in lower paygrades.

One would therefore expect highest paygrade to have a stronger influence on post-service earnings among the veterans choosing related civilian jobs than among those choosing unrelated civilian jobs. At this point, why highest paygrade should exert a stronger influence on the earnings of those in unrelated jobs than those in related jobs remains a puzzle.

CONCLUSIONS

Military occupational training appears to increase the earnings capacities of veterans trained in four military occupational categories -- Electronics Equipment Repair, Communications/Intelligence, Administrative/Clerical, and Craftsmen. Veterans trained in these occupations who went into related jobs after service were found to earn at least 8 percent more in both 1970 and 1974 than veterans who received the same training, but who went into unrelated civilian occupations. Training in other military occupation categories, however, was not found to enhance individuals' civilian sector earnings capacities to such an extent.

The findings point out an interdependence between the contribution of military occupational training to individuals' earnings capacities and the extent of use of training in the civilian sector. The military occupational categories in which the largest earnings effects due to military occupational training were found were also occupations that had higher percentages of veterans in related civilian occupations. The larger the potential earnings effect due to training, the higher is the probability that veterans will use that training.

Finally, the reader is reminded that the analysis was based on individuals who did not use the GI Bill. We were not able to incorporate data on GI Bill users into the analysis, and it is not clear whether a bias may have been introduced by their exclusion. At this point it would be hazardous to speculate how the analysis would be affected by inclusion of GI Bill users, although this would be an interesting topic for further research.

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APPENDIX A

SUPPLEMENTARY TABLES

TABLE A-1

COMPARISON OF RMC AND VETERAN EARNINGS IN 1974, FOR NON-USERS AND USERS, BY RACE, EDUCATION, AND AFQT SCORE

				Non-users[a]		Users[b]	
Educ.	AFQT[c]	Race	RMC	Vet. earnings	Ratio RMC/vet. earnings	Vet. earnings	Ratio RMC/vet. earnings
<12	Low	Black	9739	6486	1.50	5281	1.84
		Non-black	9639	8035	1.20	7214	1.34
	Med.	Black	9909	7562	1.31	7008	1.41
		Non-black	9828	8401	1.17	8059	1.22
	High	Black	9892	6451	1.53	8284	1.19
		Non-black	9921	8734	1.14	8719	1.14
12	Low	Black	9736	8242	1.18	5625	1.73
		Non-black	9417	9399	1.00	7578	1.24
	Med.	Black	9810	8788	1.12	6991	1.40
		Non-black	9688	9711	1.00	8888	1.09
	High	Black	9828	10034	.98	7838	1.25
		Non-black	9894	10404	.95	8550	1.16
>12	Low	Black	9970	9499	1.05	5472	1.82
		Non-black	9755	10379	.94	7376	1.32
	Med.	Black	10008	8408	1.19	7578	1.32
		Non-black	9829	11517	.85	9020	1.09
	High	Black	9996	11439	.87	8648	1.16
		Non-black	10036	12399	.81	9348	1.07

[a]Veterans who had not used GI Bill training benefits as of 31 March 1974.

[b]Veterans who had used GI Bill training benefits and terminated training before 31 March 1974.

[c]Low, AFQT <31; med., AFQT 31-46; high, AFQT >46.

TABLE A-2

1974 RMC BY RACE, EDUCATION, AFQT SCORE, AND SERVICE

Educ.	AFQT[a]	Non-blacks	Blacks
		Army	
<12	Low	9,614	9,752
	Med	9,882	10,000
	High	9,935	9,992
	All	9,822	9,851
12	Low	9,859	10,002
	Med	10,066	10,141
	High	10,129	10,080
	All	10,075	10,056
>12	Low	10,173	10,168
	Med	10,160	10,288
	High	10,281	10,223
	All	10,225	10,219
		Navy	
<12	Low	9,771	9,824
	Med	9,908	9,975
	High	10,091	9,969
	All	9,965	9,898
12	Low	9,185	9,917
	Med	9,551	10,051
	High	10,119	10,161
	All	9,910	10,062
>12	Low	9,323	9,769
	Med	9,628	9,955
	High	10,179	10,375
	All	10,142	10,263
		Air Force	
<12	Low	9,205	9,157
	Med	9,396	9,482
	High	9,699	9,484
	All	9,587	9,420
12	Low	9,324	9,317
	Med	9,500	9,498
	High	9,586	9,563
	All	9,554	9,453
>12	Low	9,465	9,412
	Med	9,625	9,718
	High	9,646	9,634
	All	9,640	9,608

[a]Low, <31; med, 31-46; high,>46.

TABLE A-3

VETERAN EARNINGS, 1969-74,
BY RACE, EDUCATION, AFQT SCORE, AND SERVICE

	Educ	AFQT[a]	69	70	71	72	73	74	n
					Army				
Non-Blacks	<12	Low	4,398	5,314	5,881	6,750	7,809	7,988	1,981
		Med	4,751	5,796	6,321	7,068	8,275	8,533	685
		High	5,095	5,820	6,530	7,403	8,509	8,903	586
		All	4,598	5,506	6,090	6,934	8,034	8,267	3,252
	12	Low	5,167	6,345	7,010	8,082	9,227	9,592	2,340
		Med	5,434	6,503	7,292	8,302	9,417	9,832	1,855
		High	5,782	6,932	7,654	8,753	9,942	10,521	5,698
		All	5,571	6,713	7,434	8,510	9,675	10,172	9,893
	>12	Low	5,247	7,129	7,670	9,024	10,370	11,134	105
		Med	5,724	7,714	8,415	9,638	10,920	12,462	161
		High	6,170	8,011	8,933	10,181	11,643	13,071	1,878
		All	6,091	7,945	8,832	10,083	11,527	12,931	2,144
Blacks	<12	Low	3,742	4,554	5,125	5,893	6,714	6,468	395
		Med	3,860	4,741	5,201	6,363	7,403	7,539	59
		High	4,038	5,253	5,364	6,445	6,393	5,761	12
		All	3,764	4,596	5,141	5,966	6,793	6,585	466
	12	Low	4,427	5,645	6,313	7,294	8,304	8,376	844
		Med	5,176	5,700	6,431	7,637	8,828	8,706	178
		High	5,509	6,384	7,163	8,667	9,610	9,693	121
		All	4,658	5,732	6,421	7,492	8,524	8,567	1,143
	>12	Low	4,848	6,333	6,680	8,049	8,578	9,615	66
		Med	4,646	5,871	6,393	6,923	8,503	8,718	20
		High	5,824	7,068	8,245	8,848	9,921	11,178	30
		All	5,035	6,402	6,989	7,979	8,993	9,782	125
					Navy				
Non-Blacks	<12	Low	4,685	5,694	6,237	7,419	8,288	8,675	231
		Med	4,812	5,763	6,555	7,127	8,342	8,900	146
		High	4,669	5,648	6,144	7,199	8,117	8,432	230
		All	4,710	5,693	6,278	7,265	8,236	8,637	607
	12	Low	5,192	6,382	7,029	8,037	9,077	9,310	319
		Med	5,474	6,477	7,221	8,273	9,183	9,735	484
		High	5,604	6,727	7,463	8,556	9,835	10,350	1,813
		All	5,529	6,639	7,365	8,440	9,622	10,110	2,616

TABLE A-3 (Cont'd)

	Educ.	AFQT	69	70	71	72	73	74	n
					Navy (Cont'd)				
	>12	Low	5,148	6,086	7,847	8,618	9,656	9,100	12
		Med	5,142	5,996	6,679	8,049	9,930	10,061	20
		High	6,356	7,710	8,396	9,630	11,241	12,514	446
		All	6,275	7,598	8,310	9,538	11,146	12,326	478
Blacks	<12	Low	3,894	5,000	5,255	6,942	8,153	8,774	14
		Med	4,156	5,367	6,712	5,894	6,330	14,098	7
		High	5,014	4,761	3,765	5,398	8,802	8,526	4
		All	4,147	5,065	5,424	6,401	7,747	10,225	25
	12	Low	4,262	5,374	6,412	6,942	8,120	8,057	34
		Med	4,181	5,610	5,455	6,829	7,919	8,190	21
		High	4,458	6,583	6,929	8,758	8,863	10,125	24
		All	4,300	5,804	6,315	7,464	8,292	8,721	79
	>12	Low	5,126	5,813	7,468	8,122	9,581	9,656	3
		Med							0
		High	6,623	10,285	7,241	7,379	10,143	11,513	7
		All	6,174	8,943	7,309	7,602	9,974	10,956	10
					Marine Corps				
Non-Blacks	<12	Low	3,666	5,101	6,139	6,908	8,022	8,191	148
		Med	3,646	5,138	5,775	6,743	7,512	7,774	159
		High	4,260	5,463	5,988	6,837	7,850	8,746	169
		All	3,870	5,242	5,964	6,828	7,790	8,249	476
	12	Low	4,056	5,862	6,168	7,132	8,349	8,710	165
		Med	4,676	6,333	7,090	8,230	9,428	9,673	286
		High	4,971	6,678	7,428	8,531	9,718	10,184	895
		All	4,796	6,504	7,202	8,296	9,489	9,895	1,346
	>12	Low	4,756	6,904	6,188	7,207	9,374	9,981	6
		Med	4,996	6,933	8,616	10,326	10,579	11,571	17
		High	4,997	6,710	7,806	9,118	10,087	11,171	131
		All	4,988	6,742	7,832	9,176	10,113	11,169	154
Blacks	<12	Low	3,090	4,636	4,538	6,047	6,603	6,406	19
		Med	4,192	5,857	5,099	6,319	6,836	8,044	11
		High	2,759	3,623	5,518	8,353	7,823	4,718	5
		All	3,389	4,875	4,854	6,462	6,850	6,679	35
	12	Low	3,122	5,064	5,723	6,655	7,248	7,399	56
		Med	3,969	5,321	6,395	6,953	8,933	9,341	38
		High	4,238	6,188	7,783	8,727	10,303	10,567	16
		All	3,577	5,317	6,255	7,059	8,275	8,531	110

TABLE A-3 (Cont'd)

	Educ.	AFQT	69	70	71	72	73	74	n
					Marine Corps (Cont'd)				
	>12	Low	5,108	7,639	8,914	8,955	12,144	7,560	3
		Med	3,538	4,795	4,866	5,364	7,215	6,668	2
		High							0
		All	4,480	6,501	7,294	7,518	10,173	7,203	5
					Air Force				
Non-Blacks	<12	Low	5,004	5,818	6,598	7,662	7,987	8,870	8
		Med	5,078	5,628	6,115	6,594	8,358	7,688	22
		High	5,431	6,779	6,757	8,521	9,142	9,629	31
		All	5,248	6,238	6,504	7,714	8,707	8,830	61
	12	Low	5,171	6,503	7,253	8,110	9,203	9,913	230
		Med	5,173	6,486	7,099	8,106	9,008	9,485	433
		High	5,578	6,958	7,585	8,787	9,903	10,522	1,916
		All	5,473	6,838	7,474	8,612	9,690	10,293	2,579
	>12	Low	5,976	7,655	9,237	10,078	8,987	25,411	3
		Med	5,524	5,908	6,827	7,870	9,539	10,205	8
		High	6,127	7,849	8,746	9,343	10,963	12,736	125
		All	6,088	7,731	8,644	9,273	10,835	12,866	136
Blacks	<12	Low	3,888	4,440	4,687	7,261	9,455	5,053	2
		Med	3,656	4,660	6,170	5,365	5,231	6,394	7
		High	4,263	6,869	7,509	8,533	10,545	10,771	2
		All	3,809	5,022	6,144	6,286	6,965	6,946	11
	12	Low	4,533	5,706	6,643	7,954	8,334	8,143	88
		Med	5,219	6,378	6,679	8,090	8,929	8,857	68
		High	5,407	6,700	7,432	8,390	9,878	10,585	66
		All	5,003	6,208	6,889	8,126	8,975	9,088	222
	>12	Low	7,023	9,309	9,619	10,438	10,887	13,808	3
		Med	5,095	5,302	7,371	10,286	9,312	6,665	2
		High	8,336	8,914	8,356	10,286	12,343	15,086	2
		All	6,847	8,051	8,616	10,351	10,853	12,132	7

[a]Low, <31; Med, 31-46; High, >46.

