The Impact of a Spouse Incentive on Employee Retention

Evidence from a Military Spouse Scholarship

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Past research has shown that compared with spouses of U.S. civilians, spouses of U.S. military personnel tend to earn less and are more likely to be unemployed or underemployed, even when they have more years of education or more work experience. To mitigate the impact of the demands of military life, the U.S. Department of Defense (DoD) in 2007 established the Spouse Education and Career Opportunities (SECO) program, a portfolio of initiatives that provide career development and employment assistance for military spouses. One such initiative is the My Career Advancement Account (MyCAA) Scholarship, designed to help a targeted demographic of military spouses to pursue associate’s degrees, occupational certificates, or licenses in portable career fields. The design of the scholarship at the time of this report dates back to October 2010.

A potential outcome of MyCAA is increased service member retention, a perennial goal of DoD. As part of an early evaluation of the MyCAA program (Miller et al., 2018), we identified that MyCAA has a positive relationship with service member retention over the three years following the MyCAA program. This paper is part of a study examining the longer-term outcomes associated with scholarship recipients who, by 2017 (the end of our observation period) will have completed or ended their education plans, had time to potentially move into the workforce, and faced military moves or deployments. Additionally, new statistical models allow us to better match military households of MyCAA users to similar households around the time of the choice of whether to use MyCAA.

This research should be of interest to decisionmakers responsible for programs and policies supporting military households, as well as scholars who study military personnel issues. It may also be of interest to researchers who study employee compensation and benefits and decision-making more generally.

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For more information on the RAND Forces and Resources Policy Center, see www.rand.org/nsrd/ndri/centers/frp.html or contact the director (contact information is provided on the webpage). Comments or questions on this working paper should be addressed to David Knapp at dknapp@rand.org.
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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADSS</td>
<td>Active Duty Spouse Survey</td>
</tr>
<tr>
<td>AFQT</td>
<td>Armed Forces Qualification Test</td>
</tr>
<tr>
<td>ATET</td>
<td>average treatment effect on the treated</td>
</tr>
<tr>
<td>DMDC</td>
<td>Defense Manpower Data Center</td>
</tr>
<tr>
<td>DoD</td>
<td>U.S. Department of Defense</td>
</tr>
<tr>
<td>FY</td>
<td>fiscal year</td>
</tr>
<tr>
<td>MyCAA</td>
<td>My Career Advancement Account</td>
</tr>
<tr>
<td>PCS</td>
<td>permanent change of station</td>
</tr>
<tr>
<td>PSM</td>
<td>propensity score matching</td>
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<tr>
<td>SRB</td>
<td>selective reenlistment bonus</td>
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1. Introduction

Employers seek cost-effective ways to attract and retain quality employees. Turnover, or employees’ voluntary end of employment, is of ongoing interest among employers and scholars (Hom et al., 2017). Family-friendly workplace initiatives, such as employee assistance programs, flexible work schedules, and child care, have grown more common in recent decades in the United States, as the workforce has increased to include more dual-earner couples and more women with young children (Caillier, 2016). These programs often aim to help reduce or compensate for work-family conflict that may be introduced by job demands, such as the required schedule, shift, commute, and number of hours.

In dual-earner couples, one partner’s job requirements can affect the other’s career. For example, jobs that require employees to relocate can induce negative earnings and employment effects on so-called trailing spouses who relocate as well (Boyle et al., 2001; Shihadeh, 1991). Additionally, research on dual-earner households finds that they are less mobile than single-earner households because a job change for one earner that requires relocation can result in a temporary reduction in income for the other earner (Rabe, 2011; Vidal, Perales, and Baxter, 2015; Brandén and Haandrikman, 2018). The career of an employee’s spouse can also suffer if the local labor market where that employee is assigned does not offer many job opportunities in the spouse’s career field. The geographic demands of a job therefore create potential retention problems for employers with employees who are married or in long-term committed relationships. This leads to the following questions: Can an employer program promoting the careers of employees’ spouses lead to increased employee retention, and can it be cost-effective relative to alternatives?

This study analyzes an employer tuition assistance program for the spouses of its personnel, designed in part to promote retention of those personnel. The program is offered to a population whose early-career development may be particularly affected by the demands of one partner’s job: spouses of early-career military service members. Military service is geographically demanding both because military households undergo frequent relocation (called permanent change of station, or PCS, moves) and because the labor market characteristics of areas with heavy military presence pose challenges for civilians. For example, women near military installations (whether married to military personnel or not) earn less than comparable women in other areas (Booth et al., 2000; Meadows et al., 2015). In response to these and other challenges of military life, the My Career Advancement Account (MyCAA) Scholarship was designed by the U.S. Department of Defense (DoD) to support the education and training of military spouses.

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1 We use *job* to broadly refer to a specific employer-employee relationship and use *career* to refer to a person’s specific type of work that may span employers.
MyCAA was developed to achieve several goals in addition to service member retention: greater satisfaction with military life, increased family financial stability, improved health and wellness of the military community, and the overall readiness of the armed forces (Office of the Deputy Under Secretary of Defense, 2008).

We use a propensity-score matching analysis to compare households where the spouse used the MyCAA scholarship program, a population we refer to as \textit{MyCAA users}, to comparable eligible military households based on service member characteristics, family structure, and marriage length. By merging administrative MyCAA Scholarship data to demographic data from the Defense Manpower Data Center (DMDC), we are able to observe certain characteristics of the universe of eligible spouses and their service members at the time the scholarship in its present form began in October 2010. The large number of spouses and service members combined with the comprehensive nature of our data provides a large sample, enabling us to match users to nonusers within the same labor market and military branch, and who are married to service members with the same years of experience. Within these subgroups, we match based on observable characteristics as of the application deadline and track the couples over the next six years. We observe when and if service members leave active duty, as well as when a spouse loses scholarship eligibility for any reason. We further observe the progress of the service member’s career, including any PCS move, promotion, or deployment.

We find in this study that spousal use of the scholarship is associated with a roughly 4-percentage-point increase in a service member’s continuation in active service from year to year. The magnitude of the effect is persistent over the observation window of our sample, and we argue for a causal interpretation of this finding. We also show a heterogeneous impact depending on the particular type of program paid for with the funds. Furthermore, we calculate, under some realistic assumptions, the scholarship’s costs in terms of dollars-per-person-year of increased service. We find indications that MyCAA, an untargeted program where retention is a longer-term goal but is not a condition of receipt of the scholarship, exhibits cost-effectiveness in terms of service member continuation between 2011 and 2017 similar to that of targeted retention bonuses offered between 2002 and 2007.

This study is among the first to measure the impact of vocational education and training tuition assistance on outcomes other than employment and earnings of the recipients. The analytic methods are standard in the literature on causal effects of vocational training programs using nonexperimental data (Heckman, LaLonde, and Smith, 1999), but the population and outcomes studied are not. Insofar as research has examined the efficacy of spousal career support programs, it has been in the context of high-earning couples, often couples in higher education (Wolf-Wendel, Twombly, and Rice, 2003; Careless and Mizzi, 2015) or expatriate couples with foreign job postings (Andreason, 2008; Harvey, 1998; McNulty, 2012). The latter studies find that spousal adaptation to the foreign location is critical for the employee’s retention in the post, and professional support is cited by spouses as a critical component of the adaptation process.
Even more than these previously studied spouse populations, the population served by MyCAA is especially vulnerable to career challenges. As noted above, the civilians living near military installations face a relatively challenging labor market. For military spouses, the career disadvantages of their particular location are compounded by features of military life. For example, the service member could be deployed for long periods of time, leaving the spouse responsible for care of the home and any children. Outside of the military, this study therefore lends support for the development of company spousal career programs for employees in other jobs where the demands on employees’ families are especially high.

There are several reasons that an education and training program for military spouses is of interest to the vocational training literature more broadly. First, because the military is a significant employer of young people, the pool of MyCAA-eligible spouses numbers in the hundreds of thousands. Thus, the program has the potential to influence the skills of a large fraction of the youngest members of the labor force. Second, MyCAA is unusual in that it specifically promotes mobile career skills. Generally, high mobility is associated with a college education (see, e.g., Malamud and Wozniak, 2012; Wozniak, 2010), but those eligible for MyCAA are likely to have less than a four-year degree. While we do not directly observe the education levels of eligible individuals, MyCAA provides funding only for associate’s degrees or occupational certificates and licenses, meaning that many users are likely to have less than a bachelor’s degree. Indeed, in the 2012 Active Duty Spouse Survey (ADSS), 84 percent of spouses who had used MyCAA in the past year held less than a bachelor’s degree (Friedman, Miller, and Evans, 2015). Along those lines, we show that the impact on retention was larger when MyCAA was used for an associate’s degree, as compared with an occupational certificate. MyCAA therefore provides evidence for policies that could potentially address the lack of geographic mobility among those who are least mobile.

The paper is organized as follows: Chapter 2 describes past research on spousal career programs, the relationship between spousal career prospects and employee retention, and research pertaining to potential pathways through which MyCAA may indirectly affect service member retention. Chapter 3 discusses MyCAA’s eligibility requirements, as well as the data we use to evaluate its relationship with service member retention. Chapter 4 provides context on service member retention and descriptive statistics demonstrating a relationship between service member retention and MyCAA Scholarship use. Chapter 5 introduces our methodological approach, anchored in economics’ program evaluation literature, and discusses the results. Treating the results in the previous section as causal, Chapter 6 relates the cost efficacy of the MyCAA Scholarship to the use of selective bonuses primarily aimed at retaining service members. Chapter 7 concludes by summarizing the results, discussing limitations of our analysis, and outlining potential research suggested by our findings.
2. Previous Literature

Despite limited research on employer programs designed to promote the careers of employees’ spouses, the concept has gained traction in the human resources community. Some experts now recommend that employers and prospective employees alike treat a spouse’s job as part of the hiring and negotiation process (Brust, 2017; Lebowitz, 2016; Lublin, 2016). The advice is usually directed at the employment of high-earning, highly educated couples, but the main point is that efforts to assist the prospective employee’s spouse in finding suitable employment following a relocation can make it easier to recruit and possibly be more cost-effective than other incentives, such as larger signing bonuses.

The rationalization for such policies was formalized by Becker (1965), who demonstrated in a theoretical framework how the labor force participation of one spouse affects the incentives and constraints on the other spouse. The theory was extended by Mincer (1978) to incorporate the family decision of where to live, leading to a large subsequent literature examining “tied migration” and its usually negative effects on the trailing spouse. Mincer’s theory is relevant to military families, particularly those early in their careers, who have little say in where they must locate the household. Partly for this reason, research shows that both male and female military spouses earn substantially less than their civilian counterparts (Little and Hisnanick, 2007; Cooke and Speirs, 2005; Hosek and Wadsworth, 2013).

Some research has examined the connection between a spouse’s employment and the hiring institution’s turnover. These studies do not consider spousal support policies per se, but they indicate that spousal careers do indeed increase employee turnover, particularly when relocation is part of the equation. For example, Taylor (2007) finds that a small fraction of relocating couples move for job-related reasons, but those who do experience lower job retention rates for both partners. Cooke (2013) concludes that it is more common for a person to decide not to relocate, if they would have done so without a spouse, than to drag along a spouse who would not normally have moved. Huffman, Casper, and Payne (2014) observe that, among married Army officers, having an employed spouse was associated with lower retention four years later, although the authors did not examine whether the couple experienced a PCS move during this period.

Besides the impact of spousal career prospects on employee retention, research from sociology, psychology, human resources, and economics highlights four aspects of household decisionmaking that are potentially affected by the MyCAA Scholarship. Each of these topics illustrates a possible pathway through which MyCAA could indirectly influence service member retention.

