



Research Report

CHARLES A. GOLDMAN, JEREMY BOBACK, ROBERT BOZICK, DREW M. ANDERSON

Navigating a Big Transition

Military Service Members' Earnings and Employment
After Active-Duty Service



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About This Report

Improving enlisted service member transitions from active duty to civilian life calls for better information about how these service members fare in their transitions. The authors of this report examined the relationship among enlisted service members' military occupations, personal characteristics, and civilian employment outcomes over the first three years after they separated from active duty. They used detailed empirical analysis of more than 1 million service records of enlisted service members, matched to employment and earnings after separation. The data encompass all separations from the armed forces from 2002 through 2010.

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Summary

The authors of this report examined the relationship among enlisted service members' military occupations, personal characteristics, and civilian employment outcomes over the first three years after they separated from active duty to inform programs and decisions that can help smooth this major transition. As explained further below, the authors used detailed empirical analysis of more than 1 million service records of enlisted service members, matched to employment and earnings after separation. The data encompass all separations from the armed forces from 2002 through 2010.

Experience in Military Occupations Can Affect the Transition to Civilian Employment in Predictable and Actionable Ways

Service members in each military service serve in a wide range of occupations. These occupations build skills and experience that could translate into post-service work, but service members also experience a wide range of outcomes in making the transition to civilian life. To inform recruitment, retention, and transition from service to civilian life, it is important to understand which occupations lead to success in labor markets after leaving the military. Occupations that have particularly low employment and earnings can be targeted for support. Occupations that have particularly high employment and earnings could serve as models for other occupations and a place for further investigation of human capital building in the military.

When Separating Service Members Are Unable to Find Work, There Are Significant Individual and Institutional Consequences

Leaving military unemployment and experiencing underemployment or unemployment in civilian life leads to a reduced standard of living for service members and imposes costs on the government. When separating service members make unemployment claims, the Department of Defense (DoD) must pay unemployment compensation based on their service. These costs exceeded \$900 million per year in the early 2010s during the weak job market following the Great Recession (Congressional Budget Office, 2017). These costs have come down markedly in recent years, perhaps because of a strong job market and deliberate introduction of credentialing, employment training, and transition assistance programs. Nonetheless, the U.S. economy goes through cycles, and (as this report is being prepared in 2020) a very negative cycle could just be beginning with the economic consequences of the coronavirus pandemic, highlighting the importance of maintaining and targeting transition support.

This Study Provides Detailed Analysis to Help Target Transition Programs

To inform decisions about transition support, the authors traced employment and earnings in the first three years after separation from the military. The report uses administrative data from the military services and the Social Security Administration (SSA) to generate a database of active-duty enlisted service members who separated from the armed forces between January 2002 and December 2010 after serving for at least 18 months. The main analysis breaks them into groups by service, gender, and age, then reports adjusted average post-service earnings by military occupation. These groupings account for some major differences in individuals' typical labor market outcomes, so that comparisons within groups express mainly the differences across military occupations.

The structure of the data allows us to observe whether an individual had any earnings during a calendar year, and then to measure the amount of those earnings. Although these data are comprehensive and detailed, the nature of SSA records do not show us who is searching for a job, how many weeks of the year people work, whether the work is part time or full time, or any qualities of the job or job changes. The focus on the calendar year means that, for many separations, we miss the first few months, where earnings might be even lower than we observed. Still, measuring compensation in this way provides an important summary of job success in the civilian labor market.

Some Occupations (Such as Information Technology and Intelligence) Are Associated with High Post-Service Earnings; Others (Such as Combat Arms, Medical, Supply, and Transportation) Are Associated with Low Earnings and Could Benefit from Targeted Support

We found that earnings, among those who are employed, varied markedly in relation to the former service member's military occupation. Individuals who worked in the intelligence and information systems fields consistently appeared in the high tier of post-service earnings across all four services, relative to their peers in the same service, age, and gender grouping. Those who worked in the combat arms, medical, supply, and transportation fields were generally in the moderate or low tier of post-service earnings. The gaps in earnings across occupations were largest just after separation; the gaps narrowed somewhat over the three-year period of the study.

Gaps like these point to military occupations that might need additional support to develop marketable skills, either during the whole of service members' military careers or around the time of transition. Some developments have already taken place since our analysis, including increases in credentialing for health care, machinery operators, and commercial drivers.

Behaviors, Decisions, and Service Experiences Are Also Related to Post-Service Earnings, Indicating Other Ways to Target Support

Additional analysis finds that individual behavior, decisions, and experiences were also associated with higher or lower levels of post-service earnings and employment. Higher levels of education achieved at the time of separation were associated with greater earnings after separation, though our measure of education does not capture industry credentials. Separations after poor conduct or substance abuse were associated with lower earnings. Deployment during service had mixed association with post-service earnings, depending on the member's service, gender, and length of service. Deployment was negatively related to post-service earnings for Army and Navy males with less than 20 years of service, but the relationship was actually positive for several other groups, especially Air Force males with both less than and more than 20 years of service and Army and Marine males with more than 20 years of service.

We controlled for the characteristics just discussed as well as a range of others available in military data while estimating the relationship between military occupation and post-service outcomes. Of course, occupations could be associated with other characteristics we cannot measure, so our results for occupations might be affected by these unmeasured characteristics. Nonetheless, the differences by occupation and other characteristics do point out which occupations and service member groups are most in need of interventions to improve post-service employment and earnings.

Post-Service Earnings Are Frequently Lower Than Active-Duty Earnings, Showing That Transition Support Is Generally Needed

Finally, the analysis shows that service members in most military occupations had lower earnings after leaving the service compared with their final year of active duty (considering Regular Military Compensation on active duty, specifically base pay, subsistence and housing allowances, and tax benefits). This is true even in our approach that focused on the employed who earned some positive amount post-separation. This finding emphasizes the importance of building marketable skills for service members and supporting their transitions into the civilian labor force.

The analyses in this report (including electronic appendixes with detailed results) provide a road map for undertaking transition support efforts within service and occupation, and also for broad groups of individuals based on their service, behavior, and decisions. DoD and the services can use this analysis to plan and target these programs, as can the Department of Labor, the Department of Veterans Affairs, and state and local agencies that assume responsibility for providing services after service members transition to civilian life.

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Abbreviations

AFQT	Armed Forces Qualification Test
BAH	Basic Allowance for Housing
BAS	Basic Allowance for Subsistence
BMI	body mass index
CTS	Contingency Tracking System
DEERS	Defense Enrollment Eligibility Reporting System
DMDC	Defense Manpower Data Center
DoD	Department of Defense
MEPCOM	Military Entrance Processing Command
MOC	Military Occupational Code
MOS	Military Occupational Specialty
PGIB	Post-9/11 G.I. Bill
RMC	Regular Military Compensation
SSA	Social Security Administration
TAP	Transition Assistance Program
UCX	Unemployment Compensation for Ex-Servicemembers
WEX	Work Experience File

1. Introduction

Background

As military service members transition from active-duty status to civilian life, they pursue education and employment in the civilian sector. The transition presents challenges, including finding job openings, translating skills from service into civilian work, and adjusting to a new labor force environment. Any difficulty in finding employment will have important consequences for the individuals as well as the military. At the individual level, spells of unemployment or underemployment hurt financial resources and job trajectories for the future. At the institutional level, the Department of Defense (DoD) and the military services must bear the costs of Unemployment Compensation for Ex-Servicemembers (UCX). In addition, perceptions of difficulty in making this transition might affect future recruits' interest in serving.

As a result, there is significant interest in providing information, training, and guidance at these transitions. Some military occupations appear to translate into related civilian occupations, such as human resource specialists or intelligence analysts. Other occupations, like combat arms occupations, do not have this direct connection to civilian occupation skills. Policymakers have expressed concern about service members in combat arms occupations, which require military-specific skills that might not directly translate into the civilian labor force. An important step in addressing these transition issues is identifying which military occupations are associated with lower rates of employment and lower earnings in civilian employment.

To place these concerns in some context, we examined the spending on UCX, which has been a very significant cost for DoD and the services. According to data supplied by the U.S. Department of Labor via DoD, UCX expenses peaked at \$944 million in 2011 during the worst period for employment following the Great Recession. Over the following years, UCX expenses fell steadily as the economy improved and as DoD implemented programs to aid transitions to civilian employment. In 2019, these expenses had fallen to \$139 million. With the economic impacts of the coronavirus pandemic pushing unemployment to levels not seen in generations, there is a real risk that DoD's responsibility for UCX could increase dramatically, placing significant pressure on budgets at a time when the U.S. government will also be facing many pressures on revenue and spending.

Since the time period covered by this study, DoD and the military services have started to operate several programs to provide information prior to these transitions. All separating enlisted service members now must take the Transition Assistance Program, which provides coaching on resume writing and job searching. Congress has also granted the services authority, called SkillBridge, to release members from part or all of their duty time during the last six months of their enlistment for the purpose of civilian job training, which could be in areas that are directly

related to the military occupation or not. We will return briefly to these programs in the conclusion of this report.

Objectives of This Study

Improving these transitions and targeting programs like these requires better information about how service members fare in their transitions. This study examines the relationship between enlisted service members' military occupation and their civilian employment outcomes over the first three years after they separate from active duty. To control for other differences that might affect civilian employment outcomes, we segmented service members into groups by military service, tenure, and gender, and we conditioned on a selection of other factors. Results from this study can help DoD and the services to understand the variations in enlisted service member experiences, which could help them to target programs toward service members about to separate, especially for occupations or groups that seem to face more challenges in transitioning to civilian employment.

Research questions

- Which military occupations are associated with higher rates of employment and higher levels of earnings after service? How does that relationship develop over time post-separation?
- What individual characteristics of service members are associated with labor market success?
- How does service members' income after service compare with their active-duty income?

Approach

To map the civilian occupation patterns associated with each military occupation, we linked information on service from the Defense Manpower Data Center (DMDC) to information on post-separation earnings and employment from the Social Security Administration (SSA) data. These data are well suited to this analysis because they are

- comprehensive: These data include all active-duty enlisted service members who separated from the armed forces between January 2002 and December 2010 after serving for at least 18 months (where data were available).
- detailed: DMDC tracks characteristics such as education, age, gender, history of military service, and several types of military compensation, while SSA data track employment and earnings at most jobs in the United States.

- longitudinal: Each individual is observed for a three-year period after leaving the service so that we can measure not only initial earnings but also earnings growth.

We used these data to make comparisons across Military Occupational Codes (MOCs) within military service, after controlling for individual characteristics, such as education, that might also be highly correlated with earnings. We estimated a two-step regression, first modeling any employment, then modeling earnings among the employed. We did so within groups of service members by service, length of service, and gender, because we expected decisions about work post-service to vary fundamentally across these groups, based on prior research. The result is the adjusted average earnings, both initially and over time, for a large set of common MOCs in each military service, separated by length of service and gender. The averages are adjusted based on the personal characteristics of the individuals in those occupations. In further analysis, we directly report the associations between individual characteristics and post-service earnings.

These results give decisionmakers a broad overview of how post-service earnings vary across occupations and, separately, how post-service earnings vary across types of individuals.

Key findings

- Civilian earnings varied widely across service members transitioning from different military occupations.
- Intelligence and information systems MOCs consistently appeared in the high tier of first-year earnings after separation across all four services.
- Combat arms, medical, supply, and transportation MOCs were generally in the moderate or low tier of first-year earnings after separation.
- Earnings grew on average from the first to second to third years after separation, with the gap between MOCs narrowing somewhat.
- Individuals with higher levels of education and more favorable separation codes had higher earnings after separation.

Overview of This Report

Chapter 2 provides a review of previous work on post-service earnings and employment. Chapter 3 gives a high-level overview of our research design, with details offered in Appendix A. Chapter 4 reviews the associations among military occupation, earnings, and employment, while Chapter 5 reviews the associations among other variables with earnings and employment. Chapter 6 compares earnings among separated service members with earnings during their final year of active duty, and Chapter 7 concludes the report. Appendixes B and C provide more detailed tables of results. Appendix D describes three electronic appendixes in Excel format that provide sample means and all analytic results from the study in formatted tables that can be used for further analyses (available at www.rand.org/t/RRA361-1).

2. Previous Work

To provide background for our analysis, this chapter details some of the previous research into the labor market outcomes of members after they separate from the military. There is an extensive literature on the area of veteran employment and earnings, and a wide range of labor market outcomes have been found to be associated with military service. Our analysis fills a gap in the literature by focusing on military occupations specifically and by bringing to bear such a large and detailed administrative database.

Employment

One of the key measures of transition into the civilian labor market is the employment rate. If the employment rate of veterans is lower than that of comparable nonveterans, this could be a signal that there are significant difficulties in transitioning into the civilian workforce and finding jobs. In a report focusing on the unemployment rates of veterans in 2014, Loughran found that young veterans (18- to 24-year-olds) had a 3.4-percentage-point higher unemployment rate than similar nonveterans (Loughran, 2014). The difference between veterans and nonveterans declined with age and with time since the separation from the military. The authors concluded that a primary reason for higher unemployment among young veterans was the substantial time needed to find a new job just following separation from the military. The comparison group of civilians was less likely to have separated in the recent past.

Military service members might react differently than civilians when struggling to find a job. In a 2018 RAND report on unemployment after military separation, authors Heaton, Lavery, Powell, and Wenger found that unemployed veterans waited longer than their civilian counterparts to access their unemployment benefits but received higher benefit levels (Heaton et al., 2018). The unemployment claim duration from veterans was not significantly different from that of civilian job seekers.

There could also be important differences in unemployment among different types of military service members. A 2013 paper examined whether deployment adversely affected post-service employment (Horton et al., 2013). Those authors found that deployment on its own (with or without reported combat) had no significant effect on post-service employment. However, research by Angrist and colleagues published in 2010 found a negative association between military service and post-service employment, but only for lower-skilled white men, who also tended to have higher rates of receiving disability benefits (Angrist, Chen, and Frandsen, 2010). Autor, Duggan, and Lyle, 2011, and Coile, Duggan, and Guo, 2015, confirmed that increases in generosity of disability benefits have coincided with decreases in labor force participation among Vietnam veterans. This set of findings indicates that job skills gained in the military and the

services provided for veterans benefits both play a role in who succeeds in the civilian labor force.

These findings have some clear implications for our objective in this report. Employment can change quickly in the first few years after separation, including after stints of receiving unemployment benefits, making it useful to observe service members for at least a few years after separation. It is also important to control for individual characteristics that are associated with employment. Doing so in a 2013 study by Kleykamp actually increased the observed negative effects on employment for male veterans, since those individuals have other characteristics that are typically associated with higher likelihood of employment (Kleykamp, 2013).

Earnings

There has been a considerable amount of previous research on the effects of military service on civilian earnings after separation, but much of it concentrates on the effects of lifetime earnings and uses older data. A seminal paper by Angrist in 1990 used the draft lottery for the Vietnam War as a natural experiment to eliminate selection bias. Because draft numbers were assigned at random, comparing the earnings of drafted versus nondrafted individuals ought to have captured the effect of service only, not other factors that lead people to enlist and also impact labor market outcomes. On average, white veterans earned 15 percent *less* than comparable nonveterans over a lifetime. There was no significant difference in lifetime earnings between nonwhite veterans and comparable nonveterans (Angrist, 1990).

In his 1998 paper, Angrist again examined the earnings of veterans compared with nonveterans, this time using Social Security data on those who had volunteered for military service in the 1980s. He found that military service was associated with higher employment rates after separation from the military compared with similar nonveterans. Military service was associated with a modest increase in lifetime earnings for nonwhite veterans. However, this relationship was reversed for white veterans, for whom military service was associated with a reduction in lifetime earnings. Lower lifetime earnings seemed to contradict the results showing higher rates of employment overall for veterans (Angrist, 1998).