TABLE A-4

RMC, 1969-74, BY SERVICE AND OCCUPATION

Army

Occupation	1969	1970	1971	1972	1973	1974	n
1	5630	6691	7559	8485	9270	10253	4085
2	5566	6635	7496	8421	9219	10156	634
3	5512	6582	7434	8353	9095	10032	771
4	5562	6610	7461	8385	9151	10115	1881
6	5145	6242	7103	8069	8899	9831	103
10	5534	6622	7502	8420	9188	10133	1857
11	5287	6444	7246	8095	8886	9899	17
12	5692	6754	7601	8537	9307	10314	622
14	5849	6955	7813	8720	9490	10480	23
15	5710	6733	7565	8502	9294	10286	253
16	5554	6626	7474	8396	9151	10112	241
19	5507	6592	7450	8378	9164	10085	286
20	5349	6392	7267	8170	8938	9827	745
22	5444	6514	7403	8322	9097	10061	342
23	5508	6617	7523	8464	9219	10213	448
24	5830	6859	7697	8612	9405	10455	481
25	5662	6730	7602	8524	9310	10283	876
30	5596	6645	7510	8421	9186	10153	1296
31	5648	6700	7564	8505	9277	10206	199
32	5587	6634	7473	8400	9195	10176	137
33	5665	6682	7511	8426	9156	10098	152
40	5409	6488	7345	8221	9015	9935	115
41	5488	6558	7434	8350	9092	10033	153
42	5750	6840	7638	8531	9312	10319	31
43	5632	6660	7515	8430	9242	10225	138
44	5023	6410	7168	8113	8844	9751	4
45	5704	6759	7637	8595	9370	10332	133
49	5677	6749	7653	8578	9332	10309	115
50	5777	6815	7677	8611	9389	10398	2437
51	5590	6645	7510	8431	9200	10145	1986
53	5568	6658	7545	8485	9273	10243	515
54	5650	6694	7569	8481	9244	10210	337
55	5523	6592	7451	8368	9136	10095	3312
56	5657	6722	7563	8482	9220	10164	256
57	5629	6691	7599	8601	9333	10180	58
58	5432	6488	7384	8303	9066	9965	649
60	5419	6493	7377	8290	9038	9974	1736
61	5420	6486	7339	8243	8995	9911	2726
62	5189	6260	7152	8085	8839	9728	723
63	5570	6638	7541	8469	9273	10139	38
64	5455	6539	7407	8303	9073	9976	464
65	5147	6244	7115	8038	8773	9749	68
66	5269	6355	7209	8119	8905	9842	236
67	5448	6471	7263	8186	8949	9946	102
69	5269	6305	7182	8118	8871	9828	99
70	5198	6292	7156	8002	8718	9627	159
71	5477	6561	7448	8422	9143	10055	192
72	5466	6511	7351	8277	9053	9990	152
73	5164	6261	7126	8015	8774	9662	515
74	5096	6271	7167	8103	8876	9784	71
76	5088	6138	7078	8002	8839	9737	14
78	5215	6245	7110	8074	8796	9669	42
79	5788	6790	7429	8061	8992	9877	2
80	5604	6643	7479	8384	9138	10105	2317
81	5165	6266	7154	8064	8801	9676	1023
82	5288	6350	7237	8172	8908	9819	318
83	5433	6531	7414	8338	9126	10093	1254
84	5549	6523	7359	8328	9082	9906	32
85	5376	6417	7269	8105	8859	9754	62
86	5508	6553	7413	8310	9099	10017	108

TABLE A-4 (Cont'd)

Navy

Occupation	1969	1970	1971	1972	1973	1974	n
1	5129	6163	7058	8028	8860	9757	26
4	5242	6180	7056	8033	8901	9877	484
6	5301	6335	7274	8313	9115	10070	1862
10	5377	6419	7356	8322	9114	10083	3519
11	5327	6414	7377	8446	9350	10432	570
12	5437	6471	7352	8369	9187	10207	1038
13	5507	6536	7480	8505	9315	10284	834
15	5419	6459	7397	8412	9240	10319	588
16	5655	6694	7521	8475	9255	10155	419
19	5509	6572	7485	8461	9257	10215	737
20	5471	6469	7331	8302	9084	9985	1213
21	5620	6618	7460	8489	9329	10343	479
22	5337	6388	7333	8354	9168	10178	663
23	5647	6652	7548	8525	9315	10296	1202
24	5655	6618	7475	8539	9309	10294	166
30	5191	6238	7175	8275	9074	10119	845
31	5198	6219	7161	8294	9091	10124	373
32	5500	6530	7482	8534	9324	10375	167
33	4958	5954	6896	8048	8886	9812	198
40	5336	6298	7184	8187	8960	9871	173
41	5152	6057	6896	8018	8836	9878	82
42	5350	6326	7226	8229	9063	9942	163
45	5463	6473	7385	8383	9177	10166	108
49	5967	6874	7698	8875	9679	10590	12
50	5532	6487	7404	8486	9307	10225	909
51	5474	6445	7335	8379	9191	10138	1628
53	5467	6421	7277	8305	9117	10076	442
54	4605	5572	6518	7804	8697	9714	456
55	4961	5906	6833	7966	8810	9738	1833
56	4761	5965	6916	8090	8853	9851	8
57	5271	6251	7270	8282	9072	10111	60
58	5512	6539	7509	8573	9367	10260	192
60	5349	6305	7205	8213	9009	9907	4607
61	5601	6520	7368	8304	9182	10124	257
62	5183	6231	7132	8187	8988	10028	188
63	5485	6500	7361	8385	9108	10167	124
64	5461	6461	7362	8380	9189	10168	334
65	5255	6244	7109	8157	8979	10014	2659
66	5277	6260	7199	8298	9108	10178	2069
67	5500	6513	7423	8456	9239	10264	300
68	5377	6326	7203	8200	9005	9997	315
69	5159	6161	7076	8159	8989	10057	114
70	5269	6274	7215	8293	9126	10198	859
71	5807	6772	7659	8688	9471	10458	557
72	5467	6425	7328	8386	9211	10240	829
73	5727	6645	7455	8429	9244	10145	400
74	5214	6265	7242	8348	9140	10132	31
75	5323	6324	7266	8315	9178	10272	106
76	4916	6006	6818	7945	8617	9579	10
78	5495	6535	7486	8529	9303	10312	164
79	5138	6135	7012	8149	8977	10001	341
80	4508	5409	6245	7442	8176	9067	4149
82	4856	5859	6791	7944	8698	9660	413
83	4609	5834	7032	7939	8679	9493	1
84	4958	5940	6882	7945	8738	9669	105

TABLE A-4 (Cont'd)

Marine Corps

Occupation	1969	1970	1971	1972	1973	1974	n
1	5289	6335	7160	8116	8985	10112	1014
2	5371	6407	7223	8255	9212	10264	133
3	5419	6392	7142	8061	8963	10143	165
4	5385	6390	7217	8281	9179	10245	134
5	5095	6216	7256	8269	9252	10425	23
10	5348	6417	7348	8412	9357	10435	609
12	5080	6200	7303	8315	9215	10278	311
15	5248	6394	7304	8339	9437	10473	86
16	5553	6524	7422	8343	9395	10527	14
19	5249	6426	7407	8414	9242	10232	34
20	5128	6231	7109	8091	9068	10151	215
22	5195	6318	7330	8290	9158	10501	125
23	5290	6381	7199	8153	9166	10271	97
24	5456	6480	7303	8222	9210	10340	257
25	5568	6545	7344	8316	9312	10361	47
32	5873	6765	7414	8574	9557	10727	5
40	4976	6109	7005	8127	9074	10157	45
41	5069	6214	7132	8089	8967	10263	17
42	5504	6543	7410	8547	9509	10702	34
43	5396	6307	7109	8087	9194	10227	33
45	5232	6349	7248	8263	9286	10507	46
49	5310	6320	7124	8124	9034	10150	70
51	5130	6210	7049	8079	9010	10095	329
52	5452	6450	7228	8244	9209	10270	532
53	5508	6544	7413	8435	9409	10697	192
54	5374	6450	7428	8479	9486	10628	185
55	5436	6436	7259	8264	9247	10505	543
56	5902	6759	7504	8503	9402	10397	8
57	5427	6526	7437	8458	9486	10557	46
58	5194	6278	7120	8117	9115	10229	99
60	5043	6185	7157	8187	9141	10195	894
61	5199	6253	7081	8043	8918	9945	283
62	5129	6206	7085	8160	9104	10129	88
66	5341	6378	7221	8244	9152	10251	295
67	5257	6303	7126	8037	9110	10270	18
68	5137	6241	7184	8198	9156	10299	55
70	5442	6452	7196	8165	9054	10282	31
72	5319	6297	7105	8054	9050	10139	93
73	5235	6191	7037	7974	8744	9888	35
74	5442	6528	7287	8136	9183	10342	13
75	4883	5705	6986	8080	9038	10076	15
76	5376	6297	7003	8009	9069	10064	15
78	5172	6261	7151	8195	9082	10147	44
80	5297	6294	7086	7971	9014	10176	129
81	5465	6428	7172	8156	9016	10180	308
82	5313	6325	7106	8104	9085	10259	252
83	5393	6399	7189	8150	9086	10102	314
88	5699	6638	7312	8197	9161	10316	14
86	4859	6035	7062	8157	9087	10186	71

TABLE A-4 (Cont'd)