First, to the extent that the MyCAA Scholarship increases spouse employment, allowing spouses to contribute financially to the household, this may improve the family’s ability to afford
its desired standard of living, purchase a home, help support another family member, or build savings for college or retirement. Dual-earner marriages are no longer the exception in the United States; according to the Bureau of Labor Statistics, in 48 percent of opposite-sex marriages in 2015, both spouses were employed, which was more than double the amount (19 percent) in which only the husband was employed (in 7 percent only the wives were employed). When narrowed to marriages with children under age 18, in 62 percent both parents were employed (Bureau of Labor Statistics, 2018).

Second, in addition to providing additional income, spousal employment is linked to household financial stability by insuring against adverse shocks and, thus, can help maintain service members’ options and provide a safety net during service transitions. Blundell, Pistaferri, and Saporta-Eksten (2016) show that family labor supply provides the dominant form of insurance against permanent wage shocks. Mankart and Oikonomou (2017) show both theoretically and empirically that a second earner is important in insuring against employment risk and macroeconomic downturns. A second income can assist with family financial stability for active-duty service members transitioning to National Guard or reserve status, being separated because of a disability or military downsizing, wanting or needing to leave the service for other reasons, and, in the long term, retiring (because most active-duty personnel must leave the service well before age 45, as qualification for the military retirement benefit begins after 20 years of service). As the service member leaves full-time active-duty military service, there may be employment gaps immediately after service or in the longer term. MyCAA promotes a military spouse’s attachment to the labor force, which helps to insure the household against uncertainty as the service member leaves the service. Conversely, having another income source from a spouse’s employment could also encourage the service member to consider alternative employment, negatively affecting retention.

Next, spousal employment can influence worker mobility. In general, dual-income households are less mobile than single-income households (Vidal, Perales, and Baxter, 2015; Rabe, 2011). But in military households, mobility is not a choice—service members may be re-stationed every two to three years based on the needs of the service. Recent analysis shows that these frequent moves have lasting negative impacts on spouses’ careers (Burke and Miller, 2018), and that the employment levels of military spouses worsened in the years immediately following the Great Recession that began December 2007 (Whitby and Compton, 2018). Other researchers actually recommend spousal career programs as a means of mitigating this problem, with service member retention as the ultimate goal (Hisnanick and Little, 2015). By focusing on supporting education and training for portable careers, MyCAA is designed to serve this purpose.

Finally, providing spousal employment benefits may have nonpecuniary benefits that can improve service member retention. Providing support services to military spouses may lead to improved spousal attitudes toward the military and to their support for service member re-

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2 Reported statistics on married couples included only opposite-sex couples.
enlistment in the military (Huffman, Casper, and Payne, 2014). Research suggests that military spouses’ support of their service members’ career is associated with increased service member retention intentions (Bowen, 1986; Heilmann, Bell, and McDonald, 2009; Rosen and Durand, 1995), and with actual service member retention (Huffman, Casper, and Payne, 2014; Campbell, Luchman, and Khun, 2017). If, as a result of MyCAA scholarships, spouses have a more positive attitude toward military life, they may be less likely to feel that military life is incompatible with their family life. For all of these reasons, the MyCAA Scholarship may increase service member retention by increasing spousal commitment to the military.
3. MyCAA Scholarship and Data

MyCAA Scholarship Overview

The MyCAA Scholarship provides up to $4,000 in tuition and examination assistance for eligible spouses pursuing associate’s degrees, occupational certificates, or licenses in portable career fields (Spouse Education & Career Opportunities, 2018). Spouses who already hold college degrees can use the MyCAA Scholarship to obtain career-focused education or training, or to obtain or update occupational licenses or certifications following a cross-state move (e.g., to obtain a teaching certificate, real estate license, or take the bar exam). Funding is generally limited to $2,000 per year. Spouses may attend school full time or part time and may also work while in school. Based primarily on U.S. Department of Labor assessments, DoD establishes which careers are eligible for the scholarship, but spouses can request that careers not included on the DoD career list be permitted (Military OneSource, 2018b). Examples of eligible career fields include health and human services, education, animal services, construction, and information technology.

MyCAA Scholarship eligibility is limited to spouses of active-duty military personnel in the earliest pay grades of a military career and who are not on active duty themselves. To receive the MyCAA Scholarship, interested individuals must set up an account, create an individual career plan, and work with an institution on an education and training plan to prepare for their chosen career. Once the MyCAA recipient’s education plan is approved by DoD and they are admitted to a DoD-approved institution, the student must submit financial assistance requests to DoD, which will then provide the funding directly to the institution each academic period. After their first academic period, recipients must remain in good standing and remain qualified for MyCAA to receive additional funds. MyCAA plans must be completed in three years (exceptions are allowed, but these are rare). Spouses are no longer eligible for MyCAA funds if they have reached the $4,000 limit, they have failed a class under the scholarship and not sought a forgiveness waiver, they have failed two classes under the scholarship, they become active-duty federal service members themselves, they are no longer married to their service members, or their service members have been promoted beyond the eligible pay grades or have left federal active duty.

3 This version of the MyCAA Scholarship began in October 2010. An earlier version offered more funding and was more broadly available but was scaled back because of overwhelming demand that far exceeded available funds. For more details, see Miller et al., 2018.

4 These pay grades include enlisted ranks E-1 to E-5, warrant officer ranks W-1 to W-2, and officer ranks O-1 to O-2. Educational benefits from the Post-9/11 GI Bill cannot be transferred to spouses until military personnel have at least six years of service in the armed forces, so most of these spouses would not yet be able to acquire funds from that source (Miller et al., 2018).
Data

We use administrative data from the DMDC to track demographic characteristics of service members and their dependents monthly from 2007 to 2017. These data include demographic and military service characteristics of the service member (e.g., rank, service, age, gender, education, location), as well as a few demographic characteristics of their military dependents, who are beneficiaries (e.g., dependent’s relationship with the service member, dependent’s age, gender). The military definition of dependent is limited. It implies nothing about the employment or financial status of the spouse: Even spouses earning more than their service member are termed “military dependents” under this law. The beneficiary data allow us to identify spouses and children, as well as dependents’ age and birth months, and marriage timing (assuming it occurs after service entry). As these are administrative data, they are limited to information recorded and updated over time and are only as current as when each person’s record was last updated. Service members must register their dependents for dependents to receive health care and other benefits, so we expect the data reasonably reflect births, marriages, and current dependents. Data documenting spousal characteristics such as education level and employment status are not included in DMDC files. Most of the data we use in our analysis are based on characteristics of the military household as of December 2011, conditional on having an approved plan between October 2010 and December 2011, which we refer to as the “application window” for our MyCAA cohort. There are 335,369 spouses eligible to apply for MyCAA during this time frame whose service member (the potential MyCAA sponsor, referred to as such below) was still in the active component as of December 2011. These numbers differ slightly from the numbers reported in the original study (Miller et al., 2018) because the data set was updated for these analyses and reflects that historical data are occasionally updated (e.g., with corrections or new information submitted by the services).

Additionally, we use MyCAA data for spouses with approved educational plans between October 2010 and December 2011 and characteristics of those plans and schools attended. MyCAA data also indicate the amount of scholarship funds spent. Twelve percent of the eligible population had a MyCAA plan approved, and 10 percent of the eligible population used any MyCAA funds (hereafter, MyCAA users). People may not use their funds for various reasons, including becoming ineligible for the scholarship, choosing not to pursue their educational plan, or not being able to pursue their plan. In our analysis, we will treat individuals with an approved plan who do not use their funds as nonusers.

Finally, we record events related to military service that could be potentially disruptive, affecting both the costs and benefits of a MyCAA-sponsored program, as well as the feasibility of undertaking a course of study: PCS moves and deployment. A PCS move uproots the service member and, theoretically, the entire household, while a deployment (as defined by the military’s

5 For more information, see 37 U.S. Code § 401.
Contingency Tracking System to identify those involved in contingency operations) would remove the service member from the household (but does not move the household itself) for an extended period of time.

Appendix A, Table A.1 provides additional details on each variable and its source.
4. Service Member Retention

Retaining personnel is an ongoing priority for each of the military services. Active-duty military personnel are divided into three categories: enlisted service members, warrant officers, and commissioned officers. Enlisted service members sign enlistment contracts that commit them to serve between two and six years on active duty. Many enlisted service members do not complete their first term, and many do not reenlist after their first enlistment period. In fiscal year (FY) 2011, the year our sample was considering whether to apply for a MyCAA Scholarship, the services spent $715 million in selective reenlistment bonuses (SRBs), which are targeted at enlisted nearing the expiration of term of service. Commissioned officers do not face distinct reenlistment points as enlisted service members do but generally have an initial service obligation (usually about four to six years on active duty if required). Warrant officers represent a blend of the other two personnel categories and are typically reserved for specialty roles. Warrant officers receive either a warrant from their service secretary or a commission; therefore, similar to commissioned officers, they do not face distinct reenlistment points. Because of the difference between enlisted and officers, for this study we focus on continuation—i.e., whether a service member in the active component in December 2011 is still in the active component several months later—and will refer to the percentage remaining as the retention rate.

Table 4.1 shows retention rates of our cohort in December of each year from 2012 to 2017. Prior to 2016, personnel whose spouses were MyCAA users were more likely to stay in the service relative to those with nonuser spouses. The difference in the retention rate narrows over time.

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6 For a recent discussion of first-term attrition rates in the Army, see Orvis et al., 2018.
7 FY 2011 reenlistment bonuses by service (in 2011 dollars): Air Force—$236,820,000, 33,139 airmen (average initial SRB was $14,932); Marine Corps—$90,001,000, 4,426 marines (average initial bonus was $20,330); Navy—$253,887,000, 48,391 sailors (average initial bonus was $21,530); Army—$134,300,000, 20,662 soldiers (average initial bonus was $6,500); total—$715,008,000 paid to 106,618 service members (Department of the Air Force, 2012; Department of the Army, 2012; Department of the Navy, 2012a; Department of the Navy, 2012b). Note that SRBs are just one of various special pays aimed at promoting retention of high-skilled or high-demand career fields. Examples include enlisted personnel who are divers; serve on submarine, flying, or parachute duty; maintain foreign language proficiency in needed languages; or who hold other critical skills that are difficult to retain or are eligible for special pay related to their occupation, skills, or type of duty.
Table 4.1. Percentage of Service Members Remaining Active (Retention Rates), Conditional on Being Active in December 2011, by Spouse’s MyCAA Usage

<table>
<thead>
<tr>
<th>Year</th>
<th>Nonuser Households</th>
<th>MyCAA Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2011</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>December 2012*</td>
<td>83%</td>
<td>87%</td>
</tr>
<tr>
<td>December 2013*</td>
<td>70%</td>
<td>72%</td>
</tr>
<tr>
<td>December 2014*</td>
<td>58%</td>
<td>60%</td>
</tr>
<tr>
<td>December 2015*</td>
<td>51%</td>
<td>52%</td>
</tr>
<tr>
<td>December 2016</td>
<td>45%</td>
<td>46%</td>
</tr>
<tr>
<td>December 2017</td>
<td>41%</td>
<td>41%</td>
</tr>
<tr>
<td>Sample Size</td>
<td>302,410</td>
<td>32,959</td>
</tr>
</tbody>
</table>

SOURCE: MyCAA data merged with DMDC data.
NOTES: Sample consists of service members active in December 2011 with a MyCAA-eligible spouse. Users consist only of individuals who apply for and use funds from the MyCAA Scholarship. Differences between users and nonusers that are all statistically significant at the 5-percent level are denoted with an asterisk (*).