Two reports published by RAND in the mid-2000s analyzed the earnings of reservists, comparing their earnings while active in the military after activation and their earnings after returning to civilian work (Klerman, Loughran, and Martin, 2005; Martorell, Klerman, and Loughran, 2008). A large majority of activated reservists (72 percent) saw an increase in earnings (\$850 per month on average) while activated. This analysis only considered personal earnings and did not consider the impact of activation on household costs, spousal earnings, or nonreported earnings. There have also been studies on the effects of certain aspects of military service on spousal earnings. Members of the military move frequently, and this can disrupt spousal careers. Military moves are associated with an average \$2,100 annual decrease in

spousal earnings and an increased likelihood of zero earnings in the following year (Burke and Miller, 2016). Spouses continue to have significantly lower earnings two years after the move (Burke and Miller, 2016).

A RAND publication (Loughran et al., 2011) using the approach developed by Angrist in his 1998 paper found that military enlistment increased earnings in the short term and the long term. However, there was a short-lived reduction in earnings after separation from the military. A follow-on RAND study (Martorell et al., 2014) used the same approach but extended the analysis to examine the effects of length of service in the military and military occupation. The authors found that military members in certain groups of military occupations had significantly larger gains in earnings than did those in combat arms, for example. However, all military occupations and different groups of years of service experienced earnings reductions in the year of separation from the military.

The mix of results for different types of individuals suggests that it is important to account for differences across individuals, such as military occupation. For example, combat injuries that were more severe shifted income away from labor earnings and toward benefits, according to a 2012 RAND report (Heaton, Loughran, and Miller, 2012). Posttraumatic stress has similar effects, according to Loughran and Heaton, 2013. Posttraumatic stress disorder itself is associated with several other characteristics that also tend to affect earnings. In our study as well, it is important for this study to investigate differences among service members by their personal characteristics as well as their military occupation.

The relationship between service and employment also appears to evolve over time. We focused primarily on the period of reduced earnings right after separation, which could vary in severity across service members.

Importance of Education and Skills

Military service can take the time that many young people would otherwise dedicate to postsecondary education. Loughran et al., 2011, also examined the usage of military education benefits, finding that military enlistment delayed the beginning of college education and reduced the likelihood of obtaining a four-year college degree. The results are complicated, though: Military enlistment increased the likelihood of obtaining a two-year degree, and Kleykamp, 2013, showed that veterans were more likely to be enrolled in college than civilian peers.

Some of the latter effects are caused by the generous education benefits that veterans receive both while active in the military and after separation. Barr, 2015, found that the Post-9/11 G.I. Bill (PGIB) increased college enrollment for military members by 15 to 20 percent and shifted enrollment toward four-year-degree-granting schools. In a 2017 report, Wenger et al. also examined the usage of the PGIB in addition to the tuition assistance education benefits available to active military members and veterans. That analysis found that the PGIB had a small negative

effect on continuation of service. Tuition assistance and PGIB complemented each other and supported higher rates of completion of four-year degrees after separation.

Although many of the reports discussed here examine the potential disadvantages that veterans experience in the labor market, Hall et al., 2014, found that companies got good value from hiring veterans. Hiring companies reported that veterans often had good leadership skills and teamwork, could work flexibly in fast-paced situations without stress, and had superior experience working in a diverse workplace. However, challenges were reported in matching military skills with civilian job requirements. Veterans would benefit from a better understanding of the civilian job market and the jobs for which they are qualified. Finally, Heaton et al., 2018, showed that there was a great deal of overlap in the careers sought by both the civilian and military unemployed.

Our analysis directly examines the relationship between education and later earnings. However, we cannot observe job-specific skills or general skills, such as leadership. Our results are suggestive as to which military occupations develop more marketable skills among service members.

Summary of Prior Work

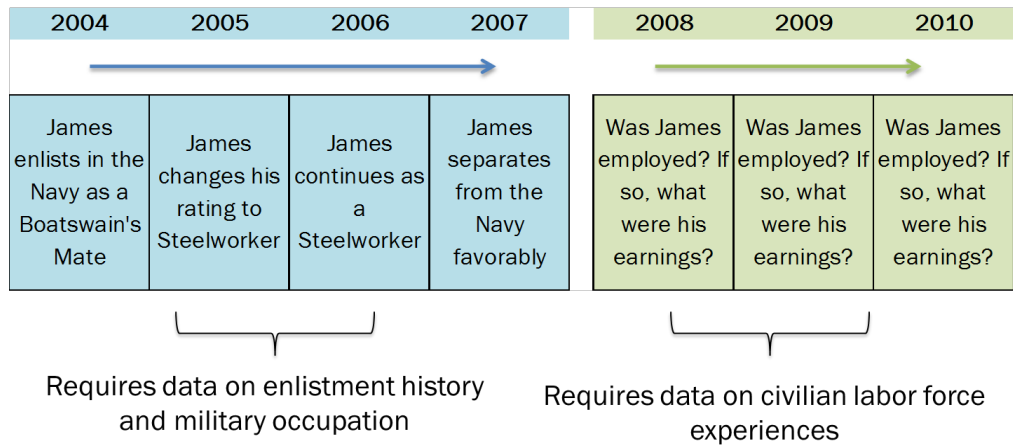
In summary, young veterans were found to be more likely to be unemployed than comparable nonveterans, but the difference between veterans and nonveterans faded with age. Education benefits provided to military members improved the rates of some kinds of degree attainment, especially when tuition assistance and PGIB benefits were combined. However, the PGIB could influence members of the military to discontinue their military service sooner than they might have otherwise. In terms of earnings, several studies have found that enlisted military members had higher earnings while they were active in the military than comparable civilians did. There were both short- and long-term improvements in earnings through service in the military, but there was a reduction in earnings in the period shortly after separation from the military. This report examines labor market outcomes in this three-year period after military separation in great detail, specifically by military occupation.

3. Research Design for Estimating the Relationship Between Military Occupation and Civilian Employment Outcomes

Research Design

To document the relationship between the occupation held by service members while enlisted in the armed forces and their civilian employment outcomes after they separate, this study uses a research design that tracks service members from their enlisted service through three years after separation. As depicted in Figure 3.1, the research design requires individual-level data from a service member’s military and civilian experiences.

Figure 3.1. Research Design



Study Sample

We based our analysis on all active-duty enlisted service members who separated from the armed forces between January 2002 and December 2010 on the condition that they were enlisted for a minimum of 18 months. We excluded from the study population service members with multiple periods of service, those with a military entrance year prior to 1978, and those with a separation code indicating death or entrance into an officer commissioning program or service academy. Furthermore, we excluded those missing regression variables and female Marines with more than 20 years of service due to low overall population (600).

The total study sample consisted of 1,010,728 service members: 205,777 from the Air Force, 369,652 from the Army, 188,547 from the Marines, and 246,752 from the Navy. Table 3.1 disaggregates these groups further based on gender and whether the period of service was less than or more than 20 years. Appendix C reports on the development of the sample in more detail.

Protection of Privacy

To protect individual privacy, SSA censored extremely high values of the earnings variable, approximately representing the top one-half of 1 percent of the sample’s earnings for each year, setting them equal to the earnings level where the censoring began. Because of the rarity of this top coding, we did not make adjustments in using this value.

Table 3.1. Study Population

Subpopulations	Army	Air Force	Marines	Navy	Total	Percentage
Females, <20 years	56,407	37,543	10,872	36,209	141,031	14.0%
Females, >20 years	4,184	6,896	excluded	3,204	14,284	1.4%
Males, <20 years	276,454	110,495	168,732	173,284	728,965	72.1%
Males, >20 years	32,607	50,843	8,943	34,055	126,448	12.5%
Total	369,652	205,777	188,547	246,752	1,010,728	100.0%

SOURCE: RAND analysis of DMDC data.

Data and Measures

Data Sources

Our analysis draws upon an array of data sources to characterize the sociodemographic background, military, and training experiences of the separated service members. These data sources include the Military Entrance Processing Command (MEPCOM), the Defense Enrollment Eligibility Reporting System (DEERS), the Active Duty Master File, the Contingency Tracking System (CTS), and the Work Experience File (WEX)—all obtained through DMDC. We combined this rich information on service members across datasets with civilian earnings data maintained by SSA. SSA is an excellent source for earnings data because it collects earnings information about any job (including self-employment) subject to Medicare tax withholding in the United States.

Variables

We have two outcome variables (each measured in multiple years). These outcome variables are whether each service member was **employed** or not (i.e., had any positive earnings during the year) and, if the service member was employed, his or her **annual earnings**. Each variable was measured during the full calendar year that fell one, two, and three years after the date of separation from active duty.

There are a few key limitations to this measure that make it different from first-year earnings after separation. The year we measure could begin up to 12 months after separation (for people

who leave the service in January). These early months are likely to contain even less employment and earnings, so we view our measure as an overestimate of the actual first 12 months. Another limitation is that we cannot tell anything about work schedule (weeks worked, whether full or part time), nor can we tell details about jobs (the industry, the role, when job changes occur, promotions, or raises). We can only tell the summation of earnings. Earnings are also how we indicate employment. Nonearners could be unemployed and seeking work, or they may have left the labor force or emigrated out of the country.

Our explanatory variables are related to military occupation and individual characteristics. *Military occupation* is the occupation held by service members at the time that they separated from the armed forces. The logic behind focusing on this occupation is that in most cases, it represents the highest level of skill and responsibility held by the individual during their military tenure. It is expected that such skills and responsibilities will directly influence post-separation employment trajectories, with certain military experiences being more or less relevant to the needs of civilian employers.

Appendix A provides details of all the variables and how we constructed them as well as the development of the sample, in general. An electronic appendix (described in Appendix D) presents sample means on key explanatory variables.

Model

The study's model is documented in Appendix A. The model has two stages. In the first stage, we estimate the relationship between the probability of being employed and the MOC and control variables. For those who are employed, in the second stage, we estimate the relationship between annual earnings and the MOC and control variables. The results of each stage are reported separately. Estimating the hurdle model in two stages is efficient, and there is no loss of generality or bias in the standard errors from a staged approach.

In each stage, we include individual characteristics to control for other factors that affect post-separation earnings besides the MOC itself. These characteristics include some factors determined at enlistment (race/ethnicity, age, Armed Forces Qualification Test [AFQT] percentile score, and SSA earnings prior to enlistment) and some factors determined at separation (pay grade, highest education level attained, marital status, cumulative time enlisted and deployed, indicators for the reason for separation, height, and body mass index [BMI]). Coefficient estimates for MOCs then represent the effect on employment or earnings, holding all other observable characteristics constant.

These characteristics are important to include, because they also potentially affect selection into MOCs. Without these controls, much of the variation in outcomes across MOCs would be unexplained and could be explained by differences in the types of people in those MOCs. AFQT in particular varies significantly across MOCs, and without including it, we might largely be reporting differences in aptitude rather than differences in MOC.

Our model does not perfectly control for selection, so that there are still some unobserved differences that lead to MOC choice and impact later outcomes, but the estimates are still policy-relevant for making decisions based on the average individual who tends to enter MOCs in the current system. We present our results using the observed averages to estimate the adjusted average earnings within an MOC.

Presentation of Results

We estimated the model separately for 15 subpopulations by service, gender, and length of service, as depicted in Table 3.1. The means reported for each subpopulation were adjusted for the average characteristics in that population, so the earnings estimates across subpopulations are a function of both the relationships among the variables we studied and the average characteristics of the subpopulation. As a result, these adjusted means are not necessarily comparable across subpopulations. The relevant comparison is *across* occupations but *within* a particular group, such as men with less than 20 years of service in the Army.

We produced two estimates for each MOC: estimates for each subpopulation as a whole and estimates restricted to favorable separation codes, excluding separation codes for disabled, crime, poor conduct, alcohol, drugs, and unqualified.

Chapter 6 discusses changes in earnings from pre-separation to post-separation, but we primarily focus on the dollar amounts earned post-separation rather than the change in earnings or percentage change. Our model controls for pre-service earnings and for pay scale at separation, among other individual factors. Directly differencing earnings is a more restrictive specification, and it obscures the levels of earnings after separation that we believe are more indicative of financial security of veterans.

Limitations

This study faces a number of important limitations. Two limitations stem from the data that are available. First, our measure of earnings is total annual earnings per calendar year, so we cannot observe the intensity with which individuals are working. If we observe a former service member earning \$20,000 in a year, we do not know whether this represents full-time work at an annual wage of \$20,000 or part-time or less than a full year of work at a higher equivalent annual wage. Positive earnings could also include periods of unemployment.

Second, we also lack data on veterans who exit the labor force, including to care for family or to enroll in college after separation. Service members get generous college aid through their PGIB benefits. As a result, some veterans were attending college during the period we studied, which could significantly reduce their opportunity to work and their annual earnings during this period. Because members with occupations that do not develop as many marketable skills could be more likely to attend college to build those skills after separation, this differential behavior could be driving some of the differences we observed in earnings levels. We followed veterans

for three years in part to reduce the impact of this likely temporary period of college attendance, which we expect to diminish over the three-year period. Comparing relative earnings across the three years allows us to explore how much the effect may diminish. With recent expansions of the DMDC's data agreements, future research is likely to be able to include measures of PGIB usage to more directly control for these effects, and we recommend that the analysis in this study be extended to include those data in the future.

Finally, as noted in the design, this study examines associations rather than cause and effect. As a result, readers and policymakers should exercise caution in how the results are interpreted and used. Nonetheless, we think the study findings shed important light on the range of transition experiences for service members with different occupations and characteristics. These differences can certainly point the way to target programs and supports to improve the transition experience for service members as individuals and for DoD and the services as institutions.

4. The Association of MOC with Earnings and Employment

This chapter presents the results of our analysis of the association among MOC, post-separation civilian earnings, and employment.

MOCs Are Associated with a Wide Range of Earnings

To compare the association of MOC with earnings, we first calculated the mean unadjusted earnings among all of the MOCs within each of the 15 subpopulation groups, such as Army males with less than 20 years of service, Army females with less than 20 years of service, etc. Table 4.1 depicts the average MOC earnings by subpopulation group in the first and third years after separation. We show contexts of favorable separations and an average over all separations. For example, among the 78 MOC categories examined in the subpopulation group of Air Force males with less than 20 years of service, the mean first-year earnings for those separated with a favorable separation code were \$34,567 in 2013 dollars. There was a noticeable premium for favorable separations relative to the overall average, particularly among men with less than 20 years of service where more unfavorable separations were present.

Table 4.1. Mean Unadjusted Earnings Among the MOCs in Each Subpopulation Group (2013 dollars, in thousands)

Separation Codes		Favorable			All		
Subpopulation Groups		Year 1	Year 3	Difference	Year 1	Year 3	Difference
Male, <20 years of service	Air Force	34.6	43.0	8.4	31.3	39.0	7.7
	Army	27.4	34.6	7.2	24.8	31.4	6.7
	Marine Corps	26.5	34.3	7.8	25.1	32.5	7.4
	Navy	29.7	34.2	4.5	26.6	33.5	6.9
Male, >20 years of service	Air Force	55.1	62.2	7.1	55.1	62.1	7.0
	Army	54.2	61.0	6.8	54.1	60.9	6.8
	Marine Corps	56.0	63.2	7.2	55.9	63.1	7.2
	Navy	51.3	58.6	7.3	51.2	58.5	7.2
Female, <20 years of service	Air Force	24.7	30.8	6.0	23.1	28.8	5.7
	Army	20.7	26.4	5.7	19.5	25.1	5.5
	Marine Corps	20.1	25.3	5.2	19.2	23.9	4.7
	Navy	20.1	25.5	5.3	19.1	24.1	5.0
Female, >20 years of service	Air Force	43.4	50.1	6.7	43.2	49.9	6.7
	Army	44.0	51.7	7.7	44.0	51.6	7.6
	Navy	38.0	44.7	6.7	38.0	44.6	6.6

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Service member civilian employment outcomes from 2002 to 2013.