Air Force

Occupation	1969	1970	1971	1972	1973	1974	n
1	5012	6114	6999	7937	8707	9669	83
5	5663	6632	7477	8408	9151	10062	153
6	4512	5596	6540	7820	8662	9618	8
10	5036	6065	6880	7929	8706	9597	4068
11	5046	6103	6971	7995	8772	9688	360
12	5073	6145	7047	8023	8804	9715	669
14	5018	6121	6926	8017	8762	9669	167
15	5217	6203	6976	7987	8761	9686	543
16	5016	6083	6981	7972	8749	9649	947
19	5044	6088	6953	7956	8738	9630	1666
20	5044	6076	6921	7970	8765	9639	259
22	4939	6023	6944	7963	8744	9661	1089
23	5175	6185	7066	8042	8809	9719	961
24	5139	6187	7149	8085	8849	9756	479
25	5232	6240	7132	8068	8818	9683	181
30	4962	6024	6927	7962	8728	9635	858
31	5090	6119	6988	7999	8776	9678	275
32	4956	6031	6934	7926	8705	9644	284
33	4966	6048	6912	7913	8662	9557	262
40	4920	6021	6941	8006	8756	9668	71
41	4976	6074	6989	8015	8784	9727	251
42	4994	6065	6942	7971	8720	9627	380
43	5176	6227	7089	8057	8808	9697	102
49	5276	6256	7061	8095	8838	9737	137
50	4910	5970	6872	7978	8754	9666	1528
51	4850	5944	6831	7880	8649	9542	5855
52	7220	8347	9192	10440	11361	12749	8
53	4946	6042	6968	8017	8767	9664	1048
54	5131	6171	7123	8146	8904	9823	725
55	4968	6042	6932	7950	8714	9618	2207
56	4980	6014	6819	7883	8660	9552	278
57	5202	6217	7070	8101	8848	9736	555
58	4968	5962	6899	7770	8648	9536	973
60	4979	6031	6907	7919	8706	9619	11791
61	4888	5952	6851	7825	8593	9484	364
62	4864	5954	6837	7915	8678	9570	453
63	4876	6003	6884	7963	8732	9665	275
64	4964	6040	6902	7961	8733	9652	1531
65	5203	6098	6885	8103	8935	9749	6
66	4930	6012	6884	7900	8685	9580	364
67	5145	6126	7006	7937	8674	9612	8
70	5006	6042	6928	7921	8703	9602	698
71	4908	5950	6750	7840	8630	9519	784
72	4848	5962	6836	7883	8648	9548	1052
73	4872	5961	6792	7888	8686	9581	208
74	5029	6049	6846	7895	8688	9506	126
75	4855	5940	6861	7849	8654	9516	26
76	5052	6039	6805	7795	8613	9538	75
78	4808	5913	6784	7801	8651	9541	626
79	4615	5762	6710	7780	8568	9519	166
80	4877	5892	6686	7801	8593	9495	805
81	4889	5939	6781	7879	8661	9547	592
82	4778	5902	6758	7830	8592	9508	1938
83	4703	5828	6693	7794	8587	9487	1892
86	5059	6113	6981	8004	8770	9682	746

TABLE A-5

VETERAN EARNINGS, 1970-74,
BY RACE, SERVICE, AND OCCUPATION
(Excluding all groups with 30 or fewer observations)

Occup	Service	Race	1970	1971	1972	1973	1974	1974 RMC	1974 Civ. Earn./ RMC
01	A	NB	6387	7169	8226	9441	9936	10253	.97
		B	5289	5838	6864	7900	7956		.78
	MC	NB	5819	6470	7546	8657	9080	10112	.89
		B	5141	5919	6949	7861	8189		.80
02	A	NB	6361	7081	8108	9288	9366	10156	.92
		B	5356	5967	6896	7659	7239		.71
	MC	NB	6022	6918	7437	9083	9518	10264	.93
03	A	NB	6120	6837	7795	8927	8981	10032	.90
		B	4840	5532	6681	7517	7258		.72
	MC	NB	6210	6700	7812	8682	9726	10143	.96
04	A	NB	6052	6728	7746	8808	9302	10115	.92
		B	5089	5679	6541	7764	7225		.71
	N	NB	6134	6724	7454	8636	8830	9877	.89
	MC	NB	6646	7287	8131	9731	10567	10245	1.03
06	A	NB	6447	7069	8119	8840	9661	9831	.98
	N	NB	6070	6689	7668	8797	9500	10070	.94
10	A	NB	6919	7472	8795	10210	11307	10131	1.12
	N	NB	7358	7842	9222	10223	10506	10083	1.04
	MC	NB	7215	7961	9052	9588	11869	10435	1.14
	AF	NB	7633	8401	9670	11184	11608	9597	1.22
11	N	NB	6366	7660	8447	9434	10335	10432	.99
12	A	NB	6674	7463	8780	9745	10426	10314	1.01
		B	5064	5480	6539	7278	7416		.72
	N	NB	6516	6714	7854	9238	11726	10207	1.15
13	N	NB	6515	7523	8887	10380	10226	10284	.99
16	A	NB	6776	7822	8921	10185	10771	10112	1.07
	AF	NB	7521	8687	10141	11280	11845	9649	1.23
19	A	NB	7052	7658	10010	10917	10932	10085	1.08
	AF	NB	7774	7912	9045	11084	11822	9630	1.23
20	A	NB	6539	7294	8534	9688	10452	9827	1.06
		B	5530	6434	7261	8382	8908		.91
	N	NB	6513	6995	8148	9434	10053	9985	1.01
	MC	NB	6757	7177	8119	8974	9275	10151	.91
22	A	NB	7070	7894	8782	9710	10677	10061	1.06
	N	NB	6694	7280	8532	9857	10195	10178	1.00
	AF	NB	6651	7829	9033	10410	11868	9661	1.23
23	A	NB	5711	6768	8633	9595	11694	10213	1.15
	N	NB	7561	8684	10153	10784	12097	10296	1.17
	AF	NB	6550	7262	8556	8990	10276	9719	1.06
24	A	NB	7900	8867	10113	11402	12816	10455	1.23
25	A	NB	6615	7517	8578	10100	10476	10283	1.02
		B	5684	6415	7735	9165	9393		.91

TABLE A-5 (Cont'd)

Occup	Service	Race	1970	1971	1972	1973	1974	1974 RMC	1974 Civ. Earn./ RMC
30	A	NB	6573	7194	8229	9348	9901	10153	.98
		B	5671	6283	6997	7674	7776		.77
	N	NB	6585	7090	7765	8976	9260	10119	.92
	AF	NB	6259	6932	8101	9057	9791	9635	1.02
31	A	NB	8767	9674	10576	11786	12398	10206	1.21
33	A	NB	6701	7634	9550	10375	9963	10098	.99
40	A	NB	6786	7404	8005	9035	9240	9935	.93
	AF	NB	6676	6996	7718	8827	9520	9668	.98
41	A	NB	7836	8237	9529	10879	11716	10033	1.17
44	A	NB	11193	12169	13816	14603	17366	9751	1.78
45	A	NB	6255	6784	7918	8164	7745	10332	.75
50	A	NB	7571	8416	9411	10793	11551	10398	1.11
	N	NB	7173	8022	9156	10544	11806	10225	1.15
51	A	NB	6878	7587	8599	9979	11223	10145	1.11
		B	5574	5974	6822	7360	7406		.73
	N	NB	6841	7585	8720	9859	10428	10138	1.03
	AF	NB	6778	7388	8248	9466	10450	9542	1.10
		B	6273	6364	7899	8280	8927		.94
52	MC	NB	6131	7122	8168	7514	9341	10697	.87
53	A	NB	8783	9123	10668	11881	13110	10243	1.28
	N	NB	8542	9828	10969	12691	14156	10076	1.40
	AF	NB	8999	9913	10289	12040	14323	9664	1.48
54	A	NB	8000	8861	9997	11377	12377	10210	1.21
	N	NB	7148	8423	9351	11428	13048	9714	1.34
	AF	NB	7680	8737	9554	11017	12219	9823	1.24
55	A	NB	6452	7144	8169	9130	9754	10095	.97
		B	5647	6383	7154	8330	8727		.86
	N	NB	6764	7598	8626	10028	11166	9738	1.15
	MC	NB	6403	7414	8531	10056	11027	10505	1.05
	AF	NB	6682	7267	8759	9727	10616	9618	1.10
56	A	NB	7200	7855	8872	9467	11012	10164	1.08
58	A	NB	6264	7043	7958	9093	9576	9965	.96
		B	4939	5197	6228	7492	8302		.83
	AF	NB	6647	7249	8370	9664	10350	9536	1.09
60	A	NB	6608	7390	8477	9620	9923	9974	.99
	N	NB	6561	7190	8386	9689	10058	9907	1.02
	MC	NB	6889	6985	8436	9517	10089	10195	.99
	AF	NB	6880	7419	8661	9838	10536	9619	1.10
61	A	NB	6369	7110	8039	9264	9696	9911	.98
		B	5751	6575	7542	7989	8085		.82
	N	NB	6508	7363	8239	8982	9798	10124	.97
	MC	NB	6261	7307	8467	9634	10104	9945	1.02
	AF	NB	6823	7323	8944	9522	9716	9484	1.02

TABLE A-5 (Cont'd)

Occup	Service	Race	1970	1971	1972	1973	1974	1974 RMC	1974 Civ. Earn./ RMC
62	A	NB	6083	6803	7877	9135	9529	9728	.98
		B	5543	6069	7111	8289	8101		.83
	N	NB	6797	7149	8591	9886	10696	10028	1.07
	MC	NB	5875	7034	7596	7939	8887	10129	.88
	AF	NB	5955	6711	7751	8814	10027	9570	1.05
63	N	NB	6990	7702	9152	10441	10723	10167	1.05
64	A	NB	6483	7000	7904	9255	9758	9976	.98
		B	5073	6189	7314	8299	7823		.78
	N	NB	6549	7468	9133	10116	10989	10168	1.08
	MC	NB	6237	7095	8357	9632	9923	10251	.97
	AF	NB	6832	7136	7929	9043	10288	9652	1.07
65	A	NB	6218	6718	7598	8944	8870	9749	.91
	N	NB	6667	7456	8463	9698	9974	10014	1.00
66	A	NB	6654	7497	8246	9320	9461	9842	.96
	N	NB	6902	7283	8903	9815	10629	10178	1.04
	AF	NB	6811	7449	8404	9572	10430	9580	1.09
68	N	NB	6967	8338	8180	9983	11494	9997	1.20
69	A	NB	6786	7194	8157	9546	9742	9828	.99
70	A	NB	7073	7768	8783	10502	10170	9627	1.06
	N	NB	6693	7535	8721	10265	10735	10188	1.05
	AF	NB	7070	7512	8658	9231	10371	9602	1.08
71	A	NB	6163	6888	8032	8892	9074	10055	.90
	N	NB	7904	8608	9565	10766	11959	10458	1.14
	AF	NB	6374	6951	8464	9589	9789	9519	1.03
72	A	NB	6330	7396	8494	9420	10323	9990	1.03
	N	NB	7472	7789	8463	9852	9695	10240	.95
	MC	NB	6578	6717	7514	8956	10000	10139	.99
	AF	NB	7397	8122	9188	10388	11869	9548	1.24
73	A	NB	6665	7216	8111	9244	9695	9662	1.00
	N	NB	6924	7483	9174	10151	10522	10145	1.04
74	A	NB	6751	7869	9228	10450	10675	9784	1.09
78	N	NB	6621	7422	8927	10110	9755	10312	.95
	AF	NB	6337	6916	8159	9516	9841	9541	1.03
80	A	NB	6233	6755	7742	8874	9364	10105	.93
		B	4990	5766	6469	7364	7408		.73
	N	NB	5906	6787	7395	8557	8943	9067	.99
	MC	NB	5658	6425	7796	8832	9072	10176	.89
	AF	NB	6541	7156	7931	9213	9298	9495	.98
81	A	NB	6298	7014	8009	9180	9647	9676	1.00
		B	5644	6536	7749	8444	8378		.87
	MC	NB	6219	6815	7983	8940	9237	10180	.91
	AF	NB	6620	7709	8475	9433	9701	9547	1.02
82	A	NB	6229	6853	7727	8593	8973	9819	.91
		B	5199	5543	6517	7094	7239		.74
	N	NB	6571	7190	8356	9469	9816	9660	1.02
	MC	NB	6556	7143	8273	9517	10229	10259	1.00
	AF	NB	6560	7325	8448	9375	9736	9508	1.02
		B	5516	6308	7613	8008	7633		.80