One potential reason for the retention rate narrowing over time, independent of MyCAA, is initial differences in the user and nonuser households. Miller et al. (2018) find that service members of nonusers have more years of service on average than MyCAA users (see Appendix A, Figure A.1). Given the high exit rate, those people who remain in the military will be a selected sample. For example, service members who were initially more senior (e.g., seven or more years of service) would have faced their first retention decision by December 2011. Consequently, because they selected into staying in the military past their initial service obligation, we expect that they are more likely to continue regardless of MyCAA. That nonuser households have more years of service in December 2011 suggests that the average nonuser is more likely to stay than the average MyCAA user because of differences in initial characteristics. Controlling for differences in the initial characteristics of households eligible for MyCAA will be an important part of our analysis.

We control for this type of difference in initial characteristics in Figure 4.1 by reporting retention to 2017 by years of service in December 2011. This allows us to understand whether MyCAA is associated with higher retention, holding initial years of service constant.8 Sponsors with one to five years of service in December 2011 whose spouses used MyCAA were 3 to 5 percentage points more likely to still be in the military six years later. The direction of the retention gap is reversed for those with zero or more than eight years of service and is not significant for those with six or seven years.

The same initial characteristics associated with the convergence in retention over time may also help explain why there are statistically nonsignificant or negative associations between retention to 2017 and a spouse's MyCAA use for service members with more than five years of

---

8 By 2017, all service members in our sample should have faced a decision point about whether to remain in the military.
service in 2011. If MyCAA influences retention by helping a household become accustomed to the demands of the service member being in the military, then households may have already revealed themselves as being accustomed to the military by the sponsor remaining in the military past the initial service obligation (which typically does not exceed six years of service).

The direction of the retention gap is also reversed for those at zero years of service, which we believe also reflects differences in initial characteristics. In the next chapter, we develop an empirical strategy that will control for differences in initial characteristics to understand whether the positive relationship observed for service members with between one and five years of service exists after controlling for the correlation between contributing factors to retention.

Figure 4.1. Service Member Retention Rates in 2017, by Spouse MyCAA Usage and Years of Service

SOURCE: MyCAA data merged with DMDC data.
SAMPLE SIZES: By year of service in 2011, for nonusers/users: 15,314/841 (0), 27,022/3,848 (1), 34,744/5,082 (2), 38,985/5,115 (3), 29,952/3,666 (4), 27,876/3,339 (5), 22,490/2,393 (6), 22,317/2,189 (7), 18,004/1,521 (8), 15,146/1,238 (9), 50,560/3,727 (10+).
NOTE: An asterisk (*) indicates that a t-test of the difference between user and nonuser continuation to December 2017 is statistically significant at the 5-percent level.

9 Service members with zero years of service who are eligible for MyCAA are a small and likely heterogenous group constituting 5 percent of the eligible population. Being married in the first year of service (and hence eligible for MyCAA) is a relatively rare event, with only 15,067 (10 percent) of new service members in FY 2011 being married (Office of the Under Secretary of Defense for Personnel and Readiness, 2018). While we do not have a directly comparable number, we do observe 16,155 people eligible for MyCAA as of December 2011 (which includes people who entered in the first three months of FY 2012 but excludes FY 2011 entrants who have left the military); the magnitude of these numbers suggests that this group consists primarily of people married prior to service, with the remainder getting married during the first year. Because the process of having a MyCAA plan approved is not immediate, the limited number of MyCAA users married to a service member with less than a year of service is, we expect, more likely to be from service members who are married at entry. If true, observed differences may reflect the lower first term of service completion rates that are exhibited, at least in the Army, by service members married at entry (Orvis et al., 2018).
To better understand why MyCAA Scholarship use is related to service member retention, we must distinguish selection from causation:

- **Selection:** MyCAA users might be a selected sample of eligible spouses whose service members are more likely to stay in active duty for any of several observed or unobserved reasons. For example, they may be observationally different in a way associated with retention (e.g., more likely to be part of the Air Force) or in an unobserved way (e.g., by having stronger initial community support that encouraged the service member to stay and made them aware of the scholarship, or unobserved commitment to the military as a career).

- **Causation:** MyCAA use may cause higher retention for any of several reasons: For example, MyCAA-funded education and training may have had the intended effect of making it easier for spouses’ careers to weather mandatory moves, users and their service members might believe that MyCAA demonstrates military support of their household and thus engenders greater commitment, or MyCAA may be pivotal in helping to align the career plans of newly married households. It could also cause lower retention if it provides spouses with a skill set that enables the family to transition smoothly out of the military.

To understand whether retention is a consequence of MyCAA use, we examine arguments that selection explains the positive relationship in Miller et al. (2018) between retention and MyCAA use. First, we highlight key findings from an earlier study that address whether selection into MyCAA is associated with spousal support for continuation in the military—our best approximate for being able to address unobserved commitment to the military. Importantly, this literature finds no differences in spousal support for service member continuation in the military shortly after the MyCAA selection choice. This is important because spousal support has been found to have a strong relationship with service member continuation (Campbell, Luchman, and Khun, 2017), and spousal support is the mechanism by which we believe that unobserved commitment to the military would manifest itself in a positive relationship between a spouse’s MyCAA use and her service member’s retention.

Second, we use a propensity score matching (PSM) analysis that stratifies the eligible population based on location, service member years of service, and service branch, and then within those categories matches users to observationally similar nonuser households in December 2011 based on age, household composition, and other observed characteristics. In this way, we are ensuring that certain observable MyCAA user and nonuser households’ local experiences were similar in December 2011 (although we are not able to control for all differences in local experience, such as whether spouses interacted with other spouses on the installation). In particular, we use a difference-in-difference PSM estimator to test concerns of whether MyCAA users select into the program in an observable way associated with retention or
in a permanent, initially unobserved way, such as by having stronger initial community support that encouraged the service member to stay and made them aware of the scholarship.

Next, we address the causal concern that MyCAA could lower retention if it provides spouses with a skill set that enables the family to transition out of the military. The implication of this potential outcome is that once the program is completed, sponsors of MyCAA users would leave the active-duty military at a higher rate. To test this, we control for the scholarship program’s requirement that the projected timeline for completion of the MyCAA plan to obtain the license, certificate, or associate’s degree fall within the time remaining on the service member’s enlistment contract or obligated term of service. We address this issue by matching user with nonuser households, conditional on remaining in the military until at least December 2014, as only MyCAA plans that can be completed within three years are approved. This controls for differences in spouse-known short-term intentions.

Key Findings on Selection into MyCAA and Spousal Support for Continuation

An alternative theory based on selection rather than causation—and a theory we rule out as unlikely—is that spouses’ usage of MyCAA could be based on long-term intention to stay in the military. This would be the case, for example, if the spouses who applied to MyCAA or began using MyCAA funds were more likely to be the spouses of military personnel intending to make military service a long-term career. Correspondingly, MyCAA nonusers could disproportionately be spouses who did not feel they needed education and training in a portable career field, because they did not expect their service members to remain in the military long term. However, analyses of weighted 2012 ADSS responses found that spouses who had used MyCAA in the previous 12 months (spanning 2011 to 2012) were no more likely to support the service member continuing than comparable past-year nonusers who were also married to service members whose rank and active-duty status met the MyCAA eligibility criteria (Friedman, Miller, and Evans, 2015). That study used multivariate logistic regression models to control for many characteristics that could otherwise potentially explain differences between recent users and nonusers, including

- spouse characteristics (age, gender, race-ethnicity, education/vocational certificate, own monthly income, indicators of health and financial well-being)
- service member characteristics (service, paygrade group, nights in the past 36 months spent away from home)
- family characteristics (years married, children, enrolled in Exceptional Family Member Program because of a family member with special needs, and housing status [on base, military off base, civilian]) (Friedman, Miller, and Evans, 2015).

In both the model that included all MyCAA rank-eligible spouses and the one that included only past year users and nonusers who were aware of MyCAA, there were no statistically
significant differences between users and nonusers on satisfaction with the military or favoring their service member staying on active duty (Friedman, Miller, and Evans, 2015, p. 63). This finding suggests that there was not a selection effect, as those who had just used MyCAA funds (and potentially were still using them) were at that time no more likely to favor staying in the military than rank-eligible spouses were.

Propensity Score Analysis

Methodology

PSM is a standard analytic method in the program evaluation literature allowing for causal inference in nonexperimental empirical designs. The validity of matching as an econometric tool was established using experimental data as benchmarks. These foundational studies find that PSM can perform well compared with the ideal experimental estimate, but care must be taken to ensure the estimates are valid. Using data from the National Job Training Partnership Act, Heckman, Ichimura, and Todd (1997) and Heckman et al. (1998) conclude that matching estimators require a rich set of control variables and that matches occur within the same geographic area. In data from a British work program, Dehejia and Wahba (1999) and Smith and Todd (2005) find that estimator bias is influenced by the subsample being studied as well. The general consensus is that a difference-in-difference matching estimator is preferable to other options, and that it is important to incorporate preintervention measures of outcomes, such as wages or labor force participation, to control for unobservable time-invariant characteristics.

The outcome variable of interest here is not employment or income but rather continuation in a job. Because the outcome is linked to a service member but scholarship use is linked to the spouse, our matching algorithm can be thought of as a match on observationally similar households in terms of sponsor characteristics, family structure, and marriage length. As recommended by prior research, we control for preintervention outcomes, including service member years of service and paygrade. These controls roughly account for experience, income, and success as measured by promotions.

We additionally match on service member characteristics, spousal characteristics, and household characteristics, which are summarized in Table 5.1. The table shows that service member sponsors of MyCAA users are more likely to be in the Army or Navy; are slightly younger; are more likely to be male, black, or Hispanic; are less likely to have a two- or four-year degree or an advanced degree; have slightly fewer years of service; and are more likely to be enlisted in a paygrade of E-3 or E-4.10 Sponsors of users are more likely to have been

10 Paygrades roughly correspond to ranks. E-3 and E-4 in the Army correspond to a Private First Class, and Specialist or Corporal, respectively; in the Air Force, Airman First Class and Senior Airman; in the Navy, Seaman and Petty Officer Third Class; in the Marine Corps, Lance Corporal and Corporal. Across the services, the base salary is based on the paygrade with additional allowances for housing, meals, hazardous duties, and other factors.
promoted in the past two years and are also slightly more likely to have experienced a disruptive event during the application window—either deployment or a PCS move. Like their service members, spouses using MyCAA tend to be younger than nonusers. There is almost no difference in marriage length (three years on average), but MyCAA users have slightly more children on average than nonusers, and more children under the age of 5. An additional variable captures whether couples were married during the application window—and therefore eligible for MyCAA in this period—but the marriages ended by December 2011. In these cases, the spouse could have used some MyCAA funds prior to December but would have become ineligible by the end of the application window.

