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# ABSTRACT

## The G.I. Bill and Underemployment*

While the ill luck of graduating during a recession is understood to potentially result in job mismatch, less is known about the drivers of underemployment outside of business cycles. This paper shows that the college subsidy investments undertaken as part of the WWII, Vietnam War, and Post-9/11 G.I. Bills led to persistent and sizable increases in the underemployment rate among bachelor's degree holders. In turn, underemployment explains approximately a quarter of the earnings penalty experienced by recent college educated veterans, over and above lost labor market experience, lower rates of graduate school completion and combat exposure effects.

**JEL Classification:** I22, J24, J31
**Keywords:** underemployment, veterans, subsidies

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A third of U.S. college graduates have been classified (Abel et al. (2014); Clark et al. (2017)) as 'underemployed' or 'overeducated,' terms that broadly define college graduates finding employment in occupations that do not require a college degree.[1] A notable consequence of underemployment is that it is associated with lower earnings relative to 'matched' employment.[2] Many studies have documented the ill luck of graduating during a recession in terms of lower lifetime earnings, occupational prestige and underemployment,[3] but the drivers of mismatch employment outside of recessionary periods have received less attention, despite the fact that the underemployment rate persists at high levels, regardless of business cycle fluctuations (Figure 1).

In this paper, I quantify how the underemployment rate in the U.S. has historically shifted in response to G.I. Bill-sponsored increases in the supply of college graduates. Veterans now account for seven percent of the civilian non-institutional population,[4] but as many as 70 percent of men in the 1920s birth cohorts were drafted for WWII. As I show below, veterans who were more likely to benefit from G.I. Bill subsidies experienced higher rates of underemployment, which in turn fueled the overall underemployment rate in the economy.

Beyond its impact on the overall labor market, veteran college graduate underemployment has been a pressing policy concern, particularly considering the rising cost of tuition. One of the aims of the G.I. Bill program is the successful civilian integration of retiring army personnel. When Post-9/11 G.I. Bill veterans were experiencing high unemployment rates and were employed in jobs not matching their qualifications, the U.S. Senate opened an

[1] Overeducation or underemployment have been the topic of several literature surveys (Groot and Van Den Brink (2000); Hartog (2000); Sloane (2003); McGuinness (2006); Leuven and Oosterbeek (2011)). The measure of underemployment I employ is a mix of statistical, expert evaluation and survey measures, described in section 2.

[2] See, for example, Appendix Table A2. Underemployed bachelor's degree holders earned 37 percent less than matched degree holders.

[3] Kahn (2010), Oreopoulos et al. (2012), Altonji et al. (2016) and Schwandt and Von Wachter (2019) document the persistent negative effects of graduating during a recession on earnings. Liu et al. (2016) find that unfavorable economic conditions at graduation reduce the match between industry and field of study. Summerfield and Theodossiou (2017) and Barnichon and Zylberberg (2019) explicitly link increases in the underemployment rate to recessionary periods.

[4] Bureau of Labor Statistics, Employment Situation of Veterans 2022, released Tuesday, March 21, 2023 https://www.bls.gov/news.release/pdf/vet.pdf

investigation focused on the instructional quality and marketing practices of for-profit colleges, whose graduates were not finding "gainful employment in their field of study."[5]

Concerns about veteran underemployment are not new: they have accompanied the G.I. Bill program since the early days of its design.[6] Nor are concerns about predatory colleges targeting veterans new.[7] But besides the instructional quality experienced by veterans, there are several other mechanisms driving the observed higher rates of underemployment for veterans, including lower labor market experience and lower likelihood of graduate degree attainment, exposure to combat and its effect on health, academic preparedness and socioeconomic background, or congestion effects resulting from graduating cohort sizes. While the main focus of the paper is quantifying the effect of G.I. Bill educational expansions on the underemployment rate, I discuss several mechanisms in section 5 and present suggestive empirical evidence that the choice of college major and the size of graduating cohorts partly explain the higher rate of underemployment among veterans.