TABLE A-5 (Cont'd)

Occup	Service	Race	1970	1971	1972	1973	1974	1974 RMC	1974 Civ. Earn./ RMC
83	A	NB	7225	8051	9193	10481	11185	10093	1.11
	AF	NB	6292	7001	8047	8989	9757	9487	1.03
		B	5841	6743	8005	8525	8292		.87
84	A	NB	6001	7145	7700	8790	9892	9906	1.00
	N	NB	5640	6444	6968	8066	7901	9669	.82
86	AF	NB	6435	7237	8134	8509	8526	9682	.88
A11	A	NB	6583	7305	8356	9538	10100	10093	1.00
	A	B	5389	6033	7034	8005	8028		.80
	N	NB	6684	7384	8482	9692	10281	9978	1.03
	N	B	5994	6324	7369	8570	9388		.94
	MC	NB	6230	6927	7993	9110	9589	10259	.94
	MC	B	5188	5991	6965	8086	8276		.81
	AF	NB	6866	7518	8649	9790	10546	9609	1.10
	AF	B	6237	6891	8184	8917	9125		.95

TABLE A-6

PERCENTAGE DISTRIBUTION OF YEAR ACTIVE DUTY BEGAN FOR VETERANS AND ENLISTED MEN, BY SERVICE

Year	A	N	MC	AF
		Veterans		
1963	.43	.43	–	.43
1964	1.04	14.24	14.58	20.62
1965	9.15	36.40	30.80	64.51
1966	57.29	21.88	41.54	10.96
1967	31.21	24.71	11.18	1.76
1968	.89	2.33	1.90	1.73
		Enlisted Men		
1963	15.41	17.69	12.50	17.59
1964	15.64	18.77	15.07	15.91
1965	17.49	22.29	18.09	17.28
1966	23.18	18.98	26.41	22.62
1967	28.29	22.27	27.93	26.60

TABLE A-7

RATIO OF RMC TO VETERAN EARNINGS IN 1973
BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	Non-black	Black
< 12	Low	1.11	1.30
	Med.	1.10	1.29
	High	1.08	1.20
	All	1.11	1.30
12	Low	.93	1.07
	Med.	.94	1.02
	High	.90	.92
	All	.92	1.03
> 12	Low	.87	1.01
	Med.	.83	1.08
	High	.79	.90
	All	.80	.99

[a] Low, < 31; med., 31-46; high, > 46.

TABLE A-8

RATIO OF RMC TO VETERAN EARNINGS, 1969-74,
BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	1969	1970	1971	1972	1973	1974
				Non-black			
<12	Low	1.15	1.15	1.19	1.17	1.11	1.20
	Med.	1.18	1.14	1.16	1.17	1.10	1.17
	High	1.09	1.11	1.14	1.13	1.08	1.14
12	Low	.93	.92	.95	.97	.93	1.00
	Med.	.94	.93	.96	.97	.94	1.00
	High	.92	.91	.94	.94	.90	.95
>12	Low	.98	.86	.93	.92	.87	.94
	Med.	.91	.83	.86	.85	.83	.85
	High	.86	.81	.83	.83	.79	.81
				Black			
<12	Low	1.40	1.38	1.41	1.37	1.30	1.50
	Med.	1.42	1.34	1.37	1.31	1.29	1.31
	High	1.36	1.29	1.37	1.20	1.20	1.53
12	Low	1.17	1.11	1.12	1.10	1.07	1.18
	Med.	1.09	1.09	1.10	1.07	1.02	1.12
	High	.99	.97	.99	.95	.92	.98
>12	Low	1.08	1.01	1.05	.99	1.01	1.05
	Med.	1.18	1.08	1.14	1.17	1.08	1.19
	High	.89	.83	.91	.96	.90	.87

[a] Low, <31; med., 31-46; high, >46 .

TABLE A-9

REGULAR MILITARY COMPENSATION, 1969-74,
BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	1969	1970	1971	1972	1973	1974	Ratio[b]	n
					Non-blacks				
<12	Low	5052	6148	7029	7977	8731	9639	.97	2283
	Med.	5354	6374	7217	8175	8926	9828	.99	2281
	High	5330	6376	7254	8220	8988	9921	1.00	4279
12	Low	4713	5749	6619	7724	8504	9417	.95	8527
	Med.	5015	6057	6920	7972	8760	9688	.98	11067
	High	5203	6260	7158	8162	8949	9894	1.00	52857
13-15	Low	5065	6096	6970	7996	8824	9755	.99	352
	Med.	5114	6159	7055	8080	8882	9824	.99	603
	High	5285	6362	7278	8280	9069	10038	1.02	9299
>15	Low	4808	5869	6838	8002	8783	9762	.99	17
	Med	4988	6115	6994	8104	8877	9894	1.00	45
	High	5272	6357	7268	8272	9054	10010	1.01	427
					Blacks				
<12	Low	5219	6312	7170	8092	8842	9739	.98	996
	Med.	5472	6488	7319	8251	9005	9909	1.00	510
	High	5379	6385	7259	8198	8976	9892	1.00	325
12	Low	5132	6215	7058	8039	8810	9736	.98	5016
	Med.	5271	6291	7119	8115	8882	9810	.99	3438
	High	5222	6261	7130	8118	8896	9828	.99	3374
13-15	Low	5420	6464	7314	8260	9026	9977	1.01	337
	Med.	5494	6515	7341	8286	9055	9999	1.01	279
	High	5398	6448	7319	8284	9034	10005	1.01	463
>15	Low	5162	6259	7132	8053	8857	9819	.99	14
	Med.	5642	6735	7597	8506	9239	10204	1.03	13
	High	5481	6415	7309	8249	9011	9801	.99	21

[a]Low, <31; med. 31-46; high, >46.

[b]Ratio of 1974 RMC to that of non-blacks with Educ.=12 and AFQT=high.

TABLE A-10

VETERAN EARNINGS, 1969-74, BY RACE, EDUCATION, AND AFQT SCORE

Educ.	AFQT[a]	Race	1969	1970	1971	1972	1973	1974	Ratio[a]
<12	Low	Black(406)[c]	3725	4568	5088	5921	6794	6486	1.24
		Non-black (2108)	4393	5342	5911	6827	7852	8035	
	Med.	Black(110)	3865	4844	5351	6314	6959	7562	1.11
		Non-black (1279)	4528	5604	6234	6973	8136	8401	
	High	Black(23)	3949	4953	5306	6859	7484	6451	1.35
		Non-black (1019)	4870	5752	6364	7300	8332	8734	
12	Low	Black(942)	4372	5617	6289	7292	8240	8242	1.14
		Non-black (2485)	5075	6302	6962	7990	9115	9399	
	Med.	Black(391)	4823	5750	6451	7583	8700	8788	1.11
		Non-black (3655)	5329	6485	7213	8258	9340	9711	
	High	Black(228)	5279	6467	7230	8568	9648	10034	1.04
		Non-black (10,352)	5645	6881	7590	8709	9901	10404	
>12	Low	Black(63)	4992	6416	6951	8349	8965	9499	1.09
		Non-black (93)	5133	7015	7463	8677	10085	10379	
	Med.	Black(45)	4650	6055	6463	7108	8419	8408	1.37
		Non-black (241)	5597	7374	8206	9499	10726	11517	
	High	Black(39)	6096	7740	8071	8658	10085	11439	1.08
		Non-black (2583)	6144	7891	8781	9994	11464	12399	

[a] Low, <31; med., 31-46; high, >46.

[b] Ratio of non-black to black 1974 earnings.

[c] Number of observations.

TABLE A-11

DEPARTMENT OF DEFENSE OCCUPATIONAL CATEGORIES AND THE PERCENT OF VETERANS IN RELATED CIVILIAN OCCUPATIONS

	Percent in Related Civilian Occupation[1]
0 INFANTRY, GUN CREWS AND SEAMANSHIP SPECIALTIES	
01 Infantry	1.1
02 Armor and Amphibious	0.0
03 Combat Engineering	8.4
04 Artillery/Gunnery, Rockets and Missiles	7.0
05 Combat Air Crew	-
06 Seamanship	0.0
1 ELECTRONIC EQUIPMENT REPAIRMEN	
10 Radio/Radar	29.8
11 Fire Control Electronic Systems (Non-Missile)	7.5*
12 Missile Guidance Control and Checkout	8.3
13 Sonar Equipment	0.0*
14 Nuclear Weapons Equipment	0.0*
15 ADP Computers	52.2*
16 Teletype and Cryptographic Equipment	23.3
19 Other Electronic Equipment	10.5*
2 COMMUNICATIONS AND INTELLIGENCE SPECIALISTS (Primarily operators of complicated equipment)	
20 Radio and Radio Code	9.4
21 Sonar	-
22 Radar and Air Traffic Control	9.5
23 Signal Intelligence Electronic Warfare	7.1
24 Military Intelligence	9.6*
25 Combat Operations Control	10.5
3 MEDICAL AND DENTAL SPECIALISTS	
30 Medical Care	9.1
31 Technical Medical Services	46.8*
32 Related Medical Services	3.2*
33 Dental Care	20.4*
4 OTHER TECHNICAL AND ALLIED SPECIALISTS	
40 Photography	34.7*
41 Drafting, Surveying and Mapping	32.7
42 Weather	6.0*
43 Ordnance Disposal and Diving	0.0*
44 Scientific and Engineering Aides	76.9*
45 Musicians	28.9*
49 Technical Specialists, NEC	6.3*

[1]dash (-) means no observations, asterisk (*) means percentage based on less than 100 observations.