Table 5.1. Summary Statistics by Spouse’s MyCAA Usage

<table>
<thead>
<tr>
<th>Variable</th>
<th>MyCAA Users (N = 32,959)</th>
<th>MyCAA Nonusers (N = 302,410)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service branch (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army*</td>
<td>49.9</td>
<td>45.9</td>
</tr>
<tr>
<td>Air Force*</td>
<td>16.2</td>
<td>21.3</td>
</tr>
<tr>
<td>Navy*</td>
<td>16.5</td>
<td>13.1</td>
</tr>
<tr>
<td>Marine Corps*</td>
<td>17.4</td>
<td>19.7</td>
</tr>
<tr>
<td>Service member age (years)*</td>
<td>26.4</td>
<td>27.3</td>
</tr>
<tr>
<td>Service member female (percentage)*</td>
<td>3.1</td>
<td>9.5</td>
</tr>
<tr>
<td>Service member AFQT in top 50th percentile (percentage)</td>
<td>61.1</td>
<td>61.3</td>
</tr>
<tr>
<td>Service member deployed in 2011 (percentage)*</td>
<td>33.4</td>
<td>30.3</td>
</tr>
<tr>
<td>Service member race/ethnicity (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Asian/Pacific Islander*</td>
<td>3.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Black*</td>
<td>17.7</td>
<td>14.0</td>
</tr>
<tr>
<td>White (not Hispanic)*</td>
<td>61.8</td>
<td>64.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13.1</td>
<td>12.8</td>
</tr>
<tr>
<td>Other/Unknown*</td>
<td>2.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Service member education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school*</td>
<td>4.8</td>
<td>4.9</td>
</tr>
<tr>
<td>High school diploma*</td>
<td>84.0</td>
<td>79.6</td>
</tr>
<tr>
<td>Associate’s degree*</td>
<td>4.9</td>
<td>5.6</td>
</tr>
<tr>
<td>Bachelor’s or more*</td>
<td>5.9</td>
<td>9.3</td>
</tr>
<tr>
<td>Unknown*</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Service member years of service*</td>
<td>5.4</td>
<td>6.1</td>
</tr>
</tbody>
</table>

According to the 2017 Military Basic Pay Chart, depending on years of experience, the base salary for E-3 is $1,886–2,126; for E-4 it is $2,089–2,536 (Defense Finance and Accounting Service, 2017).
<table>
<thead>
<tr>
<th>E-1*</th>
<th>0.4</th>
<th>1.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-2*</td>
<td>2.0</td>
<td>2.6</td>
</tr>
<tr>
<td>E-3*</td>
<td>16.7</td>
<td>14.4</td>
</tr>
<tr>
<td>E-4*</td>
<td>37.9</td>
<td>31.2</td>
</tr>
<tr>
<td>E-5</td>
<td>35.0</td>
<td>35.2</td>
</tr>
<tr>
<td>E-6 or higher*</td>
<td>2.8</td>
<td>6.7</td>
</tr>
<tr>
<td>O-1*</td>
<td>1.0</td>
<td>1.8</td>
</tr>
<tr>
<td>O-2*</td>
<td>2.2</td>
<td>3.1</td>
</tr>
<tr>
<td>O-3*</td>
<td>0.5</td>
<td>1.8</td>
</tr>
<tr>
<td>W-1/W-2*</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Service member promotion (percentage)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promoted between 2010 and 2011*</td>
<td>31.8</td>
<td>26.3</td>
</tr>
<tr>
<td>Promoted between 2009 and 2010*</td>
<td>29.1</td>
<td>24.6</td>
</tr>
<tr>
<td>Promoted between 2009 and 2011*</td>
<td>44.8</td>
<td>39.6</td>
</tr>
<tr>
<td>PCS move in 2011 (percentage)*</td>
<td>31.2</td>
<td>29.1</td>
</tr>
<tr>
<td>Spouse age (years)*</td>
<td>25.7</td>
<td>27.1</td>
</tr>
<tr>
<td>Years married†</td>
<td>3.1</td>
<td>3.0</td>
</tr>
<tr>
<td>No longer married by December 2011 (percentage)*</td>
<td>1.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Dependent children*</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Dependent children ≤5 years old*</td>
<td>0.8</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**SOURCE:** MyCAA data merged with DMDC data.  
**NOTES:** Sample consists of service members active in December 2011 with a MyCAA-eligible spouse. Table shows sample mean characteristics as of December 2011. Users consist only of individuals who apply for and use funds from the MyCAA Scholarship. Differences between users and nonusers that are statistically significant at the 5-percent level are denoted with an asterisk (*). Years of marriage is truncated at the total years of experience for each service member (†). AFQT = Armed Forces Qualification Test.

In addition to the variables in Table 5.1, we observe each eligible user’s zip code (or country, if abroad). We link the zip code to commuting zone using the 2000 definition from Autor and Dorn (2013). One concern about MyCAA application is that the benefits of the scholarship may vary based on the local labor market. One advantage of using commuting zones is their coverage of the entire United States. And because the zones are based on commuting data from the Census Bureau, they provide approximations of labor markets. Figure 5.1 shows the uptake of MyCAA as a percentage of eligible users, by commuting zone. Uptake varies from 0 percent to over 15 percent of all eligible users. This likely reflects variation in the potential cost or benefits of MyCAA-sponsored programs, as well as variation in awareness based on local levels of official or word-of-mouth advertising. Based on the evidence of substantial geographic variation in usage, we additionally stratify our matching algorithm to match users and nonusers within commuting zone, as well as within year-of-service and service branch bins. For these purposes, households located abroad (33,982 total) formed a separate geographic group, and the robustness checks show that the results are insensitive to alternative choices regarding how to match these foreign households.
Empirical Framework

The empirical framework is as follows. MyCAA usage is the treatment, indicated by the binary variable $D$. Service members and their spouses have observable characteristics $X$. Each service member has two possible outcomes at each time $t$, $Y_{1t}$ or $Y_{0t}$, which are binary variables indicating continuation in active service through time $t$ when they are in the treated or untreated state. We observe only the outcome conditional on treatment, $Y_t = DY_{1t} + (1 - D)Y_{0t}$. We are interested in the effect of MyCAA on those who use it, i.e., the average treatment effect on the treated (ATET), defined as $ATET_t = E[Y_{1t}|D = 1, X] - E[Y_{0t}|D = 1, X]$. Matching is warranted because a comparison group must be constructed for which $E[Y_{0t}|D = 0, X] = E[Y_{0t}|D = 1, X]$, allowing for estimation of ATET even though $E[Y_{0t}|D = 1, X]$ cannot be estimated directly from the data.

The matching framework relies on standard assumptions as outlined in Rosenbaum and Rubin (1983). The primary assumption is that the outcomes $Y_{1t}$ and $Y_{0t}$ are independent of treatment as long as they are conditioned on some set of observables:

$$(Y_{0t}, Y_{1t}) \perp D|X .$$

In addition, it is assumed that for any combination of characteristics $X$, the spouse has a positive probability both of selecting into treatment and of opting out:

$$0 < \Pr(D = 1|X) < 1 \ \forall X .$$

If both assumptions are satisfied, then, as Rosenbaum and Rubin (1983) show, the untreated group provides a valid comparison for the treated group in the sense that the distribution of
untreated outcomes is the same as the distribution for the treatment group if they had not used MyCAA:

\[ E[Y_{ot}|D = 0, X] = E[Y_{ot}|D = 1, X] = E[Y_{ot}|X] . \]

In addition, under these assumptions, the need to condition on \( X \) is reduced to conditioning only on the probability of selecting into treatment. This probability is estimated by the propensity score, which becomes a sufficient statistic for matching the treatment and control groups.

The assumptions are quite stringent, as they require that selection into treatment depend only on characteristics that are observable to the researcher (Heckman and Robb, 1985). As explained in Heckman, Ichimura, and Todd (1997), they also require that researchers know just as much information about the treatment as do the prospective participants. In other words, if eligible users condition their usage decision on information that is unknown to the researchers—including personal payoffs of the scholarship—then the assumptions would be violated.

Unobservable variables potentially cause problems with our data that we attempt to mitigate. First, we control for local labor markets, which largely determine the potential to use a MyCAA-sponsored degree, license, or certification. It is still possible that differences in spouse education (and, hence, usefulness of a MyCAA scholarship) explain some of the difference between users and nonusers. Statistics from the 2012 ADSS, which was conducted after the time of the application window for our cohort (November 2012 to March 2013), indicate that 84 percent of spouses who used MyCAA in the previous year had less than a bachelor’s degree, compared with 70 percent of rank-eligible spouses who did not use it in the past year, which was statistically significant at the 0.05 level based on a chi-square test (Friedman, Miller, and Evans, 2015, p. 19). We cannot control for such differences in spouses’ education level in our analyses, nor do we observe spouses’ labor market histories. We do control for service members’ education levels, which we would expect to relate to spouses’ education level due to assortative mating patterns in the United States (Mare, 2016). Indeed, in the 2012 ADSS, 81 percent of spouses of the junior enlisted (paygrades E-1–E-4) had less than a bachelor’s degree, whereas only 24 percent of spouses of junior officers (paygrades O-1–O-3, all of whom must hold a bachelor’s degree) had less than a bachelor’s degree (DMDC, 2013, p. 32).

Propensity scores are estimated as the predicted probabilities from a probit regression using regressors listed in Table 5.1, as well as a quadratic term in spouse’s age and interactions between spouse’s age and number of children. Because we want to match within service branch, year of service, and commuting zone, the probit regressions are run separately for each branch/year-of-service/commuting zone bin. Households located abroad were grouped as a separate commuting zone. This is a demanding approach, requiring variation in MyCAA usage

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11 The 2012 ADSS asked about MyCAA Scholarship use only in the prior 12 months, so this previous work was able to include only recent users in the “MyCAA user” category (Friedman, Miller, and Evans, 2015). In contrast, we were able to use MyCAA administrative data that extend back to the beginning of the current version of the MyCAA Scholarship (October 2010).
within each bin to estimate propensity scores.\textsuperscript{12} The resulting sample is about 60 percent the size of the original: 22,292 treated (MyCAA user households) and 179,761 untreated (nonuser households). Commuting zones were the primary constraint—most of the users who were dropped from the probit regressions were stationed in commuting zones with very few other people from the same service branch or with the same years of experience. Based on this, the results can be interpreted as the effect of MyCAA among the subpopulation of “typical” users, those for whom the sponsoring service member is most likely to be stationed on or near a military installation with numerous other service members at the same paygrade. This sample restriction is not especially limiting in terms of the policy interest of the results, as it still extends to a large number of spouses of interest. Furthermore, the robustness checks show that matching on the full sample and avoiding the use of bins produces estimates of a similar magnitude, reassuring us that our results are not driven by our matching strategy (see Table 5.3).

MyCAA users were matched to nonusers within the same bin based on propensity score. We matched each user to five nearest neighbors using a caliper equal to one-quarter of the standard deviation of all propensity scores, although results are insensitive to both the size of the caliper and the number of neighbors.

\textbf{Results}

Before estimating the ATET, we validate the match quality. First, we test the ability of the propensity scores to distinguish users from nonusers by calculating the sensitivity and specificity of the regression model.\textsuperscript{13} We assign a predicted treatment value of 1 if the predicted probability is larger than the average MyCAA usage rate for the relevant bin. Overall sensitivity is 76.7 percent, and specificity is 58.9 percent. Figure 5.2 shows the density of the predicted propensity score for each group, with vertical lines indicating the averages. The figure shows that the two samples share a common support over most of the range.\textsuperscript{14} Overall, 551 MyCAA user households (or 2.5 percent) were not able to be matched to a nonuser household.\textsuperscript{15}

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\textsuperscript{12} We included bins in the analysis so long as the probit regression converged properly. Despite the number of regressors listed in Table 5.2, within a given bin several regressors would be dropped because there was no variation. For example, paygrade often did not vary within a bin, so those regressors would be excluded. Because of the limitations imposed by the regression, analysis was limited to a fraction of the potential bins. Only 43 commuting zones contained enough MyCAA users from at least one year of service/branch group to be used in the analysis, and overall the average bin contained 72 users.

\textsuperscript{13} Sensitivity is the true positive rate, or one minus the false negative rate (the Type II error rate). Specificity is the true negative rate, or one minus the false positive rate (the Type I error rate).

\textsuperscript{14} The common support is the region of overlap for the two distributions. Households can be matched only if their propensity score is in this region.