Some general conclusions emerge from the table. The subpopulation groups with more than 20 years of service have notably higher average earnings compared to the groups with less than 20 years. For all groups, earnings increase from Year 1 to Year 3, and we will examine this further in this chapter. Because of differences among the subpopulations' characteristics and potential differences in how they participate in the civilian labor market, however, we prefer not to make detailed comparisons across these groups. Rather, we will focus on comparisons of individuals with different occupations and characteristics within each of these 15 subpopulations.

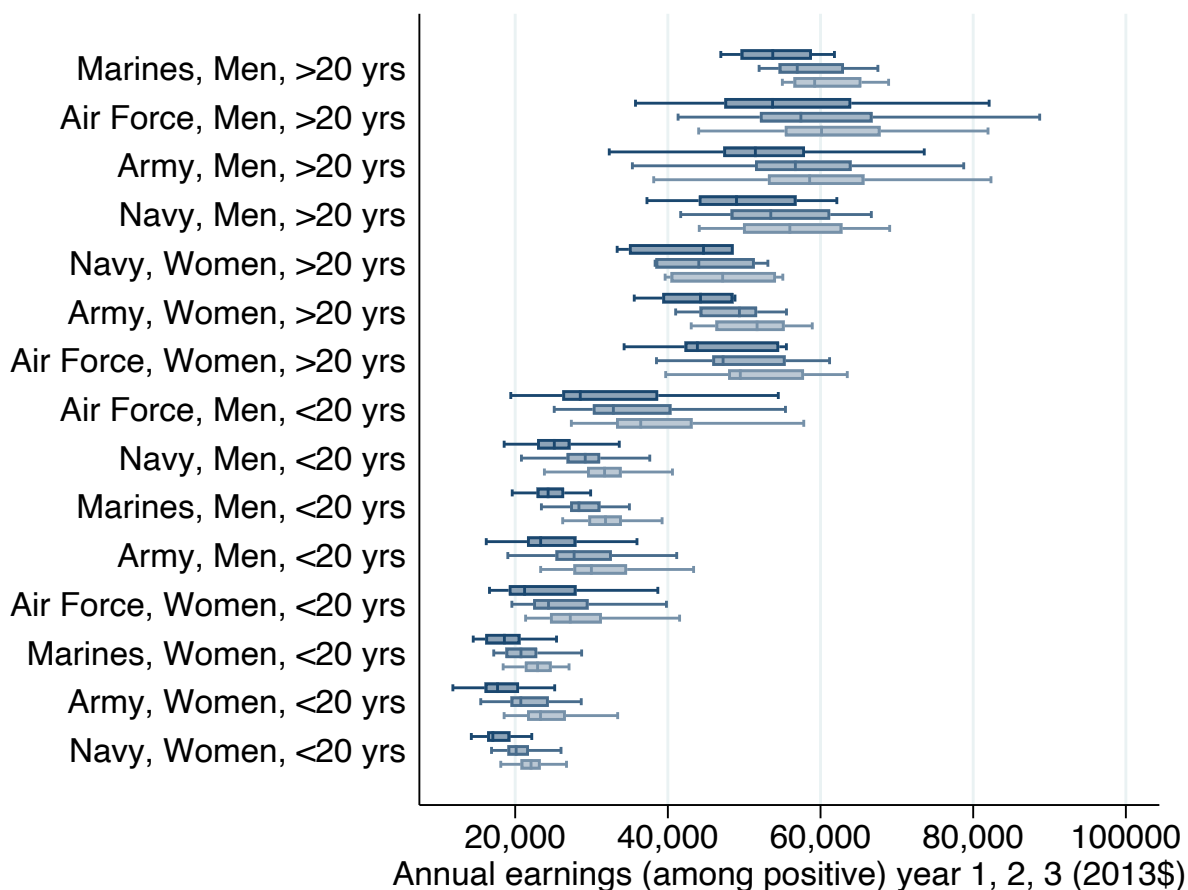
To describe the distribution across MOCs within each of the 15 groups, Figure 4.1 and Figure 4.2 display box-and-whisker plots. The midline of the box is the value for the median MOC, while the left and right boundaries of the box are the values for the 25th percentile and the 75th percentile MOCs. The whiskers extend to adjacent values, which are the most extreme values that are still within 1.5 times the interquartile range away from the median. Figure 4.1 reports the distribution among MOCs of mean earnings, among positive earners, in Years 1, 2, and 3. The groups are sorted by the median in Year 1. Figure 4.2 reports the distribution among MOCs of the percentage with positive earnings (the measure of employment) in Years 1, 2, and 3, with the groups sorted by the median in Year 1.

From Figure 4.1, we can conclude that several of the groups have a wide range of earnings across MOCs. The ranges are wider for longer-tenured service members, in addition to being

higher overall, as shown in the tables. The ranges also vary across branches somewhat, with the Air Force having the widest range.

From Figure 4.2, we can conclude that shorter-tenured service members and men tend to be employed at higher rates. Many of the groups show relatively limited spread across MOCs, with interquartile ranges ranging from two to four percentage points. Compare the within-MOC spread with the difference in median employment between men and women with shorter tenures in the Army, which is about 14 percentage points. Over time, some groups display a little growth in employment rates. Some nonemployment could arise from veterans attending community college or a university (without also working), but this appears to be fairly balanced across the years after separation and not concentrated in the earlier period.

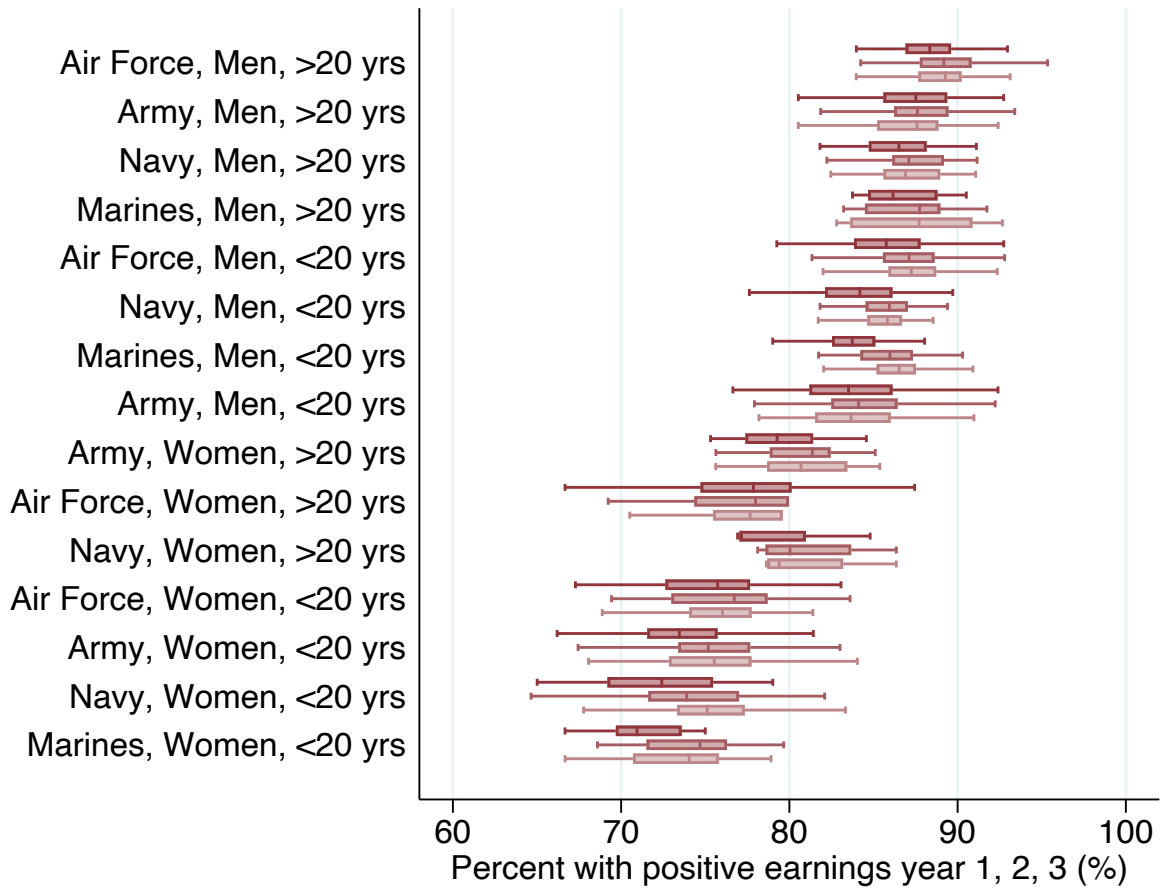
Figure 4.1. Distribution of Mean Earnings Among MOCs, by Group



SOURCE: RAND analysis of DMDC and SSA data.

NOTES: Groups are sorted by median Year 1 earnings. The midline of the box is the value for the median MOC, while the left and right boundaries of the box are the values for the 25th percentile and the 75th percentile MOCs. The whiskers extend to adjacent values, which are the most extreme values that are still within 1.5 times the interquartile range away from the median.

Figure 4.2. Distribution of Mean Employment Among MOCs, by Group



SOURCE: RAND analysis of DMDC and SSA data.

NOTES: Groups are sorted by median Year 1 earnings. The midline of the box is the value for the median MOC, while the left and right boundaries of the box are the values for the 25th percentile and the 75th percentile MOCs. The whiskers extend to adjacent values, which are the most extreme values that are still within 1.5 times the interquartile range away from the median.

Next, we sorted the MOCs within each subpopulation group, after regression adjustment, into three tiers based on adjusted average first-year post-separation earnings. In an effort to divide the earnings into three tiers with a significant number of MOCs in each tier (although not specifically equal-size tiers), we selected relative thresholds that we applied across all subpopulations. In each subpopulation, the high-earnings tier is composed of MOCs with adjusted first-year post-separation earnings over 120 percent of the subpopulation average. In the tables below and in Appendix B, this tier is highlighted in green. The moderate-earnings tier is composed of MOCs with earnings between 90 to 120 percent of the subpopulation average and is highlighted in gray. Last, the low-earnings tier is composed of MOCs with first-year earnings below 90 percent of the subpopulation average and is highlighted in orange. The electronic

appendix (described in Appendix D) includes the number of service members in each MOC within each group.

Tables 4.2 to 4.5 display the mean earnings of selected MOCs for males from all four services who separated with less than 20 years of service in the first and third years of separation and represent both service members who separated with favorable discharge codes and also all service members. The MOCs in these tables were selected because they are high density and represent a diverse array of fields. These same tables are combined with similar tables for females and males with more than 20 years of service in Appendix B.

Tables 4.2 to 4.5 reveal differences within subpopulations and across MOCs. The Air Force appears to have a wider distribution of mean earnings among its MOCs, while the Marine Corps' MOCs appear to be concentrated in the moderate tier. Across all services, those transitioning from MOCs in the intelligence and information systems fields consistently appear in the high tier of first-year earnings, while those transitioning from the medical, supply, and transportation-focused MOCs are generally in the moderate or low tier of first-year earnings.

Based on the standard errors of the estimates in our model, differences of at least \$1,000–\$2,000 per year in earnings represent significant differences in the larger population groups of males with less than 20 years of service in each service (i.e., those differences are at least twice the typical standard error in the model). For the other, smaller groups, differences of at least \$3,000–\$5,000 per year in earnings represent significant differences.

Table 4.2. Mean Adjusted Earnings of Selected MOCs for Army Males with Less Than 20 Years of Service (2013 dollars)

MOC	Separation Codes		All	
	Favorable		Year 1	Year 3
35M Human Intelligence Collector	57,851	53,361	49,503	46,830
25S Sat Comm Sys Operator-Maintainer	55,232	60,768	47,396	53,259
35X Military Intelligence, Other	52,864	59,399	47,870	54,569
25B Information Technology Specialist	50,704	56,723	42,464	48,903
35F Intelligence Analyst	47,330	51,448	42,849	47,097
35N Signals Intelligence Analyst	46,198	53,810	41,149	48,158
31B Military Police	28,845	37,051	26,182	33,478
<i>Subpopulation Average</i>	27,429	34,601	24,789	31,442
42L Administrative Specialist	25,166	33,199	22,826	29,711
88M Motor Transport Operator	23,374	30,661	21,792	28,378
68W Health Care Specialist	23,339	30,042	21,569	27,577
11B Infantryman	23,306	30,875	21,680	28,667

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Color coding orange, below 90 percent of subpopulation average; gray, 90–120 percent; green, over 120 percent.

Table 4.3. Mean Adjusted Earnings of Selected MOCs for Air Force Males with Less Than 20 Years of Service (2013 dollars)

MOC	Separation Codes	Favorable		All	
		Year 1	Year 3	Year 1	Year 3
1N1XX Geospatial Intelligence		78,920	83,696	70,823	74,985
6C0XX Contracting		59,934	67,740	53,912	62,198
3D0XX Knowledge Operations Management		56,322	67,475	50,707	60,325
3D0X2 Cyber Systems Operations		55,104	63,993	50,469	59,304
1C1X1 Air Traffic Control		54,330	74,206	49,069	66,921
1N2XX Signals Intelligence Analyst		50,310	60,986	43,915	54,193
<i>Subpopulation Average</i>		34,567	42,952	31,257	38,986
2A7X3 Aircraft Structural Maintenance		33,235	41,588	30,558	37,800
3P0X1 Security Forces		28,427	37,140	26,213	34,300
2T1XX Vehicle Operations		26,381	34,192	24,836	31,655
4N0X1 Aerospace Medical Service		24,408	32,855	23,258	30,805
4Y0XX Dental Assistant		19,959	27,166	22,423	29,026

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Color coding orange, below 90 percent of subpopulation average; gray, 90–120 percent; green, over 120 percent.

Table 4.4. Mean Adjusted Earnings of Selected MOCs for Marine Males with Less Than 20 Years of Service (2013 dollars)

MOC	Separation Codes	Favorable		All	
		Year 1	Year 3	Year 1	Year 3
26XX Signals Intelligence/Ground Electronic Warfare		41,261	50,889	39,028	48,048
02XX Intelligence		39,429	45,978	36,854	43,881
0651 Data Systems Technician		39,146	46,179	36,319	42,976
63XX Aircraft Avionics Technician		31,600	41,938	29,888	39,242
61XX Helicopter Mechanic		29,477	38,754	27,703	36,751
5811 Military Police		29,205	37,507	27,737	35,808
<i>Subpopulation Average</i>		26,535	34,286	25,119	32,477
0311 Rifleman		25,985	34,627	24,661	32,592
35XX Motor Transport, Other		25,420	31,731	24,074	30,293
0111 Administrative Specialist		24,501	32,093	23,406	30,490
3051 Warehouse Clerk		24,004	31,577	22,743	29,712
3043 Supply Administration and Operations Specialist		23,423	31,221	22,599	30,146

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Color coding orange, below 90 percent of subpopulation average; gray, 90–120 percent; green, over 120 percent.