TABLE A-11 (Cont'd)

		Percent in Related Civilian Occupations
5	ADMINISTRATIVE SPECIALISTS AND CLERKS	
50	Personnel	15.3
51	Administration	28.3
52	Clerical/Personnel	11.7*
53	Data Processing	62.7
54	Accounting, Financing and Disbursing	30.2
55	Supply and Logistics	23.7
56	Religious, Morale and Welfare	2.5*
57	Information and Education	43.6*
58	Communications Center Operations	11.2
6	ELECTRICAL/MECHANICAL EQUIPMENT REPAIRMEN	
60	Aircraft	22.0
61	Automotive	24.0
62	Wire Communications	18.2
63	Missile Mechnical and Electrical	6.5*
64	Armament and Munitions	0.0
65	Shipboard Propulsion	23.8
66	Power Generating Equipment	15.2
67	Precision Equipment	27.7*
68	Aircraft Launch Equipment	14.8*
69	Other Mechanical and Electrical Equipment	5.0*
7	CRAFTSMEN	
70	Metalworking	34.7
71	Construction	33.2
72	Utilities	37.2*
73	Construction Equipment Operators	29.0
74	Lithography	43.5*
75	Industrial Gas and Fuel Production	0.0*
76	Fabric,Leather and Rubber	4.0*
78	Firefighting and Damage Control	11.4*
79	Other Craftsmen, NEC	0.0*
8	SERVICE AND SUPPLY HANDLERS	
80	Food Service	12.7
81	Motor Transport	18.6
82	Material Receipt, Storage and Issue	15.2
83	Military Police	7.6
84	Personal Service	0.0*
85	Auxiliary Labor	0.0*
86	Forward Area Equipment Support	6.6*

APPENDIX B

PROCEDURES FOR ESTIMATING MILITARY COMPENSATION FOR ENLISTED PERSONNEL:
Data Preparation for the QRMC

APPENDIX B

PROCEDURES FOR ESTIMATING MILITARY COMPENSATION FOR ENLISTED PERSONNEL: Data Preparation for the QRMC

Active duty military personnel may receive a wide variety of monetary and non-monetary income. This appendix describes the various types of income, presenting reasons for the exclusion of some of them and explaining how others of them were estimated for 1974. It also deals briefly with the methods used to create longitudinal earnings profiles for the years 1969 through 1974. (The research results based on these data are presented in the main text of this report and in CRC 316.)

BASIC PAY

Active Duty Basic Pay is received by all enlisted personnel. Its amount depends on the paygrade (rank) and length of service. The Manpower Resources Data Analysis Center's (MARDAC) Enlisted Master Record tapes contain information on current paygrade, Date of Current Pay Grade (DCPG), and Pay Entry Base Date (PEBD) for all enlisted personnel as of the end of various calendar quarters. Annual basic pay can be estimated from these three data elements. For example, if a man's PEBD is 1 July 1964, his paygrade as of 31 December 1974 is E6, and his DCPG is November 1974 (day of month is not given), then his 1974 Basic Pay estimate is $6668.10:

Pay schedule in effect through 30 September 1974 --	
6 months at E5, over 8 years, @ $528.00	$3168.00
3 months at E5, over 10 years, @ $547.20	1641.60
Pay schedule as of 1 October 1974 --	
1 1/2 months at E5, over 10 years, @ $591.60	887.40
1 1/2 months at E6, over 10 years, @ $647.40	971.10
Total Active Duty Basic Pay	$6668.10

A data set has been created on computer tape, containing information for all male enlisted personnel with Basic Active Service Dates (BASDs) between 1 January 1963 and 31 December 1967 who appear on MARDAC's master tapes for 31 December 1974, 1973, and 1972 (the only year-end tapes available) and 30 June 1971 (the earliest tape).[1]

[1] Of the 170,579 observations with 1963-67 BASDs who are in the 31 December 1974 data file, 157,167 were matched with records from the three other data files. According to R. Brandawee of MARDAC, most of the match failures probably occurred because not all service numbers on the 31 June 1971 tape have been changed to Social Security numbers; Social Security numbers served as the basis for all matches.

The Basic Pay estimates for 1973 and 1972 were calculated by the method illustrated above for 1974, using data as of 31 December 1973 and 31 December 1972, respectively. The necessary assumption, that only one promotion occurred in a calendar year, seems eminently reasonable, for these men have been on active duty for at least 4 years by 1972.

The procedure for the 1971 estimate was identical in principle. However, information from both the June 1971 and December 1972 master tapes was used, the latter when a promotion had been received during the second half of 1971. For the 1970 and 1969 estimates, information from the 1971 tape was combined with the assumption, necessitated by the absence of data for those earlier years, that each man was in his next lower paygrade for 18 months. If the DCPG on the 30 June 1971 tape was 30 June 1970 or earlier, it was assumed that no other promotion was received between 1 January 1969 and that date. If the DCPG was between 1 July 1970 and 30 June 1971, it was assumed that another promotion had occurred exactly 18 months before the one reported in our data. For example, if the DCPG for an E5 was November 1970, he was assumed to have held that rank since May 1969.

Obviously, in many cases 18 months understates the length of time in the next lower paygrade. Although in a few cases 18 months may overstate time in grade, it is likely that Basic Pay (and other compensation based on paygrade) is on average understated slightly for 1969.

CASH ALLOWANCES

In addition to Basic Pay, enlisted personnel receive various types of allowances as well as income in kind. It is not possible with the existing data set to estimate all of the allowances received. However, this is not too serious a problem, for certain of the allowances for which an enlisted man may qualify have off-setting costs which are unique to military, vis-a-vis civilian, careers. For other types of allowances, similar reimbursements are commonly made in civilian jobs if such costs occur. Clothing allowances, family separation allowances, dislocation allowances, overseas cost of living allowances, travel allowances to new or temporary duty stations, and payment for unused leave are in these categories. The data do not include information on these allowances but, to the extent that they represent reimbursement of unusual expenses, their exclusion does not misstate net earnings. Because similar reimbursements do not appear in the Social Security earnings records for veterans who receive them, comparability between the two groups should not be impaired.

Because civilians do not generally receive compensation for expenditures on food and housing, the amounts received by men in the Armed Forces for Basic Allowance for Quarters (BAQ) and Subsistence (rations) were added to their Basic Pay in estimating total income. Where housing and rations are provided in lieu of allowances, the value of those services is assumed to be equal to the cash payment which would otherwise have been

made. That is, the amount of the allowances for which a man is eligible was included in estimates of his compensation whether he received services in kind or cash payments. This is the convention normally employed in estimating all cash RMC (Regular Military Compensation), which is commonly used for comparing military and civilian compensation.

The amount of the BAQ varies with the presence or absence of dependents and with rank. Until 1971 BAQ varied also with number of dependents for ranks below E-5 with length of service less than 4 years. Throughout the 1969-1974 period, in ranks E5 and above, however, quarters allowances have varied only with presence or absence of dependents. The value of the quarters provided does increase with family size, a variation not accounted for in these estimates. In general, the cash value of BAQ overstates the value of the service provided to unmarried, low-paygrade men living in barracks and may understate the value of housing provided to married men, especially those with several dependents.

In order to use the information in MARDAC's data files to calculate each year's total BAQ payments, it was necessary to assume that there was no change in dependency status during the period covered by each file. Thus, if a man had dependents during only part of a year -- say 1973 -- his BAQ has erroneously been calculated as if his year-end dependency status obtained all year. Except for E4s and below during 1969-1971, only the presence or absence -- not the number -- of dependents affected BAQ.

The Subsistence rate is invariant among all enlisted men, and its cash value for each year has been included in the estimated total compensation profile for each observation.

TAX ADVANTAGE

These housing and food allowances are not subject to income tax, while money spent by civilians on food and housing comes from net (after-tax) income. Therefore, in comparisons of military and civilian income, military compensation should be adjusted to reflect each man's tax-saving on allowances. Otherwise, military compensation is understated. The amount of the adjustment which should be made depends on the man's marginal tax rate and on the amount of his non-taxable allowances. Since some of the information needed to determine each man's marginal tax bracket was not available, the figures used for each man's tax advantage were derived from the average figures which have been used by the Services in estimating RMC. The dollar amounts are rank and calendar-year specific. They are based on the assumption that all allowances are received in cash; they use average characteristics for personnel in each paygrade. Since they assume there is no other family income and that standard deductions are used, the marginal tax rate used in the tax advantage calculations is inaccurate. The first assumption produces an understatement in the tax rate (and the tax advantage) that probably is not offset by the overstatement produced by the latter assumption.

Military personnel also are less likely to pay state and local income taxes on any of their military compensation. This is due in part to their being able to choose a state of residence that is not necessarily the state in which they are stationed and in part to the fact that many states do not bother to collect taxes from military personnel. Measurement of this advantage is not possible here, but this further increases the understatement of each man's military compensation relative to civilian workers.

The four components of compensation which have been estimated for each individual in the 1963-1967 BASD cohort are the same elements of the RMC calculations as heretofore have been available only for very broad groups within the military: Basic Pay, allowance for quarters, allowance for subsistence, and tax advantage. With this data set, direct comparisons can be made between RMCs for any sub-groups which can be identified within the Armed Forces, and RMC for groups at interest can be compared with the earnings of comparable groups of veterans from the same entry cohort.[1]

OTHER ALLOWANCES AND BENEFITS

Users of these RMC estimates should bear in mind that certain omissions from total military compensation result in an understatement of military incomes relative to civilian incomes, although comparisons of groups within the military may be unaffected. For example, no attempt was made to measure the value to military families of being able to purchase food and most other items at discounts in commissaries and PXs, to fly on civilian airlines at reduced fares, to receive free medical and, at some duty stations, free dental services, to retire at a young age, and to patronize heavily-subsidized recreation facilities. Not only military-civilian comparisons but also intra-military comparisons are affected by the omission from MARDAC's data files of information on special and incentive pays such as hostile fire pay (currently $65/month), sea and foreign duty pay ($8.00 to $22.50/month, depending on paygrade), diving pay ($65 to $110/month), and hazardous duty pay ($50 to $105/month for aviation and submarine crewmen, $55/month for others). The omission of these portions of total pay will tend to reduce both the average level and the variance of measured military pay. When civilians receive compensating differentials for dangerous or onerous work, the amount of that compensation is normally included in their reported incomes.

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[1] RMC estimates were prepared for 140,907 of the 157,167 records matched from the 1971-1974 data tapes. 16,260 records were eliminated: 1070 were females; 479 did not have a reasonable Pay Entry Base Date -- i.e., between 1953 and 1967; 14,078 lacked the Date of Current Pay Grade year; 626 were not in paygrades E3 through E9; 5 were reported in ranks E8 and E9 without sufficient time in service; and 2 had invalid codes for dependency statues.

RE-ENLISTMENT BONUSES AND PROFICIENCY PAY

Understatement of the average level and the variance of military incomes results also from the lack of reliable information on the receipt of re-enlistment bonuses and Pro Pay. An analysis of the indicators on MARDAC's data tapes for Variable Re-enlistment Bonus Multiplier (VRBM) and Pro Pay confirmed the warnings of several MARDAC staff members: there are severe shortcomings and serious inconsistencies in the codes provided by each of the services.