As a preamble to the empirical analysis, I discuss the measurement and welfare implications of underemployment in section 1 and present stylized facts in the U.S. labor market. Throughout the analysis, I seek to alleviate the limitations of individual measures by presenting results for a set of statistical, occupational expert evaluation and survey-based measures of underemployment, as well as their intersection. I also employ occupation-level data on cognitive skill use from the O*NET database and the Dictionary of Occupational Titles.

I proceed to isolate shifts in the supply curve of college graduates generated by conscription and benefit eligibility cut-offs for the WWII and Vietnam War G.I. Bills. I follow many other

[5] U.S. Senate Health, Education, Labor, and Pensions Committee (2012). Besides concerns about the integration of veterans in the civilian labor market, the U.S. Senate's preoccupation with underemployment was stemming from public fiscal concerns: "A student who leaves college without learning the skills required for a job in his or her field of study does not offer the same benefit to the economy—and the tax base—as a skilled graduate."

[6] As I show in section 2, initial plans for the WWII G.I. Bill were far less generous than the bill eventually signed into law. At the time, opponents of the bill were cautioning against the suitability of four-year college educational benefits for returning servicemen warning about the risk of 'overeducation'.

[7] Mettler (2005), p.81 describes how institutions lowered admission and educational standards seeking to attract WWII veteran students, and a flurry of new institutions appeared looking to attract federal money. Overwhelmed, government agencies sometimes granted approval through mail, avoiding "the formality of inspection of facilities or courses of instruction unless there were reasons to believe something was amiss."

analysts (Card and Lemieux (2001b); Bound and Turner (2002); Stanley (2003); Angrist and Chen (2011); Malamud and Wozniak (2012)) in exploiting quasi-exogenous variation in the probability of military service, and hence in the use of educational benefits across cohorts. Figure 3 illustrates that after WWII, college enrollment increased by more than 50 percent, as many returning servicemen, who had not attended college because of military service, decided to further their interrupted education. Many others were induced to attend college by the generous educational stipends provided by the G.I. Bill. During the period of conscription for the Vietnam War, men were able to defer the draft through college enrollment. The number of bachelor's degree holders continued to rise after the Vietnam war, as returning servicemen used their educational benefits to pay for a college education. More recently, the Post-9/11 G.I. Bill greatly increased college attendance and graduation rates for veterans with periods of service after the September 11, 2011 attacks (Figure 7).

Using Census data on the occupational choices of veterans who benefited from college tuition subsidies, I show that WWII and Vietnam-era cohorts with a higher availability of tuition subsidies experienced higher rates of underemployment among bachelor's degree holders, and worked in occupations with lower cognitive skill intensity. Turning to the more recent Post-9/11 G.I. Bill, I exploit the substantial change in maximum educational benefits for veterans who served after September 11, 2001, to show that the well-documented increase in college attainment (Barr (2015), Barr (2019)) was also accompanied by an increase in the underemployment rate for recent graduates.

These results indicate that the underemployment rate in the U.S. has historically been fueled by the large-scale tuition subsidy policies embedded in veteran benefits legislation. 2SLS estimates imply that the underemployment rate for veteran college graduate G.I. Bill beneficiaries was 49 percent higher than that of non-veterans for 1922-1932 cohorts (Table 1), 34 percent higher for the 1942-1955 cohorts impacted by the Vietnam War induction (Table 2), and 129 percent higher for Post-9/11 veterans than the rate for other men aged 24-45

observed between 1995 and 2020 (Table 5).[8] In turn, the higher underemployment rate among veterans explains approximately 3.9 percent of the overall male underemployment rate for WWII cohorts, 4.4 percent for Vietnam War cohorts and 2.3 percent for 1995-2000 cohorts.[9] These magnitudes are comparable to the effect of recessions on the overall underemployment rate. For example, the underemployment rate defined under the joint indicator used in this paper grew by 3.92 percent between 2007 and 2010, from 23.97 to 24.92 percentage points (See Figure 1).