Table 4.5. Mean Adjusted Earnings of Selected MOCs for Navy Males with Less Than 20 Years of Service (2013 dollars)

MOC	Separation Codes		All	
	Favorable		Year 1	Year 3
SO Special Warfare Operator	41,687	41,832	35,311	40,399
EM Electrician's Mate	37,969	45,708	33,633	41,282
IT Information Systems Technician	36,966	44,463	32,747	40,019
CT Cryptologic Technician	36,441	43,181	31,890	38,435
AC Air Traffic Controller	33,546	48,064	29,887	42,522
AT Aviation Electronics Technician	30,471	38,640	27,591	35,218
<i>Subpopulation Average</i>	29,704	34,200	26,633	33,540
HM Hospital Corpsman	28,955	35,892	26,379	32,565
BU Builder	27,188	33,566	25,094	30,977
BM Boatswain's Mate	24,468	32,194	22,194	29,238
QM Quartermaster	23,601	30,934	21,143	27,724
MS Mess Management Specialist	22,625	28,652	21,432	26,820

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Color coding orange, below 90 percent of subpopulation average; gray, 90–120 percent; green, over 120 percent.

Earnings Grew by Similar Amounts over Three Years, Shrinking Relative Gaps Among MOCs

With very few exceptions, average earnings across the MOCs increased between the first and third years after separation for both those with favorable discharge codes and all discharge codes.

Table 4.6 depicts the average change in mean earnings from first to third year post-separation by MOC earnings tier for males with less than 20 years of service with favorable separation in each of the four services. Although the dollar increase is similar across services and earnings tiers, we observe that MOCs with average earnings in the low tier increase by a greater percentage than in the high tier of MOC earnings.

Table 4.6. Average Growth in Mean Earnings from Year 1 to Year 3 by MOC Earnings Tier (2013 dollars and percentage)

Earnings Tier	Army		Air Force		Marines		Navy	
	Year 1	%	Year 1	%	Year 1	%	Year 1	%
High	\$5,872	14%	\$8,671	17%	\$6,878	17%	\$7,348	21%
Mod.	\$7,729	28%	\$7,867	23%	\$7,797	29%	\$7,306	27%
Low	\$6,996	31%	\$7,896	29%	\$7,078	32%	\$6,733	32%

SOURCE: RAND analysis of DMDC and SSA data.

As noted in Chapter 3's section on limitations, we tracked earnings over three years in part to reduce the impact of college attendance to build skills after separation. This analysis suggests that although earnings do increase over the three years, perhaps due to a greater number of hours worked (as less time is spent in college) and to wage increases, the first-year earnings provide an accurate guide to the relative standing of different occupations. In other words, the pattern of earnings is very similar whether one uses a single year after separation or earnings three years after separation.

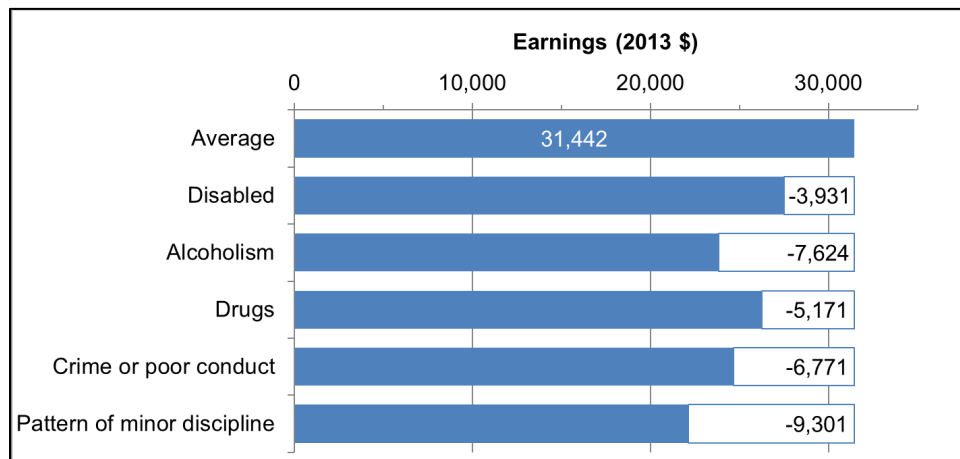
5. The Association of Other Variables with Earnings and Employment

This chapter presents the results of our analysis of the association of other variables with post-separation civilian earnings and employment. Table C.1 in Appendix C shows the association with earnings and employment of all the explanatory variables we estimated. In the appendix and the corresponding electronic appendix, the associations are separated by the 15 subpopulation groups. Here we focus on a selection of meaningful findings.

Unfavorable Separation Codes Are Associated with Lower Earnings

Unfavorable separation codes were found to be associated with lower earnings. Figure 5.1 depicts the association of unfavorable separation codes, such as alcoholism, drugs, crime or poor conduct, and pattern of minor disciplinary infractions, with the earnings of Army males with less than 20 years of service, showing average earnings in Year 3 as a reference. Because the model is linear, the estimated association is the same for any MOC among Army males with less than 20 years of service. These effects are highest for alcoholism (\$7,624) and pattern of minor disciplinary infractions (\$9,301). As seen in Appendix Table C.1, these effects are generally similar across the service, gender, and years of service groups. All of the codes shown in Figure 5.1, except pattern of minor disciplinary infractions, are also associated with lower chances of employment.

Figure 5.1. Association of Unfavorable Separation Codes with Earnings of Army Males with Less Than 20 Years of Service (Year 3, 2013 dollars)



SOURCE: RAND analysis of DMDC and SSA data.

NOTES: The top bar shows the average earnings. The white bars show the difference associated with each separation code.

College Is Associated with Higher Earnings

Service members possessing a bachelor’s degree or some college at the time of separation were found to have higher earnings than their peers who only possessed a high school diploma. The association of education with earnings increased over time. For example, Table 5.1 depicts the change from having a bachelor’s degree and some college education on earnings and employment outcomes for Army males with less than 20 years of service. In both cases, the additional education is associated with improved outcomes for separated soldiers.

Table 5.1. Relationship of Education and Deployment to Earnings of Army Males with Less Than 20 Years of Service

Variable	Change in earnings (2013 \$)		Change in chance of employment	
	Year 1	Year 3	Year 1	Year 3
Bachelor's degree*	+10,457	+13,219	↑	↑
Some college*	+1,125	+1,529	↑	↑
Per year of deployment	-415	-214	↓	↓

* Compared with high school diploma.

SOURCE: RAND analysis of DMDC and SSA data.

Deployment Is Associated with Lower Earnings for Army and Navy Males with Less Than 20 Years of Service (but Is Positive for Some Other Groups)

Deployment is associated with lower earnings and employment among Army males with less than 20 years of service. However, the deployment relationship decreases over time. This can be seen in Table 5.1, where the association of deployment with earnings is less in the third year following separation than in the first year. Appendix Table C.1 reports these associations for all groups. Navy males with less than 20 years of service display similar lower earnings associated with deployment, although the association does not decrease over time. Other groups display a positive association between years of deployment and post-service earnings, especially Air Force males both with less than and with more than 20 years of service and Army and Marine males with more than 20 years of service. Female groups generally did not show a significant relationship, perhaps because of smaller sample sizes and less-frequent deployment.

Other Associations Display Mixed Patterns

As shown in Appendix C, the association with other variables was mixed. For our measure of aptitude prior to enlistment (the AFQT percentile, which is available for the groups with less

than 20 years of service), although we found statistically significant associations with post-service earnings, these did not display a strong pattern. Some are positive and some are negative, which is perhaps surprising because higher tested ability is often associated with higher earnings. Because we controlled for both the service members' earnings prior to enlistment and military occupation, both of which are related to aptitude, we might not see much remaining association. In any case, the estimated association is small, amounting to a few hundred dollars in earnings for a 10-percentile-point change in AFQT score.

Similarly, although many studies found lower earnings levels for black and Hispanic individuals, we found a mixed pattern in our analysis. Our analysis is akin to estimating growth in earnings over time because we controlled for service members' earnings prior to enlistment, military occupation, rank, and years of service. For black individuals in our analysis, some subpopulations show positive and some show negative associations. Although the pattern is also mixed for Hispanic individuals, more of the associations are positive.

6. Comparing Military Earnings with Civilian Earnings

As a general guide to how much service members earn in civilian life compared with active duty, we explore the comparison of military to civilian earnings. In this chapter, we compare civilian earnings with the last full year of active-duty Regular Military Compensation (RMC), which is composed of Basic Pay, Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), and the tax advantage of untaxed BAH and BAS. Our method for calculating RMC follows DoD's Compensation Green Book (DoD, 2003 to 2010) and is described in Appendix A. Earnings are adjusted to constant 2013 dollars. Neither measure of earnings captures fringe benefits, such as health care and retirement.

Males and Females with Less Than 20 Years of Service Mostly Earned Less in Civilian Work

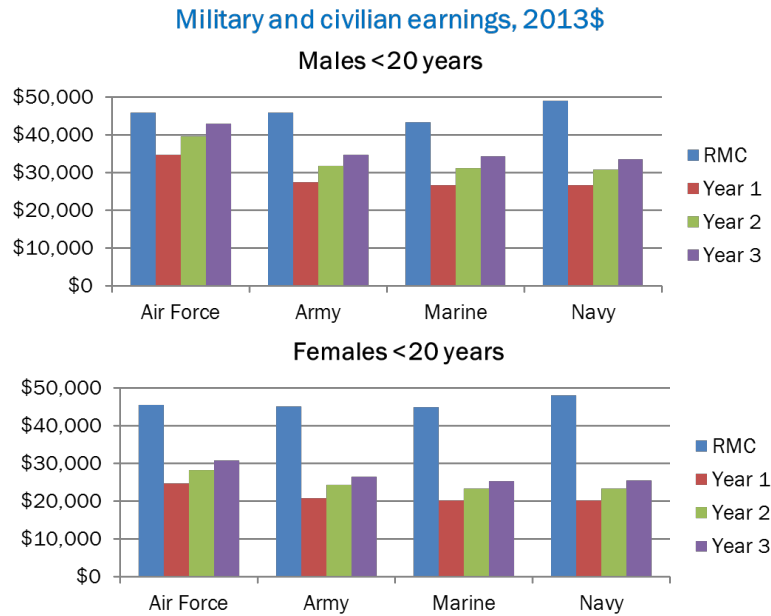
In our analysis, we found that, across the four services, both males and females with less than 20 years of service earned, on average, less in civilian employment than they did on active duty, measured by RMC. Figure 6.1 depicts the comparison by service and years post-separation. Because earnings tend to rise over the three years we studied, each group tends to make up some ground over this time. Air Force males with less than 20 years of service nearly equaled their active-duty compensation by Year 3, while the other male groups and all of the female groups remained below this benchmark even in Year 3.

Although the gender gap in compensation is small in the service, women earned significantly less after separation than men, across all branches. This could be explained by more intermittent labor supply through the year among working women.

Males and Females with More Than 20 Years of Service Also Earned Less in Civilian Work

Our analysis found that males and females with more than 20 years of service also earned less in civilian work in their first through third years post-separation. Figure 6.2 depicts the comparison between active-duty earnings (measured by RMC in the last year) and civilian earnings by service. Again, the groups are gaining ground over the three years, but here no group reaches its active-duty compensation by Year 3. These groups generally should be eligible for retired pay (a pension for active-duty service members), which we did not include in these comparisons, so it is very possible that total average income is higher for the groups with more than 20 years of service after separation (retirement).

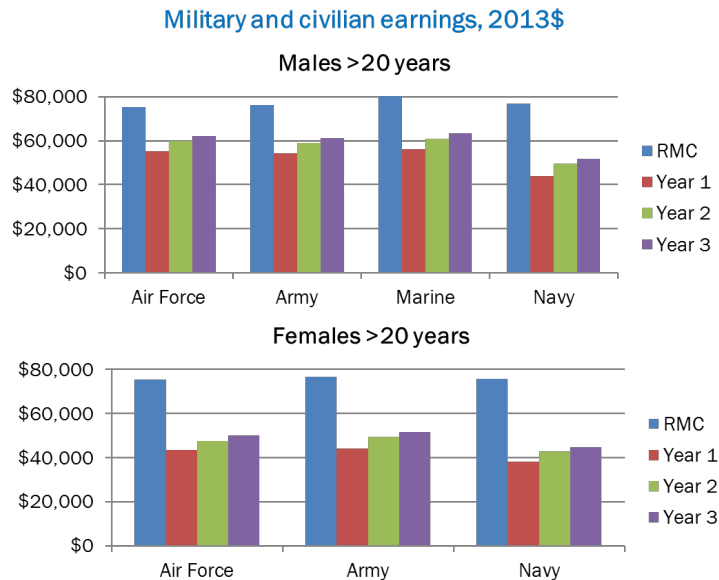
Figure 6.1. Comparison of RMC with Earnings Post-Separation by Service for Males and Females with Less Than 20 Years of Service



SOURCE: RAND analysis of DMDC and SSA data.

NOTES: RMC is the last full year of active-duty RMC. It is compared with average earnings in Years 1, 2, and 3 after separation.

Figure 6.2. Comparison of RMC with Earnings Post-Separation by Service for Males and Females with More Than 20 Years of Service



SOURCE: RAND analysis of DMDC and SSA data.

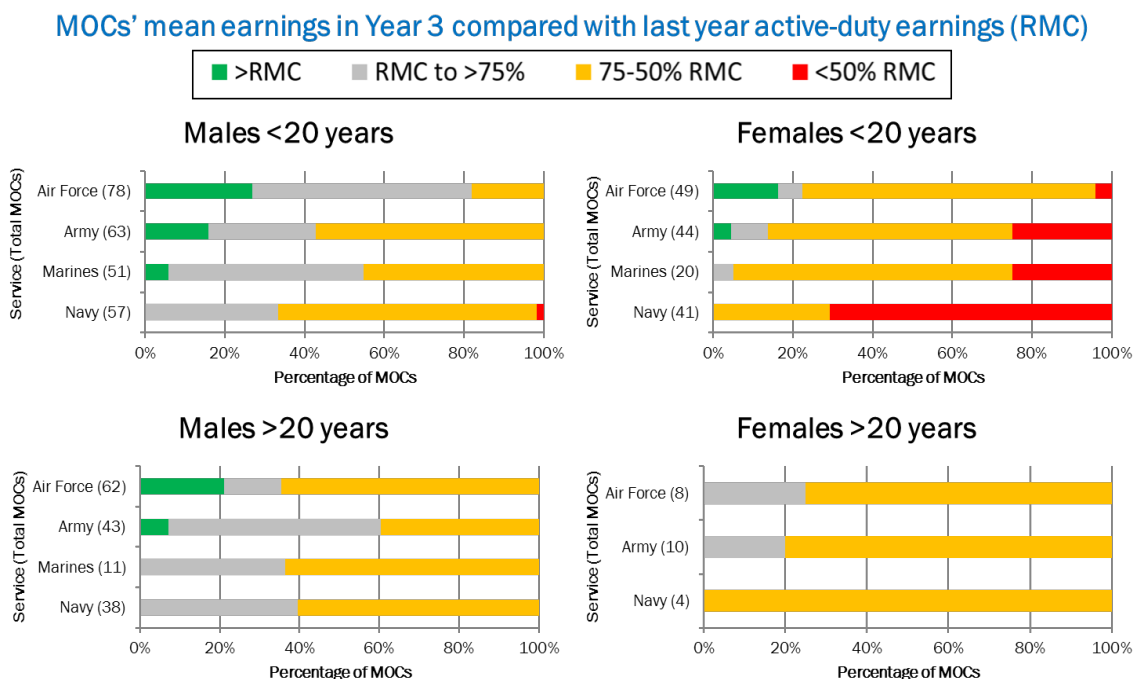
NOTES: RMC is the last full year of active-duty RMC. It is compared with average earnings in Years 1, 2, and 3 after separation.