For both Pro Pay and VRBM there is no information available earlier than 31 December 1972. The earliest information on dates of current reenlistment is on the 30 June 1971 data tape. All of the men being studied were eligible for Regular Re-enlistment Bonuses (RRB);[1] however, for many of them the date of first re-enlistment and paygrade at re-enlistment cannot be determined. Some of the men were already into their second re-enlistment by the date of the earliest available data file. It is not possible to determine whether they were still eligible for an RRB at that time. Although the timing of the receipt of an RRB cannot be determined, each man may be assumed to have received $2000.00 as a re-enlistment bonus or bonuses. (The payment equals monthly Basic Pay times the number of years of the re-enlistment for the first re-enlistment; two-thirds of monthly Basic Pay times number of years for the second; one-third for the third; and one-sixth for the fourth. The total throughout a military career may not exceed $2000.00 .)

Before 1 June 1974, all men who re-enlisted before 90 days following the end of their active obligated service were eligible for an RRB, with a lifetime maximum of $2000. Some men received, in addition, VRB equal to a multiple, from one to four, of their RRB, up to a maximum of $8000. In 1974 VRB was replaced by Selective Re-enlistment Bonuses (SRB). Men could receive either SRB or RRB, but not both. Since a maximum of $12,000 ($15,000 for Navy Nuclear Power NECs) can be received, the omission of VRB and SRB from compensation seriously understates some military incomes. Moreover, not all personnel receive these bonuses, so the variance of incomes within the military is understated also. As the data in table B-1 suggest, the Service reporting of VRBM is inconsistent. Also, as explained above, the amount of VRB or SRB cannot be determined in cases identified as receiving bonuses: it is difficult to determine which re-enlistment a man is in, his Basic Pay at re-enlistment, whether he received a lump sum or annual payments, and -- for SRB calculations -- the number of years of "additional obligated service". That number will not equal the number of years of the current enlistment if the previous enlistment was terminated by "shorting out" -- i.e., re-enlisting before the end of that enlistment period.

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[1] A few men may have not received RRBs; this would occur if more than three months elapsed between the termination of one enlistment and the date of the subsequent re-enlistment.

TABLE B-1

PROPORTION HAVING NON-ZERO VARIABLE RE-ENLISTMENT BONUS MULTIPLIER, BY YEAR OF DATA FILE AND SERVICE

Year	Army	Navy	Marine Corps	Air Force
1972	.521	.478	.0	.225
1973	.190	.485	.0	.225
1974	.129	.489	.0	.0

Pro Pay estimation also presents problems. There are three categories of Proficiency Pay: critical specialties, special duty assignments, and superior performance. In critical specialties a man may qualify for monthly payments of $50 to $150. Special duty pay adds $50/month to the pay of drill sergeants and career counselors and $50/month to $150/month for recruiters, depending on the amount of time as a recruiter; the number of months as a recruiter cannot be determined from the MARDAC tapes. For superior performance, qualifying Air Force personnel may receive $30/month and Army and Marine Corps personnel, $50/month; this pay is not available to Navy men.

In this data set there are some problems in determining the Pro Pay code for each recipient. None of the services reported Proficiency Pay ratings in the 30 June 1971 data. The Pro Pay codes for men in the Air Force ranged from 1 to 9, not 1 to 4, on the 1972 and 1973 data tapes; all 1974 codes were non-integer. For Marine Corps recipients, 1973 and 1974 codes ranged from 1 to 8; in 1974 there were also some non-integer codes. Moreover, the proportion of Marines with non-zero Pro Pay codes in 1974 was .478, which appears too high when compared with the 10 percent of total Service strength reported by the Marine Corps to be receiving Proficiency Pay.[1]

MARDAC personnel do not know how to interpret the Pro Pay codes, particularly those outside the 0-4 range. But the problem of assigning dollar values to Pro Pay recipients is even more complex, for a given code does not correspond to a single monthly amount. There have been many variations in the Pro Pay programs during 1969-74; and, in recent years, the programs have been in the process of phasing out. As an example, in 1974, Navy men with the same Pro Pay code could have been receiving monthly Pro Pay of $50.00, $75.00, $100.00, or $150.00 .

Although the Proficiency Pay and VRBM codes are inadequate for assigning reasonably precise dollar amounts to each observation, they provide some useful information. When the earnings of groups are being compared, the average earnings in 1972-1974 can be interpreted in the light of the proportion of men in a sub-group who reportedly were re-

[1] Calculated from data provided by Mrs. Alice Mackey of the Quadrennial Review of Military Compensation staff.

ceiving either type of incentive pay and the average (per recipient) amount of that type of pay for his service.

SUMMARY

The estimates of Regular Military Compensation used in this study (and in CRC 316) should reflect very accurately the true values. Because of the time-in-grade assumption sometimes applied to early promotions, a few 1969 RMC estimates may be too low. If the amount of BAQ on the average understates the value of housing received, this also biases the RMC estimates downward; this is especially likely to hold for men with several dependents.

Such omissions from total pay as the reduced likelihood of paying state and local taxes, receipt of Regular Re-enlistment Bonuses, and discounts on PX purchases also understate military incomes relative to civilian incomes. As in the case of the two biases already summarized, this downward bias should not invalidate intra-military earnings comparisons.

The absence of information on hazardous duty pay does reduce the validity of intra-military comparisons, but only for a small number of occupational specialties. Variable Re-enlistment Bonuses and Proficiency Pay were received by a larger minority of military personnel. If VRBs and Pro Pay are not distributed evenly among sub-groups being compared, not only military-civilian earnings comparisons, but also intra-military comparisons, may be misleading if only RMC is used to measure earnings of enlisted personnel. Even though some components of total compensation are not measured, the omissions are not large, and this is the first data set that allows researchers to analyze the actual earnings profiles of sub-groups of enlisted personnel, rather than relying on hypothetical profiles based on assumed promotion rates, etc., or using only very broadly-defined groups within the Armed Forces.

APPENDIX C

SELECTING THE COHORT OF ENLISTED MEN

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SELECTING THE COHORT OF ENLISTED MEN

This appendix describes the results of a sensitivity analysis which was performed to determine the effect on military-civilian pay ratios of the criterion used for selecting the group of enlisted men to be studied. The difference in military pay engendered by an additional year of military service is, at the most, 4 percent (table C-4). Because there is not a large variation in Regular Military Compensation (RMC) between men in successive enlistment years, it seemed likely that, within reasonable limits, the cohort selected for comparison with a sample of veterans would have only a small effect on the RMC estimates. Therefore, and for the sake of simplicity, all currently enlisted men with Basic Active Service Dates (BASD) between 1963 and 1967 were studied. These BASD years were chosen because nearly all of the sample of veterans had entered service during those years.

This unweighted average of RMC is actually a weighted average of the RMCs for several BASD years, the weights being the proportion of currently enlisted men (in the demographic category being analyzed) from the different BASD years. Several other weighting schemes, assigning different relative importance to men entering in each year, had been considered. Pay ratios were recomputed for two sub-samples of the enlisted men using four of these explicit sets of weights. For the sub-group with a military-civilian pay ratio, using the "unweighted" group of enlisted men, of 1.00, these explicit weights produced ratios between 1.00 and 1.02; for the sub-group which had a reported pay ratio of 1.18, the various sets of weights yielded ratios of 1.17 and 1.18 . Because of the small differences in RMC from BASD year to BASD year and because the various weighting schemes do not produce greatly different average entry dates, the selection criterion used, with respect to BASD year, did not affect the outcome of the calculations or the conclusions of the study.

Several criteria for choosing a sample of enlisted men who were comparable to the group of veterans were considered. Among these were that the two groups of men should have left school or entered the labor force at the same time, entered military service at the same time, or completed their first term of enlistment at the same time. After much deliberation, the decision was made to study all currently enlisted men whose first tour of military service ended in FY 1969;[1] however, it was not possible to determine the date of the end of the first enlistment for the currently enlisted

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[1] All of the veterans separated from active duty in FY 1969 with a reserve obligation; very few of them would have completed two tours of duty. "Currently enlisted" men are those men still on active duty as of 31 December 1974.

men. The most relevant information that was available was the Basic Active Service Date for each enlisted man and each veteran. Nearly all of the veterans entered service between 1963 and 1967. To maximize sample size and minimize sampling error, to simplify computation and exposition, and to keep costs and delays within reasonable limits, the simplest possible selection criterion was chosen: all enlisted men with BASDs between 1963 and 1967 were included in the analyses of military pay. It seemed likely that the average reenlistment dates for these men occurred in FY 1969 -- probably early in the year for Army and Navy men and late in the year for Air Force men. If it had turned out that the criterion used was seriously inadequate, re-weighted averages could have been calculated from these data; however, as is described below, a sensitivity analysis proved that the choice of including all men from the 1963-67 BASD cohort did not significantly affect the outcome of the analyses.

An alternative approach, which was eventually rejected, was to choose enlisted men by their BASD year in proportion to the distribution of the veterans by their BASD year (table C-1). There were several reasons for rejecting this procedure. First, it was known that voluntary enlistees were more likely to remain in service than inductees (and draft-induced enlistees[1]). Enlistees generally served a longer first tour than inductees at this time (except in the Air Force) and would have entered service earlier than inductees with the same End of Active Obligated Service (EAOS) date. Additionally, it appears that enlistees who chose longer first enlistment options were more likely to remain in the military after that enlistment. For these reasons, it was obvious that enlisted men currently on active duty who first reenlisted in FY 1969 would not have the same distribution of BASD years as veterans who left service during that year. Rather, more of the enlisted men (except in the Air Force) were expected to have early BASD years.

Even if the proper sampling proportions for each BASD year could have been determined, a second problem would have remained. It still would not have been possible to identify those enlisted men with 1963 and 1964 BASDs who had long first obligations and those men from later years with short first term obligations. If both the BASD year and the length of the first obligation affected subsequent promotion rates and RMC, the pay for the relevant comparison group still would not have been measured.

A third problem with using alternative weighting schemes was that they would have increased the costs and time required to prepare the data and perform the empirical analysis. Moreover, the exposition of the results would have been more complicated and confusing without, as the sensitivity analysis showed, being more reliable or informative.

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[1] Throughout this discussion, enlistee refers to voluntary enlistee and inductee refers to draftee or draft-induced enlistee.

TABLE C-1

FREQUENCY DISTRIBUTION OF VETERANS, BY SERVICE AND BASD

Year	A	N	AF	MC[a]	All
1963	.0043	.0043	.0043	-	.0039
1964	.0104	.1424	.2062	.1458	.0643
1965	.0915	.3640	.6451	.3080	.2148
1966	.5729	.2188	.1096	.4154	.4532
1967	.3121	.2471	.0176	.1118	.2509
1968	.0089	.0233	.0173	.0190	.0129

[a] Figures for MC pay were not used in the calculations presented in the text because the AFQT scores were not available for assigning Marines to AFQT categories.