Underemployment is negatively associated with the earnings of college graduates, and explains a large fraction of the veteran college graduate earnings penalty relative to non-veterans. Controlling for underemployment status in a Mincerian equation (Table 7), I find that it explains approximately 25 percent of the veteran college graduate penalty experienced by Vietnam veterans, after including controls for potential experience and graduate school attainment. For Post-9/11 college graduate veterans, underemployment explains 27 percent of the earnings penalty.

This paper documents that the G.I. Bill subsidies and college deferment options during the Vietnam War are explanatory mechanisms for the level and persistence of underemployment in the U.S. labor market. These findings are comparable to analyses of rapid expansions of the UK higher education sector between 1988-1992. Chevalier and Lindley (2009) found the U.K. higher education expansion led to a significant increase in the overeducation rate. The analysis in this paper is also related to studies of how variations in the supply of college graduates impact the college wage premium (Katz and Murphy (1992); Card and Lemieux (2001a); Walker and Zhu (2008)). For example, Card and Lemieux (2001a) find that the rise in college wage premia between 1980 and 1995 was mainly benefiting younger workers, born in the 1950s, who were facing smaller graduating cohorts relative to men born earlier. For older workers, the size of the graduating cohorts had been inflated by the return of servicemen

[8]These calculations are based on the joint underemployment indicator 2SLS estimates and the average for non-veterans reported in each table.

[9]These calculations are based on the overall male underemployment rate and the underemployment rate for veterans and non-veterans reported in Tables 1, 2, and 5.

from WWII and by the incentives that the college deferment option created for potential Vietnam recruits.

This paper also contributes to the literature examining the determinants of veteran earnings. The increase in the underemployment rate represents an explanatory mechanism for the relatively low earnings gains of Vietnam War cohorts, despite their higher rates of college completion, analyzed by Angrist and Chen (2011). Barr et al. (2021) show that earnings for veterans potentially induced to enroll in college by the Post-9/11 G.I. Bill raised college completion, but reduced average earnings seven to nine years after separation from the Army by two to three percent, with larger losses for low AFQT veterans attending for-profit colleges. Results in this paper indicate underemployment is an explanatory mechanism for these earnings losses, over and above lost labor market experience, lower rates of graduate degree attainment and exposure to combat. Given the documented high persistence of underemployment in U.S. labor markets and its scarring effects on earnings (Clark et al. (2017)), the findings in this paper point to understanding and addressing veteran underemployment as a means to reducing the veterans earnings penalty and the overall underemployment rate.

The next section describes the underemployment measures used in the paper and presents stylized facts. Section 2 briefly reviews the institutional background behind the G.I. Bill legislation and the conscription cut-offs that provide the quasi-exogenous variation analyzed in this paper. Section 3 presents the data and empirical strategy. Section 4 shows results for WWII, Vietnam and Post-9/11 cohorts and compares the effects of underemployment on earnings across cohorts. In section 5, I discuss mechanisms and present empirical evidence on the impact of college major choice on veteran underemployment, and I summarize and conclude in section 6.

# 1 Underemployment: measurement and stylized facts

## 1.1 Underemployment indicators

The concept of overeducation, or underemployment, was popularized by Richard Freeman's 1976 book *The Overeducated American*, which argued that a rising supply of graduates would decrease the monetary returns to a college degree. The concept of underemployment has been since expanded to refer to circumstances under which college graduates work in jobs that do not require such a level of schooling (Sullivan (1978); Clogg (1979); Duncan and Hoffman (1981)).