Most MOCs Earn Less in Civilian Work, and Some Earn Much Less

We now turn to examine individual MOCs along this comparison metric. Not surprisingly given the results above for the averages, our analysis shows that the mean earnings of most MOCs in Year 3 post-separation did not exceed RMC. An electronic appendix contains the entire list of MOCs with earnings and employment rates. In that file, the Year 3 earnings are color-coded to compare with RMC. Figure 6.3 depicts a summary of those color codes (and the electronic file uses the same colors in its individual cells). As the figure shows, more than half of Army and Navy MOCs for males with less than 20 years of service had mean earnings in the range of 50 to 75 percent of RMC.

At the high end, 21 of the 78 MOC groups (or 27 percent) for the subpopulation of Air Force males with less than 20 years of service examined in this study had a mean civilian earnings three years post-separation that exceeded RMC. At the other end of the spectrum is the case of Navy. For Navy males with less than 20 years of service, none of the 57 MOC groups had a mean earnings three years post-separation above RMC. One Navy MOC group (or 2 percent of total MOCs in the subpopulation of Navy males with less than 20 years of service) had mean earnings in Year 3 equivalent to less than 50 percent of RMC.

Figure 6.3. Comparing the MOCs' Mean Earnings with RMC by Subpopulation



SOURCE: RAND analysis of DMDC and SSA data.

NOTES: Numbers in parentheses indicate the number of MOCs measured for each service subpopulation. Bars show the distribution of earnings in those MOCs compared with the last full year of RMC.

Military and Civilian Earnings Contexts Differ

The preceding comparison of civilian and military earnings does have limitations. It is important to understand the ways in which these contexts differ. Most important, RMC represents active-duty service, which is full time, while civilian work could be full time, part time, or intermittent. Part-time or intermittent work might be associated with college attendance, family responsibilities, or other choices. Our figures represent averages for those with any civilian earnings. In our analysis, we were not able to consider these different contexts that affect civilian wages. In addition, as noted above, service members who separate after 20 or more years of service are likely receiving income in the form of retired pay aside from any earned income they receive.

Prior research on the Army investigated whether soldiers understood the full compensation they received in the Army relative to what they could earn in civilian employment. Hansen and Nataraj, 2011, considered some nonpecuniary benefits of civilian employment, such as less travel away from family. Ultimately, they concluded that retention rates could be improved simply through better information for soldiers about the stability and value of military employment, including a guarantee of employment and generous fringe benefits, which for many would outweigh the added flexibility of civilian life.

7. Conclusions

This report presents estimates of the effect of military occupation on the post-separation employment and earnings of transitioning service members. Here, we recap some of the major insights from this study and discuss how they can be applied to strengthen transition programs within DoD as well as other federal and state agencies.

Military Occupation Appears to Be Strongly Related to Post-Separation Earnings, Indicating the Value of Occupation-Specific Transition Support

In estimating the post-service earnings for transitioning service members, we found a wide range of earnings that are associated with different military occupations (see Chapter 4 for details). The range from best to worst earnings represents a factor of 2 to 4, depending on subpopulation, which we generally view as a large range (e.g., the difference between earning \$20,000–\$40,000 versus earning \$60,000–\$80,000, which would be associated with major economic and lifestyle differences). Because our estimates control for a number of observable individual characteristics, this analysis suggests that it is wise to target transition assistance to occupations with lower anticipated civilian earnings.

Occupations in intelligence, information technology, and some aviation fields are consistently associated with high post-service earnings and so might not need as much support for their transition (or perhaps some of these occupations already had credentialing that enabled better civilian labor market opportunities).

On the other hand, occupations in combat arms, health care, supply, and motor transport are consistently associated with average or low earnings across the subpopulation groups we studied. These and other low-earning potential occupations are ripe for targeted transition support.

Service Members in Most Occupations Earn Less After Separation, Reinforcing the Need for More General Transition Support

As Chapter 6 presented, the majority of military occupations are associated with lower earnings after separation than during their final year of active duty. There are a number of potential explanations for this finding, with different implications for military policy. Service members develop skills that might be valued more highly in the military than outside of it. The dip in earnings could therefore represent a transitional period where service members are building human capital for occupations outside the military, implying that training programs could help decrease the drop in earnings. Alternatively, the dip in earnings could be evidence that service members are not well-informed about the overall compensation value of re-enlisting

versus separation, implying that informational programs and budgeting exercises might induce some service members to re-enlist to avoid a drop in earnings. Even if service members fully understand the compensation packages available in the military and outside the military, given their skills and applicability, service members might accept lower compensation in return for the greater flexibility of civilian life.

Future work should focus on the types of jobs that service members get after separation to benchmark earnings and inform retention and transition efforts. Our study focuses on a selected sample of service members who separated, indicating that they preferred their expected opportunities in the civilian labor market over their expected opportunities in the military. Retaining this group will potentially require a larger premium in compensation over comparable civilian work.

Individual Decisions and Behavior Are Also Strongly Related to Post-Separation Earnings and Could Identify Additional Targeting for Support

Chapter 5 reviewed the relationship between a number of individual decisions and behaviors and post-service earnings. Individuals with criminal, conduct, or disability reasons for discharge experienced considerably lower post-service earnings. In contrast, individuals who earned a college degree fared much better. These individual characteristics can be used to further segment and target separating service members for additional support to make their transitions as successful as possible.

In terms of their service, we see some evidence that deployment is associated with lower post-separation earnings, especially for Army and Navy service members with less than 20 years of service. Because of the concerns about how deployment could affect employment transition, providing, or at least offering, services for members who have been deployed recently or more than average could be worthwhile.

DoD and the Services Have Implemented Significant Programs to Address Transition; Future Analyses Could Yield Valuable Insights into These Programs

Since the 2002–2010 time period covered by this study, DoD and the services have implemented significant new programs for transition. The most general program requires all separating enlisted service members to take the Transition Assistance Program (TAP), which provides coaching on resume writing and job searching. Beginning in fiscal year 2019, several updates to TAP were implemented: an earlier start, at least one year prior to separation where possible; individualized counseling in several stages; and replacing some of the Labor Department job training with other training that the service member selects. These changes have the potential to better acclimate service members to the post-service job market.

For some targeted industries, Congress authorized the SkillBridge program, which allows the services to release service members from part of their duty to train with specific employer- or union-based job training programs. These programs are currently operating in information technology, truck driving, and other occupations at specific locations in the United States and typically provide between four and 20 weeks of job training.

Beyond SkillBridge, several career fields have revised their approach to credentialing, part of a broader push for the military (see American Legion, 2017). For instance, this study shows that health care occupations among enlisted services members are associated with low post-service earnings. Occupations such as combat medic could be similar to a civilian emergency medical technician, which is a relatively low-earning occupation. Today, career management in enlisted health care occupations now includes a focus on gaining civilian-recognized credentials and college credits toward a more advanced health care profession, such as nursing, which has much higher earning potential.

The analysis in this report could be helpful in identifying additional occupations associated with low civilian earning potential. These occupations might be good targets for developing transition programs or for revising the credentialing and career management approach, as the enlisted health care occupations have done.

The methods in this study can be applied to gain insight into the effects that these new transition programs have had on the first few annual cohorts that participated in them. Several of these programs have been implemented long enough that post-service earnings data should be available for at least some service members who separated while these programs were offered. This analysis could yield information that could be used to further target and support these and potentially other transition programs.

Because this study found that results using only one year of post-service data were largely similar to results that required three years of data, such analyses can be conducted as much as two years earlier for programs that have been implemented in the past few years, saving significant time in getting results. Nonetheless, when possible, it is desirable to also follow earnings over a longer period—for example, for certain older cohorts.

This Analysis Can Help Other Federal, State, and Local Agencies Target Support for Transitioning Veterans

Supporting service members making this transition does not stop at the time of separation. Post-separation, responsibility for such support falls to the Department of Labor working through the states and America’s Job Centers and to the Department of Veterans Affairs. These federal, state, and local agencies can use the insights from this report’s analysis to target programs that support veterans making the transition to civilian employment.

Appendix A. Research Design Details

Sample

As noted in Chapter 3, we excluded service members who separated with separation codes representing death or commissioning into the officer corps.¹ Otherwise, enlisted service members who separated from active duty during the time frame were included in the sample if they had valid data on the required variables. Table A.1 traces the development of the sample, starting with the full population of enlisted separations from 2002 to 2010. As the table shows, the most significant restriction was the requirement to have at least 18 months of service, which we considered a necessary time period to be trained in a military occupation. The other steps caused between 1 and 7 percent of the sample to be lost.

Table A.1. Development of Sample

Step	Population	Percentage Remaining Relative to Previous Step
Active enlisted separations from 2002 to 2010	1,563,560	
Remove people with multiple spells of service	1,489,400	95.3%
Remove people without at least 18 months of service	1,215,795	81.6%
Remove people with entrance prior to 1978	1,203,760	99.0%
Remove people with separation codes of death or officer commission	1,190,679	98.9%
Remove people with missing gender	1,171,774	98.4%
Remove Marine women	1,171,174	99.9%
Remove people with missing regression variables	1,090,207	93.1%
Remove people without matched earnings at SSA	1,010,728	92.7%

SOURCE: RAND analysis of DMDC and SSA data.

Outcome Variables

Our analysis focused on two labor force outcomes: annual earnings and employment in the formal labor force.

Earnings is a continuous measure of earnings taken from SSA files that include all reported income subject to Medicare taxes, such as income from firms, household employers, and self-employment (as well as reserve service for those members who receive reserve pay). Annual

¹ Excluded separation codes were 1030—Death, battle casualty; 1031—Death, non-battle, disease; 1032—Death, non-battle, other; 1033—Death, cause not specified; 1040—Officer commissioning program; and 1042—Military service academy.

earnings data were obtained by matching the study population's military data records to SSA's Master Earnings File, using the service members' Social Security numbers.²

Earnings are maintained by SSA on an annual basis, and so it is not possible to discern whether, for example, lower reported earnings in a given year are reflective of lower wages or whether they instead reflect employment for only part of the year. To mitigate this problem in our analysis, we used earnings for the first full calendar year following the year in which the sample member separated from the military. For example, if the service member separated in October 2005, we would examine their total earnings recorded between January 1, 2006, and December 31, 2006. To account for inflation, we converted all earnings to real dollars in 2013 using Social Security's National Annual Wage Index.

For the part of our analysis that compared civilian earnings to service members' final year of military earnings, we needed a complete measure of compensation on active duty. SSA data include military earnings base pay, but they do not include allowances such as BAS and BAH, which are not subject to Medicare taxes. Nor do the SSA data on earnings capture the tax savings from these non-taxed allowances. To account for these significant sources of military earnings and tax savings, we estimated each individual member's RMC, which is composed of Basic Pay, BAH, BAS, and the tax advantage of untaxed BAH and BAS. We used the service member's actual Basic Pay, along with special pays except for combat or hazardous duty pay, which we excluded as a compensating differential for the hazard. We used the Compensation Green Book method to estimate BAH, BAS, and the tax advantage following DMDC's published average statistics on family demographics and income by rank and service (Department of Defense, 2003 to 2010).

Employment in the formal labor market is a dichotomous variable coded 1 if the service member had a record income in the SSA file (i.e., "positive earnings"); if not, it was coded 0. Both outcome variables were measured at one, two, and three full years post-separation.

Our outcome measures do not allow us to know when an individual changed jobs or whether they were searching for a job if they were not earning, nor do they indicate when a person was working full time or part time.

Explanatory Variables

In our multivariate models, we included two vectors of explanatory variables: one vector corresponding to the military occupation held by the service member (our key variable of interest) and one vector of control variables.

² This match was conducted by staff at SSA. To preserve confidentiality, the matched data were analyzed at SSA using programs written by the authors. The individual-level matched data were never released to the authors. The project was reviewed and approved by RAND's Human Subjects Protection Committee.

Key Variable of Interest

Military occupation is the occupation held by service members at the time that they separated from the armed forces. The logic behind focusing on this occupation is that, in most cases, it represents the highest level of skill and responsibility held by the individual during their military tenure. It is expected that such skills and responsibilities will directly influence post-separation employment trajectories, with certain military experiences being more or less relevant to the needs of civilian employers. Using information from DEERS, we classified all occupations using the MOC system, which assigns each military occupation a unique code.

To ensure that we had enough sample members in each occupation within each service to produce stable results that would not be swayed by a handful of individuals (and would protect the privacy of individuals in uncommon occupations), we established a set of decision rules that comport with the requirements of our statistical models as well as with the structure of the different services' MOC schemes. For all services, we decided that we would focus only on individual occupations that were held by at least 250 departing service members in each year of our study. For those occupations that had fewer than 250 exiting service members, we combined them with other occupations that were substantively similar.

The resulting set of MOCs for each service can be seen in the electronic appendix results tables. Below, we explain our procedure in detail.

Classifying MOCs

The structure of the MOC system differs across the four services. The Army uses a nine-character Military Occupational Specialty (MOS), code while the Marine Corps uses a four-digit MOS code with the first two digits indicating occupational field. The Air Force uses a system of Air Force Specialty Codes that assigns a five-digit code to enlisted airmen, and the Navy uses a system of naval ratings with two or three characters denoting the name of the enlisted rate.³

The set of MOCs in use can change over time. Rather than include all the MOCs we observed, we created a consistent set corresponding to the most recent MOCs. We dealt with small differences by recoding obsolete MOCs into their current, most similar counterpart. We typically assigned the more recent MOC by identifying the most frequent empirical MOC transition pattern in the enlisted force data, around the time period when an obsolete MOC was discontinued. We examined the relationship between the labels of the proposed replacement and the original code. If we judged that this procedure did not result in a similar MOC, we did not recode that MOC. We assigned these members to a generic Other category if their final MOC was an obsolete code that had no related successor.

³ In NAVADMIN 218/16, released on September 29, 2016, the Navy announced a modernization plan that discontinued the enlisted rating system and replaced it with an alphanumeric Navy Operations Specialty classification system. This report uses the Navy enlisted rating system in effect during the period of study.

Within the Air Force, we combined similar jobs of different skill levels by collapsing the MOCs that shared the first, second, third, and fifth characters, because the fourth character identifies varying skill levels within the same basic occupation. An example of this is In-Flight Fueling Helper to Superintendent. These various skill levels are represented by 1A011, 1A031, 1A051, 1A071, and 1A091. These were collapsed to 1A0x1. After grouping the skill levels, we had 897 codes. Among those 897 codes, 26 were large enough to be listed individually, 794 small codes were rolled into a single generic category, and 77 were grouped into similar occupations by the first, second, and third characters, resulting in 89 codes for analysis.

For the Army, we combined 328 codes, grouping medium-sized occupations by the first two characters, which represent the Army branch. This resulted in a total of 66 occupational groups: 40 individual MOS codes, 25 combined branch-level codes, and one generic Other category. We followed a parallel procedure for the Marines, resulting in a total of 54 occupations and branch-level groups.

The Navy uses a more general set of ratings instead of military occupations. There were 60 current two-character rating codes with an average of 50 separations per year or more. Although some ratings can use a third character for greater specification, we used only the first two characters, which represent the basic rating. We included these 60 ratings and a single generic category for all other ratings.

In our multivariate models, the occupational groups are included as a series of binary indicator variables that index the service members' final occupation before separation. For the model to converge, there needed to be an omitted or "reference" category to which occupations could be compared. We selected the occupation that was most widely held within the ranks and that represents the most basic skill level required to participate fully as a member of the service as the reference occupation category. For analyses of the Air Force, the reference occupation category is Security Forces (3P0x1). For analyses of the Army, the reference occupation is Infantrymen (11B). For analyses of the Marines, the reference occupation is Rifleman (0311). For analyses of the Navy, the reference occupation is Boatswain's Mate (BM).