\textsuperscript{15} The unmatched MyCAA user households have continuation rates that match the other users’ almost exactly, so we do not believe their omission causes bias in our matched treatment sample.
Table 5.2 shows the postmatch difference in the characteristics from Table 5.1. The average pre-match propensity score was 0.10 for the control group and 0.23 for the treatment group (see Figure 5.2). The matched sample eliminates most of these differences by dropping non-user households with propensity scores that are not similar to user households. The matched propensity scores are nearly equal, with no statistically significant difference. Some individual variables still show statistically significant differences, although the magnitude of the difference is much smaller than in the unmatched sample. Below, we perform robustness checks to help ensure that remaining differences do not drive the results. For the paygrade variables in particular, any differences between treatment and control groups reflect residual differences between service members with the same years of service. Additional robustness checks showed that removing these variables from the matching algorithm has nearly zero effect on the magnitude and significance of the results.

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16 Variables that were used for exact matching (years of service and branch) are excluded from Table 5.2 because, by construction, there are zero differences between treatment and control households.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Matched Treatment</th>
<th>Matched Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propensity score</td>
<td>0.211</td>
<td>0.209</td>
</tr>
<tr>
<td>Service member female (percentage)*</td>
<td>2.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Service member age (years)</td>
<td>26.5</td>
<td>26.5</td>
</tr>
<tr>
<td>Service member AFQT in top 50th percentile (percentage)</td>
<td>41.5</td>
<td>42.5</td>
</tr>
<tr>
<td>Service member deployed in 2011 (percentage)</td>
<td>37.7</td>
<td>37.0</td>
</tr>
<tr>
<td>Service member race/ethnicity (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan*</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>3.7</td>
<td>4.0</td>
</tr>
<tr>
<td>Black</td>
<td>17.9</td>
<td>17.5</td>
</tr>
<tr>
<td>White (non-Hispanic)</td>
<td>60.8</td>
<td>60.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14.2</td>
<td>13.8</td>
</tr>
<tr>
<td>Other/unknown</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Service member education level (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>5.6</td>
<td>5.7</td>
</tr>
<tr>
<td>High school diploma*</td>
<td>85.6</td>
<td>83.7</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>3.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Bachelor’s or more*</td>
<td>5.2</td>
<td>6.6</td>
</tr>
<tr>
<td>Unknown*</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>PCS move in 2011 (percentage)</td>
<td>31.2</td>
<td>31.1</td>
</tr>
<tr>
<td>Service member paygrade in 2011 (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-1*</td>
<td>0.3</td>
<td>0.9</td>
</tr>
<tr>
<td>E-2*</td>
<td>1.9</td>
<td>2.2</td>
</tr>
<tr>
<td>E-3</td>
<td>17.0</td>
<td>17.0</td>
</tr>
<tr>
<td>E-4*</td>
<td>41.2</td>
<td>40.0</td>
</tr>
<tr>
<td>E-5</td>
<td>32.0</td>
<td>29.7</td>
</tr>
<tr>
<td>E-6 or higher</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>O-1*</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>O-2*</td>
<td>1.9</td>
<td>2.6</td>
</tr>
<tr>
<td>O-3*</td>
<td>0.5</td>
<td>1.1</td>
</tr>
<tr>
<td>W-1/W-2</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Service member promotion (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promoted between 2010 and 2011</td>
<td>35.4</td>
<td>35.6</td>
</tr>
<tr>
<td>Promoted between 2009 and 2010</td>
<td>32.8</td>
<td>32.4</td>
</tr>
<tr>
<td>Promoted between 2009 and 2011</td>
<td>48.6</td>
<td>48.6</td>
</tr>
<tr>
<td>Spouse age (years)</td>
<td>25.7</td>
<td>25.8</td>
</tr>
<tr>
<td>Years married*</td>
<td>3.0</td>
<td>2.9</td>
</tr>
<tr>
<td>No longer married in 2011 (percentage)*</td>
<td>1.1</td>
<td>3.5</td>
</tr>
<tr>
<td>Dependent children</td>
<td>1.19</td>
<td>1.18</td>
</tr>
<tr>
<td>Dependent children ≤5 years old</td>
<td>0.74</td>
<td>0.74</td>
</tr>
</tbody>
</table>

NOTES: Matched sample consists of users in service branch/year-of-service/commuting zone bins, each matched to five nearest neighbors based on propensity score. Table shows sample mean characteristics as of December 2011. Differences between matched users and nonusers that are statistically significant at the 5-percent level are denoted with an asterisk (*).

The continuation outcomes in the matched sample reveal a different picture from the outcomes in the unmatched data, as illustrated in Figure 5.3. The unmatched data show a positive continuation gap between service members married to MyCAA users and nonusers, but that gap consistently shrinks over time, from 4.6 percentage points in 2012 to 1.4 percentage points in 2017. This is consistent with the pattern in Table 4.1, except in Figure 5.3 the unmatched sample consists only of those households for which a propensity score was also computed. In the matched sample, the results show a more persistent gap between service members married to MyCAA users and nonusers, from 5.2 percentage points in 2012 to 4.1 percentage points in 2017, ticking up slightly in the interim.

**Figure 5.3. Matched and Unmatched Differences in Continuation of Active Service**

![Figure 5.3](image)

SOURCE: MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013). NOTES: See Table 5.2 and text for additional details. Vertical lines show 95-percent confidence intervals.

Both the magnitude and the persistence of the effects are notable. On a baseline retention rate of 41 percent through 2017, the matched sample effect of 4.1 percentage points is a 10-percent increase in retention. The effect lasts beyond the three years it is permissible to spend MyCAA
Scholarship funds, meaning that the increased continuation is not simply a function of the spouses’ application to MyCAA and time needed to complete their approved courses of study.

The unmatched retention rates displayed in Table 4.1 show that service members from MyCAA households do not have appreciably higher continuation rates through 2017, compared with the full set of nonusers. This means that matched nonusers have lower continuation rates than unmatched nonusers. One potential source of this difference is in years of service: MyCAA users tend to be earlier in their careers. Fifty-six percent of them had less than four years of service as of December 2011—the standard first contract—versus 47 percent of unmatched nonusers. Because the end of the first contract is a natural point at which to leave the military, it could be that the majority of the effects found in Figure 5.3 are due to differences in decisions by first-term service members to continue past their first contract.

To test for this, consider matched outcomes based on years of service. We expect the continuation gap to be largest for service members who had not yet reenlisted as of 2011; generally, this would be service members with less than four or five years of service. Figure 5.4 shows that the gap through 2017 was largest for service members with one to four years of service in 2011, with a peak of 6 percentage points for those with four years of service. By 2017, all of these service members would have had to make the decision whether to continue further than their first contract. The effect is smaller, but still statistically significant, for service members with five to seven years of service. It is not significant for those with zero or eight or more years. Those with more than four years make up only 40 percent of all users; therefore, most of the treatment effect can be attributed to the continuation decisions of service members in their first term.
Figure 5.4. Matched Differences in Continuation Through 2017, by Years of Service in 2011

![Graph showing matched differences in continuation through 2017, by years of service in 2011. The graph illustrates differences in the probability of continuation between years of service. Asterisks (*) on the x-axis indicate statistical significance at the 5-percent level.]

SOURCE: MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013).
NOTES: See text for additional details. Asterisks (*) on x-axis indicate that the continuation gap through 2017 is statistically significant at the 5-percent level.

The overall patterns are consistent with several hypotheses outlined above, including both the selection and causation stories. In particular, unobserved characteristics as an explanation for the continuation gap cannot be discounted based on this analysis alone. For example, MyCAA may attract or approve spouses of early-career service members who already expect service will continue past their first contract.

Post-2014 Results Analysis

To address some of the concerns regarding unobserved intentions to continue, we reestimate the ATET conditional on continuing through 2014. This means service members have stayed for at least three years after the MyCAA application window; scholarship funds would presumably have run out or no longer be available, so there is no incentive for service members to remain in the military merely for the sake of receiving additional scholarship funds. Many of the early-career service members would also have faced a decision about whether to reenlist, so this date eliminates any role for information we were not able to observe about near-term intentions to continue in active service. Additionally, most of these service members had to relocate at least once between 2011 and 2014 (72 percent of nonusers and 80 percent of users), with many moving more than once (28 percent of nonusers and 33 percent of users), so there was opportunity to perceive value (or not) of spouses pursuing careers that DoD had deemed to be more portable and likely to be in demand.\(^\text{17}\)

\(^{17}\) These statistics are based on the full sample and not the subset of households in the matching analysis.
We rematched MyCAA user and nonuser households based on 2011 characteristics but limited our analyses to the sample of those who continued at least through 2014. This resulted in 12,249 MyCAA user households matched to 79,066 nonuser households. Figure 5.5 shows that in the unmatched data, service members in nonuser households continued at lower rates, with the gap growing slightly over time. But the matched effect shows MyCAA usage was associated with a higher continuation rate, growing slightly from 0.8 percentage points to nearly 2 percentage points over three years. In other words, three years after the scholarship application window, MyCAA households continued to remain in active service at rates over and above those of *ex-ante* similar nonuser households who also remained in service for at least three years.

**Figure 5.5. Differences in Continuation Through 2017, Conditional on Continuation Through 2014**

![Graph showing differences in probability of continuation between unmatched and matched MyCAA households](image)

**SOURCE:** MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013).

**NOTES:** The sample in Table 5.2 is restricted to those who have remained in the military through December 2014. See text for additional details.

Conditioning on continuation through 2014 rules out the influence of the scholarship requirement that service members’ remaining terms of service must extend beyond the plan’s stated timeline for completion. For our 2010–2011 cohort, the latest plans would have been approved in December 2011 and would not have been approved had they extended beyond three years (December 2014).

To summarize, we find that service members of MyCAA users are more likely to continue military service than service members of nonusers, even after the scholarship use window has closed, ruling out the program’s requirements as the explanation for greater short-term retention. Furthermore, survey evidence from around the time of population’s early use of the MyCAA Scholarship suggests that there was not a selection effect, and that any impact of MyCAA on
spousal support for service member continuation is not immediately realized. These results support a causal explanation for MyCAA’s effect on continuation.

Differences by Type of Credential Pursued

MyCAA will subsidize any of several types of educational credentials: associate’s degrees, occupational certificates, and occupational licenses. One of the primary differences in these types of plans is that an associate’s degree may take much longer to complete than a certificate program, and testing for occupational licenses or certificates may be of relatively short duration. Thus, one could expect that longer courses of study might be associated with higher continuation rates, as MyCAA funds are distributed within the three-year scholarship window only as long as spouses’ service members are also serving on active duty federal service. Miller et al. (2018) found that our cohort most frequently completed plans for certificates and licenses between three and 15 months after receiving the MyCAA Scholarship, whereas associate’s degrees most commonly took 15 to 27 months for completion of the plan.18

We repeat our matching analysis on the subgroup of MyCAA users who enrolled in associate’s degree programs (N = 13,360) and in occupational certificate programs (N = 18,478).19 MyCAA households in each category were matched to nonusers. Figure 5.6 shows the matched differences in continuation. The shapes of both curves mimic that of the main results, but the magnitude of the gap is different for each group. For households in which the user enrolled in an associate’s degree program, the continuation gap is larger, peaking at 7.8 percentage points and decreasing over time to 5.1 percentage points in 2017. For the occupational certification group, the gap is smaller, peaking at 5.0 percentage points and decreasing to 3.6 percentage points.