The fourth problem in determining the ideal proportion of men to sample from each BASD year is that there is, indeed, no "ideal" to attempt to match. Even if the goal were to match the BASD year distribution of the veterans -- i.e., ignoring the first objection described above, there is no way to determine the appropriate level of disaggregation at which to match proportions. That is, a sample could be drawn from the DoD files which would match the last column of table C-1 -- with 25 percent having a 1967 BASD year, 45 percent from 1966, 21 percent from 1965, and so on. This would have produced a sample whose BASD year distribution would not have fit well that of any of the four services (compare that column with the other four columns of table C-1). Separate sampling ratios, for each service could be used, at an increase in time and money costs; but this would still not be a well-matched sample, for it could be argued that further disaggregation is desirable. For example, there are differences by race in the BASD distributions within each service.[1] There are no generally accepted standards for determining which variables should be considered

[1] As a case in point, for veterans of the Army, 58.92 percent of the non-blacks had a 1966 BASD and 30.43 percent had a 1967 BASD, while 49.40 percent of the blacks had a 1966 BASD and 39.47 percent had a 1967 BASD.

when attempting to match the samples, and, in fact, the desired level of disaggregation depends on what comparisons are being made. Probably ideally a different sample would be needed for each set of comparisons, depending on what variables are used to categorize the veterans and enlisted men.

Given these reasons for not adopting a sophisticated sampling or weighting scheme for the enlisted men and because it appeared that any reasonable weighting scheme would yield results not significantly different from any other, the simplest approach was used. All men with BASD years between 1963 and 1967 were included in the study. Table C-2 presents the distribution of BASD years actually observed for the enlisted men. (The sampling ratios for the BASD years have, of course, no effect on inter-service comparisons.)

TABLE C-2

FREQUENCY DISTRIBUTION OF ENLISTED MEN,
BY SERVICE AND BASD YEAR

Year	A	N	AF
1963	.1541	.1769	.1759
1964	.1564	.1877	.1591
1965	.1749	.2229	.1728
1966	.2318	.1898	.2262
1967	.2829	.2227	.2660

That the choice of the simplest approach had little effect on the reliability of the results can be observed from the results of a sensitivity analysis performed on a subset of the data. The two groups studied were non-black high school graduates with low AFQT scores (≤ 30) and black high school graduates with low AFQTs. They were chosen because both had large numbers of observations and because one had a ratio of RMC to veteran pay of 1.00 and the other, a ratio of 1.18 . In addition, their dispersion of RMC by BASD is slightly greater than average, so they would be more sensitive to weighting choices; however, all differences in RMC by BASD are quite similar across race-education-AFQT categories.

The sample sizes are presented in table C-3. These figures are the implicit weights used in RMC calculations presented in the text, for each man with a 1963-67 BASD year carried equal weight in the calculations. These weights have been combined with the RMC figures in table C-4 to calculate the results presented in row (1) of

tables C-5a and C-5b.[1] The weights for the individual services are (from table C-3) the actual proportions of that service's low AFQT high school graduate non-blacks (or blacks) in each BASD year. The all-service average RMC is the average of the three services weighted by the proportion of all military men in the low AFQT, high school graduate, non-black (or black) category who were in each service.[2] These two all-service figures, $9418 for non-black and $9736 for black low AFQT high school graduates, appear in text table 1 (rounding error, due to truncation in the computer calculations occurs in one instance).

TABLE C-3

NUMBERS OF ENLISTED MEN BY RACE, SERVICE, AND BASD YEAR

(Low AFQT high school graduates)

	Non-black (n=8527)			Black (n=5016)		
Year	A	N	AF	A	N	AF
1963	322	467	148	476	108	193
1964	278	708	121	426	84	108
1965	345	1105	227	437	103	353
1966	723	846	501	659	38	407
1967	850	825	1061	713	76	835
All	2518	3951	2058	2711	409	1896
Proportion, service: all DoD	.2953	.4634	.2413	.5405	.0815	.3780

[1] For example, for AF blacks, 9317=(9834·193+9720·108+9524·353+9324·407+9054·835)/1896.

[2] The weights are the proportions in the last row of table C-3.

TABLE C-4

1974 RMC BY RACE, SERVICE, AND BASD YEAR

	Non-black			Black		
Year	A	N	AF	A	N	AF
1963	$10,630	$9,842	$9,977	$10,683	$10,376	$9,834
1964	10,380	9,514	9,768	10,424	10,173	9,720
1965	10,084	9,256	9,495	10,106	9,750	9,524
1966	9,748	8,970	9,366	9,796	9,704	9,324
1967	9,400	8,657	9,126	9,422	9,331	9,054

The computations yielding the results in row (weighting scheme) (2) of tables C-5a and C-5b for each of the three services were based on weights from table C-2, the proportion of all men in that service with BASD 1963 through 1967, regardless of race, education, or AFQT score. The all service average was calculated from those figures using the same weights as in the weighting scheme (1) calculations -- the proportion of low AFQT high school graduate non-blacks (or blacks) in the military who were in each of the three services.

An estimate for each service was made using as weights for the five BASD years the proportion of all that service's veterans (FY 1969 separatees) -- regardless of race, education, or AFQT score -- who entered in the respective BASD year. (See the first five rows of the first three columns of table C-1.) These figures provide a "lower bound" estimate for the Army and Navy, as explained above. These figures, by service, were combined into all-service averages, using three different weighting schemes, and the results are presented in the fourth column of rows (3), (4), and (5) of tables C-5a and C-5b.

In the first instance, weighting scheme (3), the RMC figure for each service was weighted by the proportion of all low AFQT non-black (or black) high school graduates who are in that service.[1] The figures in weighting scheme (4) combine the individual

[1] The weights are the proportions in the last row of table C-3.

TABLE C-5

1974 RMC BY RACE AND SERVICE, CALCULATED USING VARIOUS WEIGHTS

a. Non-blacks

Weighting scheme	A	N	AF	All[a]	Ratio[b]
(1)	$9,859	$9,185	$9,324	$9,418	1.00
(2)	9,943	9,220	9,496	9,500	1.01
(3)	9,680	9,080	9,533	9,367	1.00
(4)	9,680	9,080	9,533	9,564	1.02
(5)	9,680	9,080	9,533	9,557	1.02

b. Blacks

	A	N	AF	All[a]	Ratio[c]
(1)	10,002	9,920	9,317	9,736	1.18
(2)	9,979	9,838	9,439	9,763	1.18
(3)	9,717	9,698	9,536	9,647	1.17
(4)	9,717	9,698	9,536	9,691	1.18
(5)	9,717	9,698	9,536	9,697	1.18

[a] Excludes MC

[b] Ratio of all RMC to 1974 non-black veteran earnings of $9,399.

[c] Ratio of all RMC to 1974 black veteran earnings of $8,242.

service figures, derived using the veterans' BASD year proportions as weights, using as service weights the proportions of all veterans (regardless of race, education, and AFQT) of each service. The weights are given in the first row of table C-6 and have the same bases as the proportions in table C-1. These results would have been obtained if the enlisted men had been sampled to match the BASD years of the veterans for each service.[1] The "all services" figures in weighting scheme (5) of table C-5 were derived from the same individual service RMCs as for weighting schemes (3) and (4), but the service averages were weighted by the proportion of all non-black (or black) veterans who had been in each service.[2]

TABLE C-6

PROPORTIONS (AND NUMBERS) OF VETERANS, BY RACE AND SERVICE

	A	N	AF	All[a]
All	.7115 (22,318)	.1614 (5,063)	.1271 (3,987)	1.00 (31,368)
Non-black	.6969 (19,697)	.1734 (4,902)	.1296 (3,663)	1.00 (28,262)
Black	.8439 (2,621)	.0518 (161)	.1043 (324)	1.00 (3,106)

[a]Excludes 2,740 non-black and 257 black Marines.

[1]As explained above, this weighting procedure should produce a lower bound estimate for RMC because the Army and Navy BASD dates will be more recent for veterans than they should be for men still in service. However, since the proportion of one-term veterans who were in the Army is much higher than the proportion of careerists who are in the Army, the all-service average for non-blacks is actually slightly higher in weighting scheme (4) than in weighting scheme (1) because Army RMC is much higher for these men than Navy RMC.

[2]See the second and third rows, respectively, of table C-6.

These calculations of all-service RMCs were made for two reasons. First, and foremost, it was crucial to find out whether the choice of weights would affect the conclusions drawn from the study.[1] The ratios of the variously computed RMCs to veteran earnings are presented in the final column of table C-5. For non-blacks the ratio presented in the text of this report is 1.00; using alternative weights, the ratio ranges from 1.00 to 1.02. For blacks, a ratio of RMC to veteran earnings of 1.18 was reported; alternative weights yielded results of 1.17 to 1.18. The decision to include all 1963 to 1967 enlistees -- that is, an implicit weighting by the characteristics of the currently enlisted force instead of an attempt to somehow "match" to the characteristics of the veterans -- did not affect the outcome of the analyses.

A secondary reason for describing several of these weighted averages was to demonstrate that literally dozens of weighting schemes could be devised. There is no consenus as to the theoretically preferable choice. Each reader of this report probably will have his own preference, and no two of these may be the same. Fortunately, however, as the sensitivity analysis using even extreme assumptions demonstrated, the choice of weights does not appear to alter the conclusions in the comparisons of military and veteran pay.

[1] There is, of course, no potential problem in inter-service comparisons from using this simple and straight-forward selection method.

APPENDIX D

STANDARD EMPIRICAL PROCEDURE AND THE PROBLEM OF SELECTIVITY BIAS

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APPENDIX D

STANDARD EMPIRICAL PROCEDURE AND THE PROBLEM OF SELECTIVITY BIAS

This appendix discusses the problem of selectivity bias in analysis of post-service earnings. Standard procedures are described and the bias inherent in them is discussed. The procedure outlined in Maddala (reference 16) for controlling for bias is then described.

To analyze whether military occupational training enhances a veteran's civilian earnings capacity and whether different types of training add differentially to post-service earnings capacity, one might apply two standard empirical procedures to the data. One procedure would be to pool the data into a single equation and estimate a regression which includes a dummy variable for whether the veteran is in a civilian occupation related to his military occupation and interactions between the occupational relatedness dummy and the veteran's military occupation. Significantly different interaction effects indicate that different types of training add differentially to civilian earnings capacity. An alternative procedure would be to estimate separate earnings regressions for those in related civilian jobs and those in unrelated jobs. One would estimate separate regressions if the earnings effects of variables such as education were significantly different for the two groups (or one would estimate separate regressions to test whether effects of such variables were different for the two groups).

The above procedures are quite common. For instance, one would analyze the question of whether college graduates earn more than high school graduates by estimating an earnings regression which includes a dummy variable for whether one has. A basic problem with this procedure is that the decision to attend college (or to take a job in a related civilian occupation) is treated as an exogenous variable. The estimation procedure would provide unbiased estimates of mean earnings differences between college and high school graduates only if individuals were randomly provided with a college education. But the fact that individuals can choose whether or not to go to college implies that the decision to go to college is endogenous. Likewise, individuals are not randomly assigned to civilian occupations after they leave military service, but they choose to enter a related or an unrelated job on the basis of a choice mechanism described below. Again, occupational choice is endogenous, not exogenous, and should be treated accordingly.