Individual Characteristic (Control) Variables

In our models, we included controls for sociodemographic characteristics as well as characteristics of military service and training that might confound the estimated relationship between military occupation and civilian employment outcomes. These were gender, race/ethnicity, AFQT percentile score, height, BMI, age, marital status, education level, cumulative months enlisted, cumulative months of deployment, pay grade, month and year of separation, and reason for separation.

Gender is a binary variable taken from DEERS coded 1 if the service member was male and 0 if the service member was female.

Race/ethnicity is represented by a series of binary variables taken from DEERS that indicate the race/ethnicity of the service member: White, Black, Hispanic, and Other. White service members serve as the reference category in all multivariate models.

AFQT percentile score is a continuous variable taken from MEPCOM that indicates the percentage of examinees in a reference group that scored at or below that particular score. Higher values are associated with better scores.

Height is a continuous variable taken from MEPCOM that indicates the height of the service member in inches at the time of enlistment.

BMI is a continuous variable based on height and weight, both taken from MEPCOM. BMI is a standard measure of relative size based on the mass and height of an individual, with higher scores indicating a larger body size. Because of considerable variation in the sociodemographic determinants and consequences of body size by gender, we included a multiplicative interaction between BMI and the binary gender indicator in all of our models.

Age is a continuous variable taken from DEERS that indicates the number of years old the service member was at the time of enlistment.

Marital status is a binary variable taken from DEERS coded 1 if the service member was married at separation and 0 if s/he was not married at separation.

Education level is represented by a series of binary variables taken from DEERS that indicates the highest level of education received by the service member at the time of separation: less than high school, GED, high school diploma, some college, bachelor's degree, and graduate degree. Service members whose highest level of education is a high school diploma serve as the reference category in all multivariate models.

Cumulative months enlisted is a continuous measure based on the enlistment date from WEX and the separation date from the Active Duty Master File.

Cumulative months of deployment is a continuous measure based on deployment start and end dates from the CTS.

Pay grade is represented by a series of binary variables taken from WEX that indicates the pay grade of the service member at the time of separation: pay grades 1–3, pay grade 4, pay grade 5, and pay grades 6–9. Service members whose pay grade was 1–3 at the time of separation serve as the reference category in all multivariate models.

Month and year of separation is represented by a series of binary variables taken from the Active Duty Master File that indicates the month and year in which the service member separated (e.g., January 2010, February 2010, March 2010, etc.). Service members who separated in December 2011 serve as the reference category in all multivariate models.

Reason for separation is represented by a series of binary variables taken from the Active Duty Master File that indicates the official reason for separation as recorded on the service member's official DD Form 214, Certificate of Release or Discharge from Active Duty (e.g., disability, conduct, retirement, expiration of term of service). There are 74 distinct codes present

in our sample, but we grouped small frequency codes together to avoid small cell sizes. Service members with an honorable discharge serve as the reference category in all multivariate models.

Pre-accession variables on AFQT and BMI were not included in the models for populations with more than 20 years of service because they were not generally available. Separation codes were also not included for these populations because service members with more than 20 years of service normally have a retired separation code, rather than a detailed reason code.

Method

Empirical Model of the Associations Among MOC, Earnings, and Employment

Our objective was to model the factors associated with individuals' post-service earnings, both initially and observing potential growth for a worker over a three-year period. We will draw comparisons across types of individuals and types of occupations.

For both employment and earnings, we present the unadjusted means of the outcome variables by each occupational category. The unadjusted means are simply percentage of positive earnings or the average level of earnings (among those with positive earnings) for veterans who served in a particular military occupation.

Given that there are a range of sociodemographic characteristics and military experiences of individual service members that both influence the types of occupations they are assigned to within the military and the types of occupations they are able to procure following release from the military, we present regression-adjusted means that eliminate the confounding effects of some of these characteristics that we were able to observe in the military data sources. Note that although we were able to control for a number of such characteristics, there could be unobserved factors that drive both the selection of occupation and post-service outcomes.

We therefore implemented an empirical model in which earnings or employment is a function of MOC, conditional on personal characteristics. The results of our analysis could be interpreted as causal effects of entering a particular MOC on earnings, for the average service member, under the assumption that we conditioned on all important confounders. Because this assumption is not plausible without measures of, for example, occupation-specific skills, we put forth these estimates as correlational relationships.

We did not intend to uncover the effect of placing the average service member into a given occupation but, rather, to identify the occupations in which service members earn less, net of the other personal characteristics associated with earning less, and, secondarily, to identify which personal characteristics of service members are associated with earning less. These relationships are still actionable for policy, because policies can be tailored to the occupation and the types of people who choose it, even if they are different in unobserved ways from the types of people who choose a different occupation.

Estimation

To obtain regression-adjusted means for earnings, we estimated a two-part hurdle model, which is a model that combines two processes to predict the outcome. The first part of the model involves “clearing the hurdle” from not holding a job to being employed. Because this part of the model only distinguishes between zero and nonzero values, we estimated it using a logistic regression. The second part of the model uses ordinary least squares estimation to predict earnings for only those sample members who are employed (those who cleared the hurdle). We first estimated a logistic model:

$$(1a) \quad \text{Employed}_{i,t} = \alpha + \delta \mathbf{MOC}_i + \gamma \mathbf{X}_i + \varepsilon_{i,t}$$

In this model, the value of outcome $\text{Employed}_{i,t}$ for service member i in year $t = 1,2,3$ can be 0 (not employed) or 1 (employed). On the right-hand side of the equation, the key parameters of interest are represented by δ for the vector of military occupations \mathbf{MOC} . γ are the main effects of the vector of time-invariant control variables \mathbf{X} . $\varepsilon_{i,t}$ is an idiosyncratic error term specific to the outcome. Conditional on being employed, we then estimated an ordinary least squares model:

$$(1b) \quad \text{Earnings}_{i,t} = \alpha + \delta \mathbf{MOC}_i + \gamma \mathbf{X}_i + \beta y_{i,-k} + \eta_{i,t}$$

In Equation (1b), $\text{Earnings}_{i,t}$ represents the annual earnings of employed former service member i in year $t = 1,2,3$. This model also includes a control for earnings in the year immediately before enlistment, $y_{i,-k}$, such that k is the number of years enlisted. η_i is an idiosyncratic error term, different from the error in Equation (1a). All other terms are the same as in Equation (1a). We used the parameter estimates in Equation (1b) to calculate predicted earnings for each individual military occupation, with all variables contained in \mathbf{X} set to their mean (for continuous measures) or mode (for categorical measures).

We also estimated Tobit models that allow estimating the two stages of employment and earnings together in one model (where the mass of people with zero earnings represents the no employment condition). An advantage of this model is that it explicitly accounts for correlation in the error terms of Equations (1a) and (1b) above. However, it is dramatically more intensive in computation time for large data sets like these. We found the results largely consistent with the models we presented (likely because the vast majority of members in each subpopulation have positive earnings), but the results were more challenging to interpret, so we presented only the hurdle model.

Appendix B. Earnings for Selected MOCs Within Subpopulations

Table B.1 reports a selection of 11 occupations for each subpopulation (service branch, term of service, and gender grouping). The occupations were selected to showcase the range of earnings and represent at least some common MOCs. Complete tables for all MOCs analyzed are available in the electronic appendix (available at www.rand.org/t/RRA361-1). Each table reports the adjusted average yearly earnings, in 2013 dollars, for favorable separations and all individuals, and Year 1 and Year 3 under each of those groupings. The figures were estimated using the fitted values from our regression and the means in each tenure and gender group. The electronic appendix provides a full listing of MOCs and the number of individuals in each.

The color coding represents tiers of earnings within a service, term of service, and gender group (a subpopulation group). The subpopulation average is reported in the table. The MOCs within each table are sorted by the Favorable Year 3 column. Those with earnings of more than 120 percent of the table average are highlighted in green. The moderate earnings tier is composed of MOCs with earnings between 90 and 120 percent of the subpopulation average and is highlighted in gray. The low earnings tier is composed of MOCs with first-year earnings below 90 percent of the subpopulation average.

Table B.1. Mean Adjusted Earnings for Selected MOCs, by Subpopulation

Army Males with Less Than 20 Years of Service				
Separation Codes	Favorable		All	
MOCs	Year 1	Year 3	Year 1	Year 3
35M Human Intelligence Collector	57,851	53,361	49,503	46,830
25S Sat Comm Sys Operator-Maintainer	55,232	60,768	47,396	53,259
35X Military Intelligence, Other	52,864	59,399	47,870	54,569
25B Information Technology Specialist	50,704	56,723	42,464	48,903
35F Intelligence Analyst	47,330	51,448	42,849	47,097
35N Signals Intelligence Analyst	46,198	53,810	41,149	48,158
31B Military Police	28,845	37,051	26,182	33,478
<i>Subpopulation average</i>	27,429	34,601	24,789	31,442
42L Administrative Specialist	25,166	33,199	22,826	29,711
88M Motor Transport Operator	23,374	30,661	21,792	28,378
68W Health Care Specialist	23,339	30,042	21,569	27,577
11B Infantryman	23,306	30,875	21,680	28,667

Army Males with More Than 20 Years of Service

Separation Codes	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
MOCs				
35X Military Intelligence, Other	79,496	86,029	79,578	86,009
18X Special Forces	76,878	81,910	76,248	82,327
25B Information Technology Specialist	73,641	76,220	73,586	75,960
35F Intelligence Analyst	71,638	75,659	71,495	75,446
92Y Unit Supply Specialist	58,188	66,068	57,991	65,871
42L Administrative Specialist	57,393	65,871	57,321	65,736
<i>Subpopulation average</i>	54,225	60,992	54,079	60,881
91X Mechanical Maintenance, Other	51,582	58,892	51,467	58,690
31B Military Police	51,089	58,788	50,901	58,668
11B Infantryman	47,313	53,811	46,999	53,628
68W Health Care Specialist	47,891	53,238	47,754	53,097
88M Motor Transport Operator	43,101	49,690	43,256	49,833

Army Females with Less Than 20 Years of Service

Separation Codes	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
MOCs				
35X Military Intelligence, Other	40,260	47,469	37,609	44,169
35N Signals Intelligence Analyst	38,414	46,677	35,537	43,404
35F Intelligence Analyst	35,409	42,652	33,577	40,544
<i>Subpopulation average</i>	20,703	26,396	19,548	25,091
92A Automated Logistical Specialist	20,634	26,784	19,275	25,146
92Y Unit Supply Specialist	19,220	25,938	18,146	24,533
42A Human Resources Specialist	19,644	25,397	18,601	23,861
31B Military Police	19,509	25,194	18,772	24,218
25U Signal Support Systems Specialist	19,346	23,144	18,291	22,932
68W Health Care Specialist	18,386	23,134	17,669	22,352
91B Wheeled Vehicle Mechanic	16,412	22,292	15,818	21,245
88M Motor Transport Operator	15,887	20,971	15,261	20,295

Army Females with More Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
25X Signal Corps, Other	49,020	59,124	48,795	58,917
42L Administrative Specialist	48,424	57,762	48,580	57,555
92A Automated Logistical Specialist	43,904	55,517	43,505	55,307
92Y Unit Supply Specialist	47,006	52,043	46,604	51,921
42A Human Resources Specialist	43,973	51,513	44,278	51,452
88X Transportation, Other	44,718	51,022	43,864	51,049
<i>Subpopulation average</i>	44,029	51,680	43,976	51,613
68X Medical CMF, Other	38,684	45,971	39,268	46,231
68W Health Care Specialist	38,315	43,442	38,517	43,656
92X Quartermaster Corps, Other	35,795	43,428	35,596	43,059

Air Force Males with Less Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
1N1XX Geospatial Intelligence	78,920	83,696	70,823	74,985
6C0XX Contracting	59,934	67,740	53,912	62,198
3D0XX Knowledge Operations Management	56,322	67,475	50,707	60,325
3D0X2 Cyber Systems Operations	55,104	63,993	50,469	59,304
1C1X1 Air Traffic Control	54,330	74,206	49,069	66,921
1N2XX Signals Intelligence Analyst	50,310	60,986	43,915	54,193
<i>Subpopulation average</i>	34,567	42,952	31,257	38,986
2A7X3 Aircraft Structural Maintenance	33,235	41,588	30,558	37,800
3P0X1 Security Forces	28,427	37,140	26,213	34,300
2T1XX Vehicle Operations	26,381	34,192	24,836	31,655
4N0X1 Aerospace Medical Service	24,408	32,855	23,258	30,805
4Y0XX Dental Assistant	19,959	27,166	22,423	29,026

Air Force Males with More Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
7S0XX Special Investigations	90,026	99,379	90,295	98,819
1N2XX Signals Intelligence Analyst	82,221	91,619	82,089	90,874
6C0XX Contracting	76,537	89,345	77,128	89,200
3D0X2 Cyber Systems Operations	70,137	77,216	70,267	77,316
2A3X4 Avionics Systems	55,813	63,526	55,971	63,569
<i>Subpopulation average</i>	55,133	62,196	55,144	62,146
3D0X1 Knowledge Operations Management	53,495	60,322	53,716	60,465
2S0X1 Materiel Management	50,145	57,344	49,999	56,844
2A3X3 Tactical Aircraft Maintenance	49,746	57,366	49,811	57,654
2W1X1 Aircraft Armament Systems	47,259	53,668	46,880	53,452
2W0X1 Munitions Systems	46,940	53,582	46,994	53,660
2T3XX Vehicle Maintenance	46,685	53,693	46,567	54,009

Air Force Females with Less Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
1C1X1 Air Traffic Control	42,689	59,116	38,251	52,660
1N2XX Signals Intelligence Analyst	41,352	50,965	37,241	46,084
1N0X1 Operations Intelligence	37,951	48,232	35,316	44,332
3D0X2 Cyber Systems Operations	37,477	47,159	35,655	44,169
6FOX1 Financial Management and Comptroller	27,115	33,080	24,624	30,601
<i>Subpopulation average</i>	24,727	30,766	23,120	28,816
3D0X1 Knowledge Operations Management	24,642	30,798	23,092	28,910
3P0x1 Security Forces	22,199	28,134	21,047	26,893
3S0X1 Personnel	21,391	26,713	20,277	25,665
2S0X1 Materiel Management	20,568	27,650	19,491	25,829
4N0X1 Aerospace Medical Service	18,764	24,086	17,974	22,893
4Y0XX Dental Assistant	18,022	21,540	18,057	21,367

Air Force Females with More Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
6FOX1 Financial Management and Comptroller	56,018	64,156	55,531	63,503
3D0XX Knowledge Operations Management	54,427	62,884	54,588	62,081
3D1XX Client Systems	45,984	55,433	45,213	53,610
3D0X1 Knowledge Operations Management	44,117	50,192	43,870	49,884
<i>Subpopulation average</i>	43,380	50,113	38,018	44,693
3SOX1 Personnel	42,470	47,498	42,404	47,598
2SOX1 Materiel Management	41,400	48,636	40,897	48,191
4NOX1 Aerospace Medical Service	34,070	39,547	34,271	39,712

Marine Corps Males with Less Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
26XX Signals Intelligence/Ground Electronic Warfare	41,261	50,889	39,028	48,048
02XX Intelligence	39,429	45,978	36,854	43,881
0651 Data Systems Technician	39,146	46,179	36,319	42,976
63XX Aircraft Avionics Technician	31,600	41,938	29,888	39,242
61XX Helicopter Mechanic	29,477	38,754	27,703	36,751
5811 Military Police	29,205	37,507	27,737	35,808
<i>Subpopulation average</i>	26,535	34,286	25,119	32,477
0311 Rifleman	25,985	34,627	24,661	32,592
35XX Motor Transport, Other	25,420	31,731	24,074	30,293
0111 Administrative Specialist	24,501	32,093	23,406	30,490
3051 Warehouse Clerk	24,004	31,577	22,743	29,712
3043 Supply Administration and Operations Specialist	23,423	31,221	22,599	30,146