The patterns show that MyCAA usage is associated with persistently higher continuation rates. The parallel lines suggest that there are no major differences between the groups in terms of pre-MyCAA intent to continue or leave active service. Rather, the difference in magnitude between the groups’ differential continuation rates suggests that different types of spousal credentials have a different impact on service members’ willingness to continue in active service. For example, associate’s degrees may better enable a spouse to find employment or may provide more flexible employment—for example, in terms of work/family balance when a service member is deployed—or may facilitate higher pay. Determining the exact cause behind these patterns may require access to post-MyCAA Scholarship employment rates or general life satisfaction levels of spousal users and sponsoring service members; it therefore must be left to future research.

18 Note that spouses may have begun their course of study prior to applying to MyCAA, which can explain why some obtained their certificates or associate’s degrees relatively quickly.

19 There were too few users with occupational licensing plans to perform a separate analysis on that group (N = 1,111), so they were dropped from these analyses.
Figure 5.6. Differences in Continuation Through 2017, by Type of MyCAA Plan

SOURCE: MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013).
NOTES: The sample is restricted to those who are seeking an associate’s degree or a certificate and their matched nonusers. Vertical bars show 95-percent confidence intervals. See text for additional details.

Robustness Checks

The matching algorithm relies on several assumptions, including which households to use in the sample and the characteristics on which to match exactly. To assess the robustness of the results to these decisions, we recalculate the matched continuation rates under various alternative specifications. In each case, we altered either the analytic sample or the particular grouping variables used to define matching bins and then matched within each bin on all other variables listed in Table 5.2. Table 5.3 shows the results, including the sample size for which a propensity score could be estimated and the resulting sensitivity and specificity for each case.

First, we try different combinations of variables to define the bins within which households are matched. More variables will break the sample into more granular bins, yielding a more precise match on characteristics but possibly sacrificing sample size if some bins are too small to estimate a probit model. Row (2) of Table 5.3 shows the estimated continuation gap when no bins are used and, instead, the propensity scores are estimated on the pooled sample using branch and years of service as variables in the probit regression. This allows for the maximum sample size and yields control household matches for 100 percent of MyCAA user households. The estimated continuation gap is similar to the main analysis presented above, although slightly larger after 2014. However, the sensitivity and specificity are lower—in particular, the specificity is barely above 50 percent, meaning that the regression does a poor job of distinguishing nonusers in the pooled sample. In row (3), when we group within service branch and year-of-service (but not commuting zone) bins, the full sample is still used for the matching,
and the continuation gap is estimated to be lower than in the main analysis, from a full percentage point lower in 2012 to 0.3 percentage points lower in 2017.

The results in rows (4) and (5) show the relevance of commuting zone and gender based on alternative specifications in which either or both of those are alternatively included in the set of binning characteristics. The rationale for binning based on commuting zone was the need to control for local labor market characteristics. A rationale for binning on gender is that male spouses of active service members have different challenges from female spouses (Karney and Crown, 2007; Southwell and MacDermid Wadsworth, 2016).20 However, male spouses are also small in number,21 and in our main analysis we did not match exactly on gender because the number of male MyCAA users was very small.

The rows show that the inclusion of commuting zone is relevant, but the inclusion of gender is not. Adding gender to the set of exact-match variables does not change the results compared with row (3). However, adding commuting zone brings the results in line with the main analysis of row (1). The difference between including and not including commuting zone as a binning variable must be due to whether MyCAA users are being matched to nonusers outside their commuting zone. When that happens, those outside–commuting zone matches must have continued at higher rates than nonusers in the same commuting zone. This reaffirms the decision to use commuting zones in our main analysis. Whether these differences are due to labor market characteristics, geographic variation in preference for military life, or differential awareness of MyCAA across locations, the results show that controlling for locality is relevant for measuring the magnitude of MyCAA’s effect on continuation.

Next, we varied the analytic sample. In row (6), we dropped households whose marriage ended prior to December 2011 (those labeled “no longer married” in the original analysis), because these households were unusual in their pattern of MyCAA spending: They started using funds during the eligibility window but ceased to remain eligible beyond the window because the marriage ended. This group was small, consisting of only a few hundred user households and several thousand nonusers, and dropping them does not change the results.

In row (7), we drop commissioned officers and warrant officers, which constitute a minority of the eligible population. The result is a larger effect, approximately 1 percentage point higher in each year.

In rows (8) and (9), we try alternative groupings for households located abroad. These households pose two potential issues: First, it is more difficult to identify the relevant labor market or “local” comparison group; second, and relatedly, the opportunities associated with a

20 See, also, advice written expressly for male military spouses at Military OneSource (2018a).

21 Contributing to the small number of male civilian military spouses is the fact that female service members are also more likely to be in dual-military marriages. In 2012, 21 percent of active-duty women were in dual-military marriages, compared with 4 percent of active-duty men (Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy, 2013). Such couples are ineligible for MyCAA if both are on full-time active-duty federal service.
MyCAA-sponsored program may be quite different for a user located abroad, particularly if job opportunities are limited due to language or visa barriers. We try two alternative matching strategies with respect to these households: dropping them altogether (row 8), and matching them within country in the same way the U.S.-based households are matched within commuting zone (row 9). Both specifications result in a smaller matched sample than the main analysis, but there is no substantive difference in the results.

Table 5.3. Differences in Continuation Through 2017 Under Alternative Matching Specifications

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Continuation Gap (MyCAA Users Versus Nonusers)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>(1) Main analysis (Figure 5.3)</td>
<td>202,053</td>
<td>76.7</td>
<td>58.9</td>
</tr>
<tr>
<td>(2) Pooled sample (no bins)</td>
<td>334,989</td>
<td>70.9</td>
<td>51.7</td>
</tr>
<tr>
<td>(3) Match within branch and YoS bins (not CZ)</td>
<td>334,989</td>
<td>72.5</td>
<td>54.1</td>
</tr>
<tr>
<td>(4) Match within branch/YoS/gender bins (not CZ)</td>
<td>323,793</td>
<td>70.1</td>
<td>54.8</td>
</tr>
<tr>
<td>(5) Match within branch/YoS/CZ/gender bins</td>
<td>183,629</td>
<td>74.0</td>
<td>60.0</td>
</tr>
<tr>
<td>(6) Drop if marriage ended prior to December 2011</td>
<td>185,656</td>
<td>73.9</td>
<td>60.0</td>
</tr>
<tr>
<td>(7) Drop officers and warrant officers</td>
<td>154,301</td>
<td>76.0</td>
<td>58.0</td>
</tr>
<tr>
<td>(8) Drop households located abroad</td>
<td>171,640</td>
<td>76.6</td>
<td>58.6</td>
</tr>
<tr>
<td>(9) Match households abroad within country</td>
<td>181,168</td>
<td>77.0</td>
<td>59.0</td>
</tr>
</tbody>
</table>

NOTES: Sample size indicates the number of households for which a propensity score was computed. Continuation gaps indicate the difference in continuation rates for MyCAA users versus matched nonusers, based on the sample of eligible households in which the service member was active in December 2011. Except for the changes noted in the table, all other specifications of the match were the same as described for the main analysis. CZ = commuting zone; YoS = years of service.
6. Initial Findings on MyCAA’s Relative Cost-Effectiveness for Retention

As discussed in Chapter 4, retaining personnel is an ongoing priority for the military. While the primary purpose of the MyCAA Scholarship is supporting military spouses’ education, training, and employment, service member retention is one of several longer-term intended outcomes. In Chapter 5, our analysis revealed that MyCAA was associated with greater retention, ranging from a low of 4.1 percentage points greater retention in 2017 to 5.8 percentage points greater retention in 2013. Given that average retention for nonusers was 70 percent through 2013 and 41 percent through 2017, the relative magnitude of this relationship is substantial, ranging from 8 to 10 percent of overall continuation.

In this chapter, we provide context for impact of MyCAA, an untargeted benefit, relative to the targeted retention program—the selective reenlistment bonus program—that we introduced in Chapter 4. Our comparison considers the cost of getting one additional service member to continue in the military. Using our estimates for MyCAA and SRB estimates from Asch et al. (2010) for the cost for inducing one additional enlistment, we conduct a cost comparison between an untargeted benefit for which retention is a secondary goal (MyCAA) and a targeted benefit for which retention is a primary goal (SRB).

In Table 6.1, we compute a cost per additional service member continuing in the military based on each of these programs. The maximum MyCAA Scholarship amount permitted per spouse is $4,000, and our calculations of the average MyCAA Scholarship funds provided for the spouses of enlisted service members in our analytic cohort (those who applied from October 2010 to December 2011) was $2,297. Using the estimates in Table 5.3 for enlisted service members, we compute the marginal cost of MyCAA by dividing the average MyCAA Scholarship used by the difference in continuation for enlisted service members (row [7], Table 5.3). We estimate that the average cost per retained service member ranges from $35,900 to $45,900 depending on the continuation horizon (i.e., continuation from December 2011 to December 2014, 2015, 2016, 2017). As most of the MyCAA-eligible population would have

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22 Example of computing the cost of getting one additional service member to continue in the military: Consider a retention program that pays a benefit of $10,000 per person. If only 40 percent of service members were retained before a program and, all else equal, 50 percent were retained after, then the cost of inducing one additional service member to continue because of the program would be $10,000/(0.5–0.4) = $100,000. Conceptually, for each additional person induced to remain through the program, nine other people are paid who would have remained regardless of the benefit program.

23 One limitation of this analysis is that we do not observe or account for the costs associated with advertising or administering the MyCAA Scholarship or the SRB program. MyCAA “costs” reflect payments made on our sample of plans approved between October 2010 and December 2011 and paid through December 2014, as reflected in the MyCAA Scholarship data.
faced a reenlistment decision no later than 2015, we expect the cost to be toward the shorter time ranges.\(^{24}\)

In FY 2011, the year our sample was considering whether to apply for a MyCAA Scholarship, the services spent about $715 million in SRBs. SRBs are just one of several special pays aimed at promoting retention of high-skilled and high-demand career fields. For example, enlisted aircrew, submariners, divers, parachutists, and those with critical foreign language proficiency are eligible for special pay related to their duty, skill, or occupation.

In Table 6.1, we compute the average cost of inducing an additional first-term reenlistment using an SRB based on Asch et al. (2010), which evaluates the efficacy of SRBs between January 2002 and September 2007 (so, earlier than our cohort). Unlike MyCAA, SRBs are targeted. SRBs are independent of MyCAA and depend on years of service, rank, service, location, and occupational specialty and/or special skills. We control for all but occupation and skills in our match between MyCAA users and nonusers. Table 8.2 in Asch et al. (2010) provides recommended ranges for the average cost per additional year of service for first-term reenlistments generated by FY 2007 bonuses, which we transform to reenlistments by multiplying by the average years of reenlistment by service and further index to 2011 dollars using the Consumer Price Index for all Urban Consumers.\(^{25}\)

The average costs, by service, of an additional first-term reenlistment from an SRB are reported in Table 6.1. We find that the cost of an additional first-term reenlistment for the Army ranges from $30,900 to $44,300, while the costs for the other services all exceed $58,200. Air Force reenlistments are far more costly, and Asch et al. (2010) urge caution, as bonus responsiveness may be biased due to limited variation in enlistment terms during this period. Taken literally, the estimates suggest that SRBs are an expensive means of retaining Air Force personnel. Asch et al. (2010, p. 113) note that “the cost-effectiveness of bonuses can be deemed too high only relative to a benchmark. [. . .] The estimated bonus costs are likely to be substantially less than the marginal cost of raising military pay to achieve reenlistment goals.” They are also likely to be less costly than the cost of recruiting, screening, and training replacement personnel.