Following Maddala, we may show why treating occupational choice as an exogenous variable introduces a bias in earnings comparisons. Assume that upon leaving military service each veteran has two (unobservable) expected incomes, Y_R^* and Y_{UR}^* .

Y_R^* is his expected earnings if he chooses a related civilian job and Y_{UR}^* is his expected earnings if he chooses an unrelated occupation. The individual will choose a related occupation if $Y_R^* > Y_{UR}^*$ or an unrelated occupation if $Y_{UR}^* > Y_R^*$. In this model, occupations are chosen on the basis of expected earnings and nonpecuniary factors are assumed not to play a role.

Assume that Y_R^* and Y_{UR}^* are linear functions of the individual's personal characteristics, his education level, mental ability, race, etc. Denote these variables by the vectors X_R and X_{UR}. Then, we may write,

$$Y_R^* = \beta_R X_R$$

$$Y_{UR}^* = \beta_{UR} X_{UR} \quad . \tag{1}$$

Given the (unobservable) expected earnings Y_R^* (Y_{UR}^*), the actual earnings of individuals finding jobs in the related (unrelated) occupation may be written as,

$$Y_R = Y_R^* + \epsilon_R = \beta_R X_R + \epsilon_R$$

$$Y_{UR} = Y_{UR}^* + \epsilon_{UR} = \beta_{UR} X_{UR} + \epsilon_{UR} \tag{2}$$

where ϵ_R and ϵ_{UR} are error terms that account for the fact that observed earnings will differ from expected earnings. In any given data sample, there will be n_1 individuals finding related jobs and n_2 individuals finding unrelated jobs.

Make the further assumption that if $Y_R^* > Y_{UR}^*$, then $Y_R > Y_{UR}$ (or vice versa).[1] On the basis of this assumption, one will observe an individual choosing a related civilian job if $Y_R > Y_{UR}$ or an unrelated civilian job if $Y_{UR} > Y_R$.

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[1] One might say that this is a strong assumption, but Maddala defends it on the basis that it is hard to formulate a theory of systematic mistakes. In fact, in our data, this assumption might in fact be true. Since each veteran's occupation was observed from a DoD survey conducted ten months after leaving service, it seems reasonable that veterans could have generated offers in both related and unrelated jobs during this time. If this is true and if veterans always took the highest offer, then the assumption that $Y_R > Y_{UR}$ will in fact be true.

Choose related job if:

$$Y_R > Y_{UR} \Rightarrow \beta_R X_R - \beta_{UR} X_{UR} > \epsilon_{UR} - \epsilon_R .$$

Choose unrelated job if:

$$Y_R < Y_{UR} \Rightarrow \beta_R X_R - \beta_{UR} X_{UR} < \epsilon_{UR} - \epsilon_R .$$

Let ϵ_R and ϵ_{UR} be distributed normally. The probability of choosing a related civilian job is,

$$\Pr(Y_R > Y_{UR}) = \Pr(\beta_R X - \beta_{UR} X > \epsilon_{UR} - \epsilon_R) = \Pr(\gamma Z > \epsilon) \qquad (3)$$

where $\epsilon = \epsilon_{UR} - \epsilon_R$ and Z is a vector containing some or all of the elements of X_R and X_{UR}. Since ϵ_{UR} and ϵ_R are distributed normally, ϵ is also distributed normally.

Now we state the difficulty with the standard procedure. The observed earnings Y_R of the n_1 individuals in related jobs are conditional upon $\beta_R X_R - \beta_{UR} X_{UR}$ exceeding ϵ whereas the observed earnings of the n_2 individuals in the unrelated jobs are conditional upon $\beta_R X_R - \beta_{UR} X_{UR}$ being less than ϵ. The error terms in equation (2) are truncated at ϵ and thus have non-zero expectations. Maddala states the following expected values of ϵ_R and ϵ_{UR}:

$$E(\epsilon_R) = -\sigma_{\epsilon,R} \frac{f(\gamma Z)}{F(\gamma Z)} = -\sigma_{\epsilon,R} U_1 \qquad (4)$$

$$E(\epsilon_{UR}) = \sigma_{\epsilon,UR} \frac{f(\gamma Z)}{(1-F(\gamma Z))} = \sigma_{\epsilon,UR} U_2$$

where (1) $f(\cdot)$ is the ordinate of the standard normal density function evaluated at $\gamma Z = \epsilon$, (2) $F(\cdot)$ is the normal distribution function evaluated at γZ, (3) $\sigma_{\epsilon,R}$ is the covariance between ϵ and ϵ_R, and (4) $\sigma_{\epsilon,UR}$ is the covariance between ϵ and ϵ_{UR}.[1]

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[1] It may be shown that,

$$\sigma_{\epsilon,R} = (\sigma_R^2 - \sigma_{R,UR}) / \sigma$$

and

$$\sigma_{\epsilon,UR} = (\sigma_{UR}^2 - \sigma_{R,UR}) / \sigma \text{ where}$$

σ_{UR}^2 = variance of ϵ_R, σ_{UR}^2 = variance of ϵ_{UR}, $\sigma_{R,UR}$ = covariance between ϵ_R and ϵ_{UR}, σ = standard deviation of ϵ. These relations will be useful later.

The expected earnings of those in related jobs and those in unrelated jobs are thus,

$$E(Y_R \mid \text{choose related job}) = \beta_R X_R - \sigma_{\epsilon,R} U_1$$

$$E(Y_{UR} \mid \text{choose unrelated job}) = \beta_{UR} X_{UR} + \sigma_{\epsilon,UR} U_2 \qquad (5)$$

where $U_1 = \frac{f(\gamma Z)}{F(\gamma Z)}$ and $U_2 = \frac{f(\gamma Z)}{1-F(\gamma Z)}$. Because $E(Y_R \mid \text{choose related job}) \neq \beta_R X_R$ and because $E(Y_{UR} \mid \text{choose unrelated job}) \neq \beta_{UR} X_{UR}$, one cannot simply regress Y_R on X_R and Y_{UR} on X_{UR} and use the regressions to predict out earnings for comparison purposes.[1]

Consider a special case. Assume that the X_R and X_{UR} vectors contain all the same variables. Suppose one believed that $\beta_R = \beta_{UR}$ (or estimated separate regressions for those in related and unrelated jobs, tested this hypothesis, and accepted it), then the next step in the analysis would be to pool the data in a single regression and include a dummy for whether the individual is in a related occupation to test the hypothesis that $\beta_{O,R} \neq \beta_{O,UR}$ (i.e., the constant terms are different). The regression coefficient for occupational relatedness $\hat{\delta}$ would be interpreted as an estimate of $\beta_{O,R} - \beta_{O,UR}$. The problem is that the expected value of $\hat{\delta}$ is $(\beta_{O,R} - \sigma_{\epsilon,R} U_1) - (\beta_{O,UR} + \sigma_{\epsilon,UR} U_2)$ and not $\beta_{O,R} - \beta_{O,UR}$. The direction and magnitude of the bias depends upon the values of $\sigma_{\epsilon,R}$, $\sigma_{\epsilon,UR}$, U_1, and U_2. One now sees the sense in which self-selectivity imparts a bias in the standard procedure.

Maddala (reference 16, pp. 8-10) provides a discussion of when the bias will be positive and when it will be negative. It is not clear, in general, which way the bias will run. The direction of bias depends upon the values of σ_R^2, σ_{UR}^2, and $\sigma_{R,UR}$. The direction of the bias may be inferred from the estimated values of $\sigma_{\epsilon,R}$ and $\sigma_{\epsilon,UR}$. The direction of bias in the present work is discussed below.

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[1] If U_1 and U_2 are omitted from the regression and they are correlated with X_R and X_{UR}, respectively, the parameter estimates $\hat{\beta}_R$ and $\hat{\beta}_{UR}$ will be biased.

Maddala suggests a simple way to handle the problem. First, using probit (or logit), estimate the parameter vector γ in the function $Pr(\gamma Z > \epsilon)$. Use the estimated parameter vector to construct the variables U_1 and U_2. Estimate an earnings regression for those in related jobs including U_1 in the equation and do likewise for those in unrelated jobs including U_2. The estimated equations may then be used to predict out earnings of those in related and those in unrelated jobs for comparison purposes. The predicted earnings will be free of bias due to truncation in the values of Y_R and Y_{UR}.

Now we may address the question of the selectivity bias. As was evident from the discussion in the text, there was a tendency for M3 to provide smaller estimates of earnings effects than M1 for 1970 and smaller estimates of earnings effects than M2 for 1974. (It was not found, however, that M3 provided uniformly smaller earnings effects than M1 and M2 in both 1970 and 1974.) These results indicate a slight positive selectivity bias in the standard procedure. Further, it may be concluded from the parameter estimates of $\sigma_{\epsilon,R}$ and $\sigma_{\epsilon,UR}$ that the selectivity bias is positive. Using the estimates of $\sigma_{\epsilon,R}$ and $\sigma_{\epsilon,UR}$ from the 1970 regressions, -.5827[1] and -.8441, respectively, along with the relationships in the footnote on page 11, it is easily shown that $\sigma_R^2 > \sigma_{UR}^2$. Maddala (reference 16, p. 8-9) demonstrates that $\sigma_R^2 > \sigma_{UR}^2$ is a necessary condition for the selectivity bias to be positive. The logic of this condition is the following. Given the truncation point in a normal distribution, the average of a random sample of size n from the upper tail will be a more upward biased estimate of the mean the larger is the variance of the distribution. Therefore, if σ_R^2 exceeds σ_{UR}^2, the average of the earnings of those in related jobs will be a more upward biased estimate of the mean earnings for related civilian jobs than the average of the earnings of those in unrelated jobs will be of the mean earnings for unrelated civilian jobs. Therefore, the difference in average earnings between those in related and those in unrelated jobs will be an upward biased estimate of earnings effects due to military occupational training. Our results indicate that $\sigma_R^2 > \sigma_{UR}^2$ and that the selectivity bias was positive.

[1] Note that -.5827 is our estimate of $\sigma_{\epsilon,R}$ since the regression coefficient on U_1 is $-\sigma_{\epsilon,R}$.

APPENDIX E

APPENDIX E

VALUES OF $F(\gamma Z)$, $f(\gamma Z)$, U_1 AND U_2 FOR A VETERAN WITH SELECTED CHARACTERISTICS[a]

Military occupation group	$F(\gamma Z)$	$f(\gamma Z)$	U_1	U_2
Combat	.0387	.0833	2.1545	.0866
Electronics Equipment Repair	.1466	.2298	1.5676	.2693
Communications/Intelligence	.0587	.1176	2.0036	.1249
Medical	.1069	.1844	1.7258	.2065
Other Technical	.2396	.3098	1.2931	.4073
Administrative/Clerical	.1750	.2571	1.4690	.3116
Electrical/Mechanical Equipment Repair	.1585	.2427	1.5318	.2885
Craftsmen	.2527	.3196	1.2652	.4277
Supply/Service Handlers	.1881	.2034	1.6663	.2317

[a]The selected characteristics are those provided in the text. The veteran is a white Army draftee with 12 years of education who scored 50 on the AFQT and who reached the paygrade of E4 in service.