Marine Corps Males with More Than 20 Years of Service

Separation Codes	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
MOCs				
06XX Communications, Other	61,632	68,799	61,822	68,921
3043 Supply Administration and Operations Specialist	58,513	64,869	59,211	65,366
<i>Subpopulation average</i>	55,989	63,229	55,937	63,123
89XX Sergeant Major-First Sergeant	53,174	64,024	52,956	63,958
03XX Infantry, Other	53,920	60,464	54,193	60,379
84XX Career Recruiter	53,429	59,708	53,384	59,226
58XX Military Police and Corrections, Other	53,994	57,867	54,103	58,238
01XX Personnel & Administration, Other	49,698	57,185	49,818	57,404
60XX Aircraft Maintenance	49,319	56,148	49,273	56,458
35XX Motor Transport, Other	47,225	55,493	46,939	55,312
13XX Engineer, Other	46,870	54,894	47,193	55,001

Marine Corps Females with Less Than 20 Years of Service

Separation Codes	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
MOCs				
06XX Communications, Other	26,503	35,325	25,416	32,621
5811 Military Police	25,539	28,788	23,070	27,058
0111 Administrative Specialist	22,633	26,678	21,119	25,267
3043 Supply Administration and Operations Specialist	21,543	25,198	19,895	24,456
<i>Subpopulation average</i>	20,126	25,277	19,165	23,884
3051 Warehouse Clerk	19,494	25,591	18,585	24,338
04XX Logistics	19,356	23,673	19,405	23,375
3531 Motor Vehicle Operator	17,377	23,981	16,976	22,657
60XX Aircraft Maintenance	17,280	22,881	17,318	21,810
0621 Field Radio Operator	16,448	21,991	16,299	21,452
2311 Ammunition Technician	15,784	19,586	15,367	18,423
3381 Food Service Specialist	15,405	20,587	14,506	19,386

Navy Males with Less Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
SO Special Warfare Operator	41,687	41,832	35,311	40,399
EM Electrician's Mate	37,969	45,708	33,633	41,282
IT Information Systems Technician	36,966	44,463	32,747	40,019
CT Cryptologic Technician	36,441	43,181	31,890	38,435
AC Air Traffic Controller	33,546	48,064	29,887	42,522
AT Aviation Electronics Technician	30,471	38,640	27,591	35,218
Subpopulation average	29,704	34,200	26,633	33,540
HM Hospital Corpsman	28,955	35,892	26,379	32,565
BU Builder	27,188	33,566	25,094	30,977
BM Boatswain's Mate	24,468	32,194	22,194	29,238
QM Quartermaster	23,601	30,934	21,143	27,724
MS Mess Management Specialist	22,625	28,652	21,432	26,820

Navy Males with More Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
CT Cryptologic Technician	62,408	68,849	62,136	68,630
IT Information Systems Technician	60,961	68,963	60,569	68,471
ET Electronics Technician	60,791	69,214	60,563	69,057
MM Machinist's Mate	59,168	67,145	59,067	67,063
Subpopulation average	51,346	58,609	51,232	58,460
OS Operations Specialist	50,052	56,671	49,695	56,297
SK Storekeeper	47,940	54,787	47,773	54,628
AM Aviation Structural Mechanic	47,651	54,458	47,497	54,409
HM Hospital Corpsman	46,184	53,483	46,191	53,358
BM Boatswain's Mate	42,916	49,769	42,691	49,491
MA Master-At-Arms	41,019	49,608	40,828	49,429
MS Mess Management Specialist	38,400	44,260	38,253	44,201

Navy Females with Less Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
CT Cryptologic Technician	28,322	33,977	26,276	31,956
ET Electronics Technician	25,415	33,129	24,360	31,231
IT Information Systems Technician	26,585	32,513	25,119	31,207
HM Hospital Corpsman	21,335	26,317	20,920	25,645
<i>Subpopulation average</i>	20,137	25,472	19,125	24,142
MA Master-At-Arms	19,373	25,247	18,176	23,360
SK Storekeeper	18,049	24,029	17,546	22,945
AT Aviation Electronics Technician	17,400	23,213	16,959	22,231
OS Operations Specialist	17,326	22,316	16,430	20,904
AM Aviation Structural Mechanic	16,385	21,234	16,320	20,486
BM Boatswain's Mate	16,091	21,077	15,486	19,906
MS Mess Management Specialist	15,610	19,950	14,767	18,982

Navy Females with More Than 20 Years of Service

Separation Codes MOCs	Favorable		All	
	Year 1	Year 3	Year 1	Year 3
CT Cryptologic Technician	48,720	55,378	48,618	55,059
IT Information Systems Technician	44,760	53,552	44,671	53,280
<i>Subpopulation average</i>	38,018	44,693	38,003	44,612
HM Hospital Corpsman	34,802	40,894	34,892	41,075

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Color coding: orange, below 90 percent of subpopulation average; gray, 90–120 percent; green, over 120 percent.

Appendix C. Effect of Variables on Earnings and Employment

In Table C.1, each line represents a regression of the outcome, listed at the top of the right-hand column, on the characteristic listed on the left-hand side. All available characteristics were included in one model for each subpopulation, so that the coefficients represented condition on and hold other factors equal. The lines are within groups; where blank, the variable was not included in that model either because data were not available or relevant (pre-accession variables on AFQT and BMI and separation code variables were not included in the models for subpopulations with more than 20 years of service) or there were too few members with that value to meet privacy disclosure requirements.

Green highlighting denotes a statistically significant coefficient at the 5 percent level, after a Bonferroni adjustment for multiple comparisons. Employment effects are reported only in direction, rather than as a magnitude.

The same information is available in the electronic appendix (available at www.rand.org/t/RRA361-1) in a sortable format (including the Year 2 coefficients).

Table C.1. Relationship of Variables to Earnings and Employment

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Percentile rank on AFQT				
Air Force female, < 20 years	-8	-15	-	-
Air Force female, > 20 years				
Air Force male, < 20 years	-48	-56	-	-
Air Force male, > 20 years				
Army female, < 20 years	31	39	-	-
Army female, > 20 years				
Army male, < 20 years	-7	-10	-	-
Army male, > 20 years				
Marines female, < 20 years	25	57	+	-
Marines male, < 20 years	-14	-30	-	-
Marines male, > 20 years				
Navy female, < 20 years	50	47	-	-
Navy female, > 20 years				
Navy male, < 20 years	24	23	-	-
Navy male, > 20 years				

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Age prior to military entrance				
Air Force female, < 20 years	-179	-260	-	-
Air Force female, > 20 years	-961	-1,246	-	-
Air Force male, < 20 years	-359	-403	-	-
Air Force male, > 20 years	-1,198	-1,280	-	-
Army female, < 20 years	-67	-167	-	-
Army female, > 20 years	-747	-723	-	-
Army male, < 20 years	-169	-225	-	-
Army male, > 20 years	-674	-852	-	-
Marines female, < 20 years	-427	-522	-	-
Marines male, < 20 years	-477	-596	-	-
Marines male, > 20 years	-1,045	-1,240	-	-
Navy female, < 20 years	-125	-132	-	-
Navy female, > 20 years	-598	-754	-	-
Navy male, < 20 years	-438	-562	-	-
Navy male, > 20 years	-942	-1,016	-	-
BMI				
Air Force female, < 20 years	49	34	+	+
Air Force female, > 20 years				
Air Force male, < 20 years	0	0	+	+
Air Force male, > 20 years				
Army female, < 20 years	-1	1	+	+
Army female, > 20 years				
Army male, < 20 years	7	11	+	+
Army male, > 20 years				
Marines female, < 20 years	-8	7	+	+
Marines male, < 20 years	65	86	+	+
Marines male, > 20 years				
Navy female, < 20 years	22	3	+	+
Navy female, > 20 years				
Navy male, < 20 years	33	38	+	+
Navy male, > 20 years				
Years deployed				
Air Force female, < 20 years	-374	-319	+	+
Air Force female, > 20 years	-469	1,263	+	-
Air Force male, < 20 years	1,089	1,379	-	+
Air Force male, > 20 years	1,207	1,249	-	+

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Army female, < 20 years	-34	488	+	+
Army female, > 20 years	269	1,563	+	+
Army male, < 20 years	-415	-214	-	-
Army male, > 20 years	1,169	1,255	-	+
Marines female, < 20 years	1,938	2,824	+	+
Marines male, < 20 years	-288	249	-	-
Marines male, > 20 years	2,960	2,512	-	-
Navy female, < 20 years	-301	226	+	+
Navy female, > 20 years	-2,352	-1,216	-	-
Navy male, < 20 years	-633	-610	-	-
Navy male, > 20 years	-706	-1,000	-	+

Education level (compared with high school diploma)

Bachelor's degree

Air Force female, < 20 years	10,472	12,753	+	+
Air Force female, > 20 years	9,075	10,273	+	+
Air Force male, < 20 years	10,530	14,123	+	+
Air Force male, > 20 years	11,970	13,329	+	+
Army female, < 20 years	8,713	10,530	+	+
Army female, > 20 years	6,156	9,189	+	+
Army male, < 20 years	10,457	13,220	+	+
Army male, > 20 years	7,745	8,099	+	+
Marines female, < 20 years	14,500	17,432	+	+
Marines male, < 20 years	12,021	16,686	+	+
Marines male, > 20 years	11,205	10,092	+	+
Navy female, < 20 years	7,772	10,052	+	+
Navy female, > 20 years	6,859	6,516	+	+
Navy male, < 20 years	9,124	11,533	+	+
Navy male, > 20 years	7,441	8,239	+	+

Some college

Air Force female, < 20 years	1,186	2,748	+	+
Air Force female, > 20 years	2,806	3,834	+	+
Air Force male, < 20 years	2,524	3,613	+	+
Air Force male, > 20 years	5,756	6,178	+	+
Army female, < 20 years	602	941	+	+
Army female, > 20 years	35	1,720	+	+
Army male, < 20 years	1,125	1,529	+	+

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Army male, > 20 years	3,056	3,039	+	+
Marines female, < 20 years	1,926	5,538	+	+
Marines male, < 20 years	2,488	3,208	-	-
Marines male, > 20 years	4,925	4,783	+	+
Navy female, < 20 years	1,393	2,438	+	-
Navy female, > 20 years	340	125	+	+
Navy male, < 20 years	539	104	-	-
Navy male, > 20 years	2,888	3,640	+	+

Separation codes (compared with term expiration)

Character or behavior disorder

Air Force female, < 20 years	-6,927	-8,062	-	-
Air Force female, > 20 years				
Air Force male, < 20 years	-7,727	-11,135	-	-
Air Force male, > 20 years				
Army female, < 20 years	-4,144	-6,115	-	-
Army female, > 20 years				
Army male, < 20 years	-6,772	-8,143	-	-
Army male, > 20 years				
Marines female, < 20 years	-1,304	-3,675	-	-
Marines male, < 20 years	-4,929	-6,796	-	-
Marines male, > 20 years				
Navy female, < 20 years	-2,984	-4,762	-	-
Navy female, > 20 years				
Navy male, < 20 years	-5,960	-7,327	-	-
Navy male, > 20 years				

Alcoholism

Air Force female, < 20 years	-6,098	-2,547	-	+
Air Force female, > 20 years				
Air Force male, < 20 years	-4,442	-3,943	+	-
Air Force male, > 20 years				
Army female, < 20 years	-4,208	-7,006	-	-
Army female, > 20 years				
Army male, < 20 years	-6,036	-7,624	-	-
Army male, > 20 years				
Marines female, < 20 years				
Marines male, < 20 years	-3,898	-3,981	-	-
Marines male, > 20 years				

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Navy female, < 20 years	-3,555	-4,668	+	-
Navy female, > 20 years				
Navy male, < 20 years	-3,912	-4,368	+	-
Navy male, > 20 years				
Drugs				
Air Force female, < 20 years	-2,856	-5,176	+	+
Air Force female, > 20 years				
Air Force male, < 20 years	-2,635	-4,663	+	+
Air Force male, > 20 years				
Army female, < 20 years	-3,718	-5,015	-	-
Army female, > 20 years				
Army male, < 20 years	-3,948	-5,171	-	-
Army male, > 20 years				
Marines female, < 20 years	-570	-939	+	+
Marines male, < 20 years	-1,535	-2,736	+	+
Marines male, > 20 years				
Navy female, < 20 years	-1,615	-3,997	+	+
Navy female, > 20 years				
Navy male, < 20 years	-3,548	-4,986	+	-
Navy male, > 20 years				
Pattern of minor disciplinary infractions				
Air Force female, < 20 years	-4,849	-5,064	+	-
Air Force female, > 20 years				
Air Force male, < 20 years	-4,056	-6,108	+	+
Air Force male, > 20 years				
Army female, < 20 years	-4,976	-5,520	-	-
Army female, > 20 years				
Army male, < 20 years	-7,592	-9,301	+	-
Army male, > 20 years				
Marines female, < 20 years				
Marines male, < 20 years	-5,718	-5,733	+	-
Marines male, > 20 years				
Navy female, < 20 years	-5,257	-7,169	+	+
Navy female, > 20 years				
Navy male, < 20 years	-4,734	-4,911	+	-
Navy male, > 20 years				

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Commission of a serious offense				
Air Force female, < 20 years	-3,553	-1,950	+	+
Air Force female, > 20 years				
Air Force male, < 20 years	-2,397	-2,044	+	-
Air Force male, > 20 years				
Army female, < 20 years	-3,533	-4,783	-	-
Army female, > 20 years				
Army male, < 20 years	-4,293	-5,093	-	-
Army male, > 20 years				
Marines female, < 20 years	-2,558	-1,929	+	+
Marines male, < 20 years	-4,683	-3,874	-	-
Marines male, > 20 years				
Navy female, < 20 years	-2,360	-4,668	+	+
Navy female, > 20 years				
Navy male, < 20 years	-3,870	-4,899	+	-
Navy male, > 20 years				
Conduct				
Air Force female, < 20 years	-5,021		+	-
Air Force female, > 20 years				
Air Force male, < 20 years	-3,450	-5,820	+	-
Air Force male, > 20 years				
Army female, < 20 years	-3,146	-4,502	-	-
Army female, > 20 years				
Army male, < 20 years	-4,873	-5,939	-	-
Army male, > 20 years				
Marines female, < 20 years	-3,859	-346	+	+
Marines male, < 20 years	-3,860	-1,772	+	-
Marines male, > 20 years				
Navy female, < 20 years	-2,292	1,059	+	+
Navy female, > 20 years				
Navy male, < 20 years	-4,747	-2,266	-	-
Navy male, > 20 years				
Disabled				
Air Force female, < 20 years	-6,529		-	-
Air Force female, > 20 years				
Air Force male, < 20 years	-7,600	-7,408	-	-
Air Force male, > 20 years				

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Army female, < 20 years	-4,271	-3,570	-	-
Army female, > 20 years				
Army male, < 20 years	-3,910	-3,931	-	-
Army male, > 20 years				
Marines female, < 20 years	-3,213	-906	-	-
Marines male, < 20 years	-3,481	-3,060	-	-
Marines male, > 20 years				
Navy female, < 20 years	-2,953	-3,902	-	-
Navy female, > 20 years				
Navy male, < 20 years	-5,825	-5,396	-	-
Navy male, > 20 years				