Our comparison is not direct because (1) reenlistments are not observed in our sample of potential MyCAA users, (2) our sample is broader than individuals eligible for first-term reenlistment, (3) the SRB cost estimates included both married and unmarried service members, (4) we did not observe whether our sample was in any SRB-eligible occupational specialties, and

\(^{24}\) Additionally, because those facing a first-term reenlistment decision exhibit greater responses to MyCAA (see Figure 5.4), it is possible that even $36,100 may be high. For example, individuals with three years of service in December 2011 have a greater retention rate of between 5.8 and 7.7 percentage points between 2014 and 2017, resulting in an average reenlistment cost of between $29,800 and $39,600.

\(^{25}\) The bounds in Asch et al. (2010) are based on whether or not the SRB varies by deployment. The Army results are particularly sensitive to deployment, given the use of a policy that required service members to remain in the Army during this time frame. Because this policy, known as “stop-loss,” is not in use today, we use the alternative bounds that Asch et al. (2010) recommend for the Army.
(5) SRB results are from an earlier period (2002–2007) than MyCAA use (December 2011–2017). In making our comparison, we attempt to address these issues or err on the side of making the comparison more favorable for SRBs. For example, to address that we cannot observe reenlistments, we present results on continuation due to MyCAA over a six-year period, the longest enlistment period currently offered for first-term enlistments. Our sample is broader than individuals eligible for first-term reenlistment and includes unmarried individuals. Asch et al. (2010) find that first-term reenlistments are most responsive to bonuses and that unmarried individuals in the Army are more likely to continue (results are not available for the other services). Most concerning for making a direct comparison is that the SRB and MyCAA estimates are from differing periods. From 2005 to 2007, the end of the SRB period, the civilian unemployment rate was low, making retention more difficult. This may have caused the estimated cost of SRBs to be higher than what they would have been during a period of higher unemployment, like that experienced during the MyCAA period (December 2011–2017). Consequently, we focus on orders of magnitude—i.e., are costs of retaining a service member through the untargeted spouse MyCAA Scholarship one to two times or ten times more expensive than a targeted SRB?

Our findings suggest that the cost of using the spouse MyCAA scholarship to encourage a service member to continue during 2011 to 2017 may compare favorably and is the same order of magnitude as the estimated cost of SRBs used to retain service members beyond their first term in the Army, Navy, and Marine Corps from 2002 to 2007. This is notable given that the MyCAA Scholarship is not targeted like an SRB, suggesting the economic rents (i.e., payments to individuals who would have continued regardless) are likely much higher.

We urge caution in relying heavily on our point estimates for policy for three reasons. First, for this interpretation to be true, both the MyCAA and SRB estimates must be causal—the intervention must lead to the observed effect and not result in part from selection. While we consider competing explanations in the previous section and Asch et al. (2010) make efforts to address them, neither analysis has an experimental framework. Second, we are not able to analyze known reenlistment as in Asch et al. (2010), but we provide a broad range that should clearly encapsulate first-term reenlistments. Third, the costs of administering and advertising both programs, which was beyond the scope of our effort, would need to be factored in before definitive statements about the relative costs could be asserted.

Despite the above caveats pertaining to specific marginal cost estimates, our comparisons suggest that the MyCAA spouse scholarship could be a cost-effective service member retention program, potentially similar to SRBs for the Army and less expensive than SRBs for the other services, even though it is not specifically designed to be a retention tool that requires a reenlistment for receipt.
Table 6.1. Average Cost Associated with MyCAA and SRBs per Service Member

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated with MyCAA per additional enlisted service member continuing from 2011 to 2014–2017*</td>
<td>$35,891</td>
<td>$39,604</td>
<td>$41,019</td>
<td>$45,941</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Army</th>
<th>Navy</th>
<th>Marine Corps</th>
<th>Air Force</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$30,885</td>
<td>$44,281</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$91,643</td>
<td>$103,887</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$58,208</td>
<td>$71,189</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$299,062</td>
<td>$311,486</td>
</tr>
</tbody>
</table>

NOTES: All values reported in 2011 dollars. Costs are inflated using the annual averages of the Consumer Price Index for All Urban Consumers as published by the Bureau of Labor Statistics. Authors’ calculations based on MyCAA Scholarship data and SRB estimates reported in Asch et al. (2010).

* Table provides relative cost comparisons if computed reenlistment/continuation rates were due to (i.e., causally related to) MyCAA use or SRBs. Comparisons are not direct because (1) reenlistments are not observed in our sample of potential MyCAA users, (2) our sample is broader than individuals eligible for first-term reenlistment, (3) we did not observe whether our sample was in any SRB-eligible occupational specialties, (4) SRBs results are from an earlier period (2002–2007) than MyCAA use (October 2010 to December 2014), and (5) the SRB cost estimates included both married and unmarried service members.
7. Conclusions

Although U.S. federal agencies have adopted family-friendly policies and benefits, there is little research on the relationship between their programs and actual turnover behavior (Caillier, 2016). In this paper, we investigate whether an employer program promoting spouses’ careers can lead to increased employee retention among those early in their careers. We study one such program in DoD, the MyCAA Scholarship for military spouses to pursue associate’s degrees, occupational certificates, and licenses in portable career fields. We find consistent and sustained evidence for its impact on military service member retention for the six years following receipt of the scholarship. We also find a larger relationship for service members whose spouses participate in an associate’s degree program rather than a program for an occupational certificate. Moreover, we find that, in this case, the cost of offering this untargeted spousal benefit from 2011 to 2017 is the same order of magnitude as selective bonuses aimed at retaining specific occupations and experience levels that were offered from 2002 to 2007.

A benefit of studying a military program is that we can observe characteristics of the entire universe of the eligible population. While we do not have an experimental framework, we argue that our results can be causal given our implementation of a propensity score matching framework in which we can control for service members’ career profiles. Furthermore, we argue that unobservable information plays a minimal role, given that a previous analysis of survey data found that spouses who had used MyCAA in the previous 12 months (spanning 2011 to 2012) were no more likely to support the service member continuing than comparable past year nonusers (Friedman, Miller, and Evans, 2015), further indicating that any impact of MyCAA on spousal support for service member continuation is not immediately realized but may develop later, during or after the use of MyCAA Scholarship funds. Furthermore, the measured impact is positive even among the population of households whose service members continue in active service beyond the end of the three-year scholarship window, suggesting service members did not remain in the service to allow the spouse to complete his or her program.

If interpreted causally, this finding suggests an as-yet-unexamined pathway through which employers may influence employee retention: by providing career-related benefits to the employee’s spouse. This provides indications of the retention benefits of family-friendly programs that are common at workplaces around the country. The Inventory of Total Rewards Programs and Practices conducted by WorldatWork found that 85 percent of workplaces offered tuition assistance to their employees in 2017 (WorldatWork, 2018). Such programs are assumed to be cost-effective, but evidence is often lacking. Our findings offer indications that family-friendly programs like these may be cost-effective and open up the possibility of yet other
avenues for providing employee benefits—by targeting employees’ spouses and families. MyCAA shows that such programs can be a means of retaining staff, even when the program itself is not directly targeted at retaining employees in specific fields.

Future research can clarify the precise mechanisms through which MyCAA usage leads to greater retention. We found that pursuit of associate’s degrees (rather than certificates) is associated with relatively greater retention, implying that some of the impact on retention is due to the marketability of the credential or of the skills learned with the scholarship funds. Future research comparing the wage and employment impacts between different groups of users and nonusers could be illuminating. One reason for greater retention of service members could be improved employment prospects of the military spouse, leading to greater household income. Alternatively, MyCAA Scholarship use may be linked to retention via the experience altering users’ perception of the military: In other words, usage could be associated with changing beliefs that the military supports the family as a whole, and this in turn leads to longer careers in active duty. Currently, we are unable to distinguish which pathway is primarily associated with our findings. If our results persist regardless of employment and earnings outcomes, that would provide suggestive evidence of the latter argument.

A key limitation of our analysis is that it is focused on a population of service members who are relatively early in their careers, with an average service length of less than six years and marriage lengths since military service began that averaged three years. Furthermore, the population was primarily enlisted personnel who typically have less than a four-year college degree at entry, so the results may not be applicable for older or more-experienced individuals. Relatedly, our results suggest that most of the discernable effect is limited to individuals with one to five years of service. Early in people’s careers, in periods coinciding with new marriages and an effort to identify whether work and marital matches are likely to last, employers may play a part by helping align the household goals of new employees in a way that retains personnel. Consequently, our finding may not extend to service members with more experience or in longer marriages, for whom household roles are more established. Another limitation of our analysis was that we could not observe spouse educational and work characteristics. Ideally, administrative data could be incorporated to account for these differences.

Our findings demonstrate that creating opportunities for spouses to advance their careers through education contributes to retention decisions for early-career service members. The findings lend support to the potential efficacy of spousal career programs as a means of promoting worker retention in jobs where the demands for mobility are especially high. Future research could focus on whether spousal career programs supporting more-advanced bachelor’s or graduate degrees could increase this relationship via greater household income or limit it via greater spousal opportunities that weaken retention. Additionally, further exploration of our

26 WorldatWork did study some programs aimed at families, including child-care resources and scholarships for employees’ children, yet spouses were not the target of any program except health insurance.
results in nonmilitary populations and over alternative periods will help clarify the breadth of these findings (i.e., do they extend beyond early careers and new marriages?) and the importance of household income in individual career decisions.
This appendix provides details on variables used for this analysis, including definitions, sources, and graphical distributions of key variables. See also Miller et al. (2018), Appendix A for information from the original study. Table A.1 lists variables used for all phases of the analysis: determining eligibility, performing the matching analysis, and doing robustness checks and subgroup analyses. The data sets indicated by acronyms (DEERS, CTS, ADP, and MEPCOM) are administrative files provided by the DMDC.