Married

Air Force female, < 20 years	-1,068	-849	-	-
Air Force female, > 20 years	-832	4,203	-	-
Air Force male, < 20 years	4,151	4,384	+	+
Air Force male, > 20 years	4,393	-1,088	+	+
Army female, < 20 years	-725	-2,521	-	-
Army female, > 20 years	-1,672	4,028	-	-
Army male, < 20 years	3,852	3,679	+	+
Army male, > 20 years	4,298	-735	+	+
Marines female, < 20 years	-875	4,661	-	-
Marines male, < 20 years	4,474	5,833	+	+
Marines male, > 20 years	2,450	-1,130	+	+
Navy female, < 20 years	-1,316	527	-	-
Navy female, > 20 years	1,511	4,933	-	-
Navy male, < 20 years	4,923	5,650	+	+
Navy male, > 20 years	5,818		+	+

Earnings in year prior to military entrance (in 2013 dollars)

Air Force female, < 20 years	0.25	0.19	+	+
Air Force female, > 20 years	0.22	0.29	+	+
Air Force male, < 20 years	0.32	0.16	+	+
Air Force male, > 20 years	0.17	0.26	+	+
Army female, < 20 years	0.30	0.12	+	+
Army female, > 20 years	0.18	0.23	+	+
Army male, < 20 years	0.24	0.11	+	+
Army male, > 20 years	0.14	0.28	+	+
Marines female, < 20 years	0.28	0.30	+	+

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Marines male, < 20 years	0.31	0.16	+	+
Marines male, > 20 years	0.20	0.14	+	+
Navy female, < 20 years	0.14	0.09	+	+
Navy female, > 20 years	0.11	0.24	+	+
Navy male, < 20 years	0.26	0.16	+	+
Navy male, > 20 years	0.17		+	+

Service years

Air Force female, < 20 years	893	234	-	-
Air Force female, > 20 years	373	1,027	-	-
Air Force male, < 20 years	933	-310	-	-
Air Force male, > 20 years	-217	872	-	-
Army female, < 20 years	784	21	-	-
Army female, > 20 years	247	803	-	-
Army male, < 20 years	625	364	-	-
Army male, > 20 years	576	902	-	-
Marines female, < 20 years	1,088	1,093	-	-
Marines male, < 20 years	952	348	-	-
Marines male, > 20 years	77	736	-	-
Navy female, < 20 years	780	1,472	-	-
Navy female, > 20 years	1,371	742	-	-
Navy male, < 20 years	644	1,076	-	-
Navy male, > 20 years	1,219		-	-

Pay grade (compared with E3 or lower)

E4 pay grade

Air Force female, < 20 years	1,691		-	-
Air Force female, > 20 years		2,289	-	-
Air Force male, < 20 years	3,421	-589	+	+
Air Force male, > 20 years	7,694	1,787	-	-
Army female, < 20 years	2,223			
Army female, > 20 years		2,053		
Army male, < 20 years	3,894		-	+
Army male, > 20 years		2,579		
Marines female, < 20 years	2,492	3,094	-	+
Marines male, < 20 years	4,599		+	+
Marines male, > 20 years		623		
Navy female, < 20 years	459		-	-
Navy female, > 20 years		2,059		

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Navy male, < 20 years	3,246	-8,058	-	+
Navy male, > 20 years	1,534		+	-
E5 pay grade				
Air Force female, < 20 years	7,970	-6,650	-	-
Air Force female, > 20 years	-6,865	9,498	+	-
Air Force male, < 20 years	11,199	2,273	+	+
Air Force male, > 20 years	4,441	6,173	+	+
Army female, < 20 years	8,330	-10,487	+	+
Army female, > 20 years	-11,438	6,767	+	+
Army male, < 20 years	10,387	-6,977	+	+
Army male, > 20 years	-3,525	6,276	+	+
Marines female, < 20 years	7,021	7,482	+	+
Marines male, < 20 years	10,638	-4,662	+	+
Marines male, > 20 years	-7,820	4,718	+	+
Navy female, < 20 years	5,433	-15,868	-	+
Navy female, > 20 years	-19,904	7,927	+	+
Navy male, < 20 years	10,744	779	-	+
Navy male, > 20 years	9,531		+	+
E6—E9 pay grade				
Air Force female, < 20 years	13,296	1,990	+	+
Air Force female, > 20 years	1,133	13,719	+	+
Air Force male, < 20 years	15,302	15,344	+	+
Air Force male, > 20 years	17,637	13,531	+	+
Army female, < 20 years	16,054	0	+	+
Army female, > 20 years	0	14,680	+	+
Army male, < 20 years	19,472	6,089	+	+
Army male, > 20 years	9,719	13,233	+	+
Marines female, < 20 years	14,050	17,129	+	+
Marines male, < 20 years	21,233	11,793	+	+
Marines male, > 20 years	12,962	15,971	+	+
Navy female, < 20 years	17,053	-6,806	-	+
Navy female, > 20 years	-8,871	23,203	+	+
Navy male, < 20 years	27,800	11,394	+	+
Navy male, > 20 years	23,194		+	+

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Race (compared with White)				
Black				
Air Force female, < 20 years	1,691	2,613	+	+
Air Force female, > 20 years	3,362	-253	+	+
Air Force male, < 20 years	-879	1,253	-	-
Air Force male, > 20 years	1,568	658	-	-
Army female, < 20 years	2,065	-2,484	+	+
Army female, > 20 years	-27	-1,584	+	+
Army male, < 20 years	-1,309	-3,007	-	-
Army male, > 20 years	-2,750	997	-	-
Marines female, < 20 years	1,481	-2,129	+	+
Marines male, < 20 years	-2,777	-6,136	-	-
Marines male, > 20 years	-6,040	-39	-	-
Navy female, < 20 years	807	-1,521	+	+
Navy female, > 20 years	-1,079	-2,389	+	+
Navy male, < 20 years	-2,598	-6,529	-	-
Navy male, > 20 years	-5,725		-	-
Hispanic				
Air Force female, < 20 years	2,431	2,248	+	+
Air Force female, > 20 years	3,018	1,604	-	-
Air Force male, < 20 years	2,484	-747	-	-
Air Force male, > 20 years	610	652	-	+
Army female, < 20 years	1,993	425	-	+
Army female, > 20 years	-1,103	122	-	+
Army male, < 20 years	1,520	-801	-	-
Army male, > 20 years	970	974	-	-
Marines female, < 20 years	2,128	240	-	-
Marines male, < 20 years	1,389	-2,835	-	-
Marines male, > 20 years	-1,479	1,309	+	+
Navy female, < 20 years	1,918	964	+	+
Navy female, > 20 years	1,188	42	-	-
Navy male, < 20 years	1,305	-3,235	-	-
Navy male, > 20 years	-2,501		-	-
Other race/ethnicity				
Air Force female, < 20 years	2,285	2,559	+	-
Air Force female, > 20 years	3,608	139	-	-
Air Force male, < 20 years	219	1,143	-	-

Variable	Earnings		Employment	
	Year 1	Year 3	Year 1	Year 3
Air Force male, > 20 years	2,656	-281	-	-
Army female, < 20 years	954	-5,563	-	+
Army female, > 20 years	513	-617	-	-
Army male, < 20 years	122	-1,872	+	+
Army male, > 20 years	-634	-450	-	-
Marines female, < 20 years	347	-1,474	-	-
Marines male, < 20 years	-1,244	-6,504	-	-
Marines male, > 20 years	-4,030	-504	-	-
Navy female, < 20 years	537	1,557	-	-
Navy female, > 20 years	-2,023	-302	-	-
Navy male, < 20 years	-176	-1,418	-	-
Navy male, > 20 years	-88		-	-

SOURCE: RAND analysis of DMDC and SSA data.

NOTE: Green highlighting denotes a statistically significant coefficient at the $p < 0.05$ level, after a Bonferroni adjustment for multiple comparisons.

Appendix D. Description of Electronic Appendixes

Three supplemental Excel files for this report (available at www.rand.org/t/RRA361-1) provide more detail on our findings in a sortable and searchable format that users might find convenient when viewing and using our detailed results.

MOC Outcomes Tables: The file includes a tab for each subpopulation. Those tabs include Year 1, 2, and 3 earnings for all study MOCs for both favorable separation codes and all service members. These values correspond to those in Tables 4.1–4.5 and Appendix B; both of those sets of tables report only Years 1 and 3 for a selected set of MOCs. The figures are regression-adjusted and in 2013 dollars. The files also include the employment rates (i.e., percentage with positive earnings) for all three years for all service members and for favorable separation codes only.

The MOCs in each subpopulation are sorted in the order of Year 3 earnings for favorable separation codes. The Year 3 earnings are color coded to show the comparison with RMC for the last year of active duty, using the same color codes as in Figure 6.3 (which is included on the cover page of the file).

MOC Outcomes Coefficient Tables: This file contains two tabs for earnings and two for employment (in each case, one for favorable separation codes and one for all codes), four tabs total. The tabs report regression coefficients on the individual measures associated with post-service earnings at Year 1, Year 2, and Year 3. Within each tab, the results are broken up by subpopulations. The green highlighted coefficients are significant at the 5 percent level, after a Bonferroni adjustment for multiple comparisons. This file contains the same coefficients as reported in Table C.1, but with Year 2 included and also organized in a two-dimensional arrangement that allows comparison by either subpopulation or variable.

MOC Sample Means Tables: This file contains a table of the means of selected explanatory (independent) variables for all records eligible for the analysis as well as the records that were actually run in models with earnings data. The means are presented by subpopulation.

References

- American Legion, *The State of Credentialing of Service Members and Veterans: Challenges, Successes, and Opportunities*, SOLID, LLC, 2017.
- Angrist, Joshua, Stacey Chen, and Brigham R. Frandsen, “Did Vietnam Veterans Get Sicker in the 1990s? The Complicated Effects of Military Service on Self-Reported Health,” *Journal of Public Economics*, Vol. 94, No. 11–12, 2010, pp. 824–837.
- Angrist, Joshua D., “Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records,” *American Economic Review*, Vol. 80, No. 3, June 1990, pp. 313–336.
- Angrist, Joshua D., “Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants,” *Econometrica*, Vol. 6, No. 2, March 1998, pp. 249–288.
- Autor, David H., Mark Duggan, and David S. Lyle, “Battle Scars? The Puzzling Decline in Employment and Rise in Disability Receipt Among Vietnam Era Veterans,” *American Economic Review*, Vol. 101, No. 3, May 2011, pp. 339–344.
- Barr, Andrew, “From the Battlefield to the Schoolyard: The Short-Term Impact of the Post-9/11 GI Bill,” *Journal of Human Resources*, Vol. 50, No. 3, Summer 2015, pp. 580–613.
- Burke, Jeremy, and Amalia Miller, *The Effects of Military Change of Station Moves on Spousal Earnings*, Santa Monica, Calif.: RAND Corporation, WR-1170-OSD, 2016. As of February 14, 2021:
https://www.rand.org/pubs/working_papers/WR1170.html
- Coile, Courtney, Mark Duggan, and Audrey Guo, “Veterans’ Labor Force Participation: What Role Does the VA’s Disability Compensation Program Play?” *American Economic Review*, Vol. 105, No. 5, May 2015, pp. 131–136.
- Congressional Budget Office, *Transitioning from the Military to the Civilian Workforce: The Role of Unemployment Compensation for Ex-Servicemembers*, Washington, D.C., CBO Publication 52503, 2017.
- Department of Defense, OUSD (P&R) Directorate of Compensation, Selected Military Compensation Tables [Compensation Green Book], 2003 to 2010 editions. As of May 11, 2020:
<https://militarypay.defense.gov/References/Greenbooks/>

- Hall, Kimberly Curry, Margaret C. Harrell, Barbara Bicksler, Robert Stewart, and Michael P. Fisher, *Veteran Employment: Lessons from the 100,000 Jobs Mission*, Santa Monica, Calif.: RAND Corporation, RR-836-JPMCF, 2014. As of February 14, 2021:
https://www.rand.org/pubs/research_reports/RR836.html
- Hansen, Michael L., and Shanthi Nataraj, *Expectations About Civilian Labor Markets and Army Officer Retention*, Santa Monica, Calif.: RAND Corporation, MG-1123-A, 2011. As of October 14, 2020:
<https://www.rand.org/pubs/monographs/MG1123.html>
- Heaton, Paul, David S. Loughran, and Amalia Miller, *Compensating Wounded Warriors: An Analysis of Injury, Labor Market Earnings, and Disability Compensation Among Veterans of the Iraq and Afghanistan Wars*, Santa Monica, Calif.: RAND Corporation, MG-1166-OSD, 2012. As of February 14, 2021:
<https://www.rand.org/pubs/monographs/MG1166.html>
- Heaton, Paul, Diana Catherine Lavery, David Powell, and Jeffrey B. Wenger, *Comparing Ex-Servicemember and Civilian Use of Unemployment Insurance*, Santa Monica, Calif.: RAND Corporation, RR-1496-OSD, 2018. As of February 10, 2021:
https://www.rand.org/pubs/research_reports/RR1496.html
- Horton, Jaime L., Isabel G. Jacobson, Charlene A. Wong, Timothy S. Wells, Edward J. Boyko, Besa Smith, Margaret A. K. Ryan, and Tyler C. Smith, “The Impact of Prior Deployment Experience on Civilian Employment After Military Service,” *Occupational and Environmental Medicine*, Vol. 70, No. 6, June 2013, pp. 408–417.
- Klerman, Jacob Alex, David S. Loughran, and Craig Martin, *Early Results on Activations and the Earnings of Reservists*, Santa Monica, Calif.: RAND Corporation, TR-274-OSD, 2005. As of February 14, 2021:
https://www.rand.org/pubs/technical_reports/TR274.html
- Kleykamp, Meredith, “Unemployment, Earnings and Enrollment Among Post 9/11 Veterans,” *Social Science Research*, Vol. 42, No. 3, May 2013, pp. 836–851.
- Loughran, David S., *Why Is Veteran Unemployment So High?* Santa Monica, Calif.: RAND Corporation, RR-284-OSD, 2014. As of February 10, 2021:
https://www.rand.org/pubs/research_reports/RR284.html
- Loughran, David S., Paco Martorell, Trey Miller, and Jacob Alex Klerman, *The Effect of Military Enlistment on Earnings and Education*, Santa Monica, Calif.: RAND Corporation, TR-995-A, 2011. As of February 10, 2021:
https://www.rand.org/pubs/technical_reports/TR995.html

- Loughran, David S., and Paul Heaton, *Post-Traumatic Stress Disorder and the Earnings of Military Reservists*, Santa Monica, Calif.: RAND Corporation, TR-1006-OSD, 2013. As of February 10, 2021:
https://www.rand.org/pubs/technical_reports/TR1006.html
- Martorell, Paco, Jacob Alex Klerman, and David S. Loughran, *How Do Earnings Change When Reservists Are Activated? A Reconciliation of Estimates Derived from Survey and Administrative Data*, Santa Monica, Calif.: RAND Corporation, TR-565-OSD, 2008. As of February 10, 2021:
https://www.rand.org/pubs/technical_reports/TR565.html
- Martorell, Paco, Trey Miller, Lindsay Daugherty, and Mark Borgschulte, *Effects of Military Service on Earnings and Education Revisited: Variation by Service Duration, Occupation, and Civilian Unemployment*, Santa Monica, Calif.: RAND Corporation, RR-342-OSD, 2014. As of February 10, 2021:
https://www.rand.org/pubs/research_reports/RR342.html
- Wenger, Jennie W., Trey Miller, Matthew D. Baird, Peter Buryk, Lindsay Daugherty, Marlon Graf, Simon Hollands, Salar Jahedi, and Douglas Yeung, *Are Current Military Education Benefits Efficient and Effective for the Services?* Santa Monica, Calif.: RAND Corporation, RR-1766-OSD, 2017. As of February 10, 2021:
https://www.rand.org/pubs/research_reports/RR1766.html