### Table A.1. Variable Names, Definitions, and Sources

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Definition</th>
<th>Purpose</th>
<th>Source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsor age</td>
<td>Sponsor age in years</td>
<td>Used in matching</td>
<td>Defense Enrollment Eligibility Reporting System (DEERS)</td>
</tr>
<tr>
<td>Sponsor gender</td>
<td>Indicator for female sponsor</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Sponsor race</td>
<td>Sponsor’s race and ethnicity (categorical: white (non-Hispanic), black, Asian/Pacific Islander, American Indian/Alaskan, Hispanic, other)</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Sponsor AFQT category</td>
<td>Indicates sponsor in top 50% on AFQT</td>
<td>Used in matching</td>
<td>Military Entrance Processing Command (MEPCOM)</td>
</tr>
<tr>
<td>Sponsor paygrade</td>
<td>Paygrade (categorical: E-1 through E-6 or higher, O-1 through O-3 or higher, or W-1/W-2)</td>
<td>Used to determine eligibility and for matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Sponsor service branch</td>
<td>Army, Navy, Air Force, or Marine Corps</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Sponsor years of service</td>
<td>Time in active military service, in years</td>
<td>Used in matching</td>
<td>Active Duty Pay File (ADP) and DEERS (when ADP information missing)</td>
</tr>
<tr>
<td>Sponsor education</td>
<td>Highest level of education (categorical: less than high school, high school diploma, associate’s, degree, bachelor’s degree, or postgraduate)</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Sponsor active component indicator</td>
<td>Indicates whether sponsor is in active duty</td>
<td>Outcome variable</td>
<td>DEERS</td>
</tr>
<tr>
<td>Spouse age</td>
<td>Age of spouse in years</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td>Spouse active duty/guard/reserve indicator</td>
<td>Indicates whether spouse is in active duty, National Guard, or reserves</td>
<td>Used to determine eligibility</td>
<td>DEERS</td>
</tr>
<tr>
<td>Commuting zone based on USDA’s 2000 definition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mailing address ZIP code</strong></td>
<td>5-digit zip code for sponsor mailing address</td>
<td>Used to match to commuting zone</td>
<td>DEERS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Status of MyCAA plan</strong></td>
<td>Completed, active, or inactive</td>
<td>Used to determine treatment group</td>
<td>MyCAA Goals &amp; Plans</td>
</tr>
<tr>
<td><strong>MyCAA plan type</strong></td>
<td>Categorical: associate’s, certificate, or license</td>
<td>Used in subgroup analysis (Figure 5.6)</td>
<td>MyCAA Goals &amp; Plans</td>
</tr>
<tr>
<td><strong>Total funds expended in MyCAA</strong></td>
<td>Sum of funds spent across all approved financial assistance request documents, adjusting for refunds, through December 2014</td>
<td>Used in cost analysis (Chapter 6)</td>
<td>MyCAA Financial Assistance Documents</td>
</tr>
<tr>
<td><strong>Years appearing married</strong></td>
<td>Number of years for which the household spouse/spONSor pair has been married in our observation window. If they were married before the sponsor joined the military, it may differ from actual marriage length.</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td><strong>PCS moves</strong></td>
<td>Indicator for whether household experienced a PCS move during given calendar year</td>
<td>Used in matching and subgroup analysis (Figure B.2)</td>
<td>DEERS</td>
</tr>
<tr>
<td><strong>Deployment</strong></td>
<td>Indicator for whether sponsor experienced at least 30 days of deployment in support of the Global War on Terror during given calendar year</td>
<td>Used in matching and subgroup analysis (Figure B.1)</td>
<td>Activation and Deployment Contingency Tracking System (CTS)</td>
</tr>
<tr>
<td><strong>Dependent children</strong></td>
<td>Number of dependents under age 18 (categorical variable based on integer value, capped at 6), based on the total number of unique child records appearing during the given calendar year</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td><strong>Dependent children under age 6</strong></td>
<td>Same as above for children ages 0 to 5.</td>
<td>Used in matching</td>
<td>DEERS</td>
</tr>
<tr>
<td><strong>Marriage indicator</strong></td>
<td>Indicates whether spouse/spONSor pair is still married</td>
<td>Used to determine eligibility</td>
<td>DEERS</td>
</tr>
</tbody>
</table>

NOTE: USDA = U.S. Department of Agriculture

As noted in the main text, MyCAA users tend to have fewer years of service. Figure A.1 shows that sponsors of MyCAA users were more likely than potential sponsors of nonusers to have one to five years of service, and less likely to have six or more (or zero) years of service.
Figure A.1. MyCAA Participation Rates, by Service Member Years of Service

SOURCE: MyCAA data merged with DMDC data.
NOTE: Sample sizes: 302,410 nonuser households and 32,959 user households.

Figure A.2 shows months of deployment in 2011. In the analysis, we used a variable indicating whether the service member had more than one month of deployment; the figure shows that such service members’ deployments were roughly evenly distributed.
Figure A.2. Length of Deployment in 2011, by MyCAA Usage

SOURCE: MyCAA data merged with DMDC data.  
NOTES: Sample sizes: 302,410 nonuser households and 32,959 user households. Deployment variable used in matching algorithm was an indicator for whether the service member had at least one month of deployment in 2011.

Figure A.3 shows the distribution of eligible spouses’ ages. MyCAA users tend to be younger, with an average age roughly 1.5 years below that of nonusers. Both distributions peak around 23.5 years.

Figure A.3. Age of MyCAA-Eligible Spouse in December 2011, by MyCAA Usage

SOURCE: MyCAA data merged with DMDC data.  
NOTES: Sample sizes: 302,410 nonuser households and 32,959 user households. Vertical dashed lines show average age for each group. Averages are 27.1 years (nonusers) and 25.7 years (users). The distributions peak at 23.3 years (nonusers) 23.6 years (users).
Figure A.4 shows the age of the service member in each household. As with spouses, service members in nonuser households tend to be older (by about one year). The peaks of the distributions are 1.6 years apart.

**Figure A.4. Age of Sponsoring Service Member in December 2011, by MyCAA Usage**

![Age Distribution Chart](chart.png)

**Source**: MyCAA data merged with DMDC data.

**Notes**: Sample sizes: 302,410 nonuser households and 32,959 user households. Vertical dashed lines show the average age for each group. Averages are 27.3 years (nonuser households) and 26.4 years (user households). The distributions peak at 25.9 (nonuser households) and 23.5 (user households).

Figure A.5 shows the distribution of marriage length for couples who were married after the beginning of our observation window (i.e., after the service member began active service). This represents 99.5 percent of nonuser households and 99.6 percent of user households. Average marriage length as of December 2011 was 2.98 years for nonuser households and 3.11 years for user households. This average is somewhat misleading because of the large number of nonuser households with new marriages (close to zero years). MyCAA user households are more likely than nonuser households to be married between one and five years, while nonuser households are more likely to be married six or more years.
Figure A.5. Years of Marriage as of December 2011 for Couples Married After Beginning of Active Service, by MyCAA Usage

SOURCE: MyCAA data merged with DMDC data.
NOTES: Sample sizes: 300,651 nonuser households and 32,794 user households. Data labels are rounded to the near percentage point. Average years married: 2.98 (nonusers) and 3.11 (users). Couples who were married prior to the start of our observation window (i.e., prior to the beginning of active service) are excluded.
Appendix B: Subgroup Analyses

Service member retention is affected by several factors, and the benefits of MyCAA are likely to vary with some of those factors. Here, we detail PSM differences in continuation for particular subgroups whose continuation is likely to be affected by certain military-related events: deployment and PCS moves. Overall, the results show that the effect of MyCAA usage is robust among those households that experience these events during the application window but is minimal when the events occur several years after the application window.

Deployment

Deployment is part of military service, but it can have substantial effects on both service members and their families. Across all services since September 11, 2001, there have been 5.4 million deployments of 2.8 million individuals (Wenger, O’Connell, and Cottrell, 2018). Of all Army soldiers active in December 2011, 73 percent had deployed to Iraq and/or Afghanistan; many of the other 27 percent were recent recruits who could expect to be deployed in the near future (Baiocchi, 2013). Deployment, in turn, is linked to spousal and family well-being, particularly emotional stress (Chandra et al., 2011; Lester et al., 2010). Marital satisfaction is negatively associated with deployment, particularly the first deployment (Karney and Trail, 2017).

Evidence of deployments since September 11, 2001 suggests that deployment is positively associated with reenlistment, although these results are sensitive to cumulative time spent deployed and whether the deployment was longer or shorter than expected (Asch et al., 2010; Hosek and Martorell, 2009). Deployment also disrupts spouses’ employment. Savych (2008) finds that deployment reduces spousal labor force participation by an average of 2.8 percentage points (nearly twice that for families with young children), with this reduction starting a few months prior to deployment and ending a few months after the service members return.

Given the evidence, it is not obvious whether MyCAA would differentially affect households in which the service member was deployed compared with those in which they were not. If spouses reduce their labor force participation during deployment, the job skills provided by MyCAA may not be useful. Because deployment on its own does not negatively impact continuation, MyCAA households may still have higher continuation rates after conditioning on

27 We also examined the benefits of MyCAA based on characteristics unrelated to military service—length of marriage (newlyweds versus others) and field of study. There were no statistically significant differences based on length of marriage; continuation rates were higher when MyCAA users enrolled in fields related to law, compared with medical/veterinary or human resources. Results are on file with the authors.
deployment if MyCAA provides useful skills for the postdeployment period when a spouse may return to work.

We calculate the effect of continuation for two different matched pairs of users and nonusers: those whose service members deployed during the application window in 2010–2011 and those deployed in 2014, just after MyCAA would have ended. These analyses allow us to test and rule out selection in a similar way to the post-2014 analysis above. Given deployment in 2010–2011, MyCAA usage could be contingent on postdeployment plans to stay in active service. On the other hand, deployment in 2014 will not be known as of December 2011, so it should not influence the decision to apply for a MyCAA scholarship.

This analysis conditions on a strict subset of those households in the main analysis: deployment in a given year requires having continued in service to that year. Overall, deployed service members in our sample continue after deployment at higher rates than those who were not deployed. Among those active in 2011, those who had deployed during the application window continued in active service at rates roughly 3 percentage points higher than those who did not deploy. Among those who continued to 2014, those who deployed that year continued through 2017 at rates about 5 percentage points higher than those who did not deploy. These differences are larger than the differences in MyCAA application, so any deployment-based differences in continuation cannot be fully attributed to MyCAA usage.

Figure B.1 shows the matched ATET for each group, from deployment until 2017. The continuation gap diminishes as the year of deployment increases. The results for those with deployment during 2010–2011 show a similar pattern as for the full matched sample, albeit a slightly larger continuation gap by about 1 percentage point each year. For those deployed in 2014, the gap is approximately half the size and is not statistically significant. The closest analogue for the analysis of 2014 deployments would be Figure 5.5, which is conditional on the service member having remained until December 2014. The results suggest that a service member’s decision to continue in active service is more strongly influenced by deployment itself, rather than a spouse’s having used MyCAA prior to deployment.
Figure B.1. Differences in Continuation Through 2017, Conditional on Deployment in Given Year

![Graph showing differences in probability of continuation through 2017, conditional on deployment in given year.](image)

**SOURCE:** MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013).

**NOTES:** The sample in Table 5.2 is restricted to those who are deployed in 2010–2011 or deployed in 2014 and their matched nonusers. In the analysis of military households where the service member experiences a deployment in 2014, the sample is conditional on the individual being eligible to deploy at any point in 2014, meaning the service members must have remained in the military until at least January 2014. See text for additional details.

**PCS Moves**

Like deployment, PCS moves are also a regular part of military life. Service members can expect to move every two to three years in the early part of their careers. Unlike deployment, PCS moves are somewhat predictable; a household with a PCS move in 2010–2011 would know that another move is likely sometime around 2013; those with a move in 2012 would likely move again sometime around 2014. Recent discussions about revisiting this policy reflect a concern that such frequent moves negatively affect retention (Vergun, 2018) because of the social upheaval experienced by the family. If MyCAA influences retention, it would do so indirectly by mitigating some of this upheaval, allowing a spouse to continue employment in the same field in which he or she worked before the move.

As with deployment, we reestimate the continuation gap between MyCAA user and nonuser households conditional on having a PCS move in 2010–2011 versus in 2014. Because a service member is unlikely to leave immediately after a PCS move, as minimum service lengths are attached to PCS moves, we begin measuring continuation in the year following the move. Conditioning on PCS moves is like conditioning on continuation, in that a household accepting a PCS move probably intended to at least try living in their new location—hence, the conditioning eliminates the possibility of selection due to intent to stay until a given date.

Figure B.2 shows the results. Among households with PCS moves in 2010–2011, during application window, MyCAA has a similar association with continuation as in the main analysis.
As with deployment, the measured continuation gap shrinks when conditioning on PCS moves in 2014. For those households with PCS moves in 2014, MyCAA has zero association, statistically or substantively, with continuation. As for deployment, conditioning on PCS moves in 2014 shows that any effect of MyCAA is absorbed by the direct effect of the PCS move.

**Figure B.2. Differences in Continuation Through 2017, Conditional on PCS Move in Given Year**

![Graph showing differences in continuation through 2017, conditional on PCS move in given year](image)

**Source:** MyCAA data merged with DMDC data and commuting zone crosswalks from Autor and Dorn (2013).

**Notes:** The sample in Table 5.2 is restricted to those who had a PCS in 2010–2011 or in 2014 and their matched nonusers. In the analysis of military households with a PCS move in 2014, the sample is conditional on the service member having remained in the military through 2014. See text for additional details.
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DMDC—See Defense Manpower Data Center.


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