The literature operates with a variety of measures of underemployment, which can be broadly classified as *objective*, *subjective* or *statistical* indicators. Subjective indicators are generally constructed by eliciting opinions from employees on whether their job requires a college education, skills acquired in college, or a specific number of years of schooling. Objective measures rely on expert classifications of the amount of education necessary in particular occupations. Statistical measures compare the number of years of schooling attained by college graduates to the mean, median or mode level of schooling for workers in their occupation. Given the many limitations of individual indicators, I employ several measures of underemployment in this paper:

*Objective indicator*—The Bureau of Labor Statistics (BLS) provides information on "typical education needed for entry" for the set of occupations for which it publishes employment projections data. BLS economists specify the typical entry-level education for each occupation, by analyzing both quantitative (Census, O*NET survey data) and qualitative data from employers, workers, training experts, or representatives of professional associations. The data I use is part of the 2014-24 National Employment Matrix. Evaluations of typical education needed for entry are available at the four-digit level, for occupations in the 2010 Standard Occupational Classification (SOC). I classify individuals as underemployed if they attained a bachelor's degree, but work in occupations for which the typical education

needed for entry is less than a bachelor's degree. One limitation of this indicator is that a college education may not be needed for entry, but may, however, serve to substantially increase earnings, or chances of promotion in the respective occupation.

*Subjective indicator*—Under Department of Labor funding, O*NET, the "Occupational Information Network" surveys employees on a detailed list of occupational characteristics, including educational requirements. The O*NET Education and Training Questionnaire includes the following question: "If someone were being hired to perform this job, indicate the level of education that would be required. (Note that this does not mean the level of education that you personally have achieved.)" The data I use come from the O*NET 20.0 Database, and is available for occupations at the four-digit level under the 2010 SOC. I classify individuals as underemployed if they hold a bachelor's degree or a higher educational qualification, but they work in an occupation in which fewer than 50 percent of respondents indicate that such a degree is necessary. This underemployment indicator was previously employed by Abel et al. (2014). The main limitation of this measure is, as expected, its subjective nature: employees in a field may systematically over- or under-evaluate the level of schooling required in their occupation.

*Statistical indicator*—The statistical indicator relies on the distribution of educational attainment in each four-digit SOC 2010 occupational category, for employees aged 18-64. Bachelor's degree holders, who typically attain 16 years of schooling, are classified as underemployed if the mean plus one standard deviation level of education in their occupation falls below 16. The main limitation of this indicator is that the one standard deviation cut-off is arbitrary, and the indicator may also be sensitive to the assignment of years of required schooling for various educational categories.[10] Another limitation of the statistical indicator is that it reflects labor market circumstances rather than actual job requirements. If enough college degree holders work in an occupation, they may pull up the mean educational

[10]For the statistical indicator in this paper, I assign two years of schooling for masters degrees, three years for other professional degrees, and seven years for doctoral degrees, based on tabulations from National Science Foundation (2006).

attainment to levels at which the respective occupation would no longer be classified as a case of underemployment.

Appendix Table A1 summarizes the relatively high correlations between the three indicators used, and their values in the 2000-2014 Census and ACS data. In order to mitigate some of the individual limitations of these indicators, I create a joint indicator, by taking the intersection of the objective, subjective and statistical indicators described above. In calculating measures of underemployment, I exclude college graduates who are enrolled in graduate school, as their occupational choice may be a temporary form of income support. Analyses are also conducted excluding individuals who are not born in the U.S., as their underemployment status may be a reflection of their visa restrictions or limited transferability of educational credentials.

## 1.2 Stylized facts and welfare implications of underemployment

The comovement between college completion and the underemployment rate among college graduates is illustrated in Figure 1. The underemployment rate spikes during recessionary periods, but persists at relatively high levels, regardless of the business cycle.

*Underemployed workers earn substantially less than matched bachelor's.*— Appendix Table A2 presents the average earnings of employed individuals aged 24-64, using a snapshot of the U.S. population in the 2015 American Community Survey. Graduates classified as underemployed earned 29,696 dollars, or 37 percent less than bachelor's degree holders not classified as underemployed. In turn, the earnings of underemployed bachelor's were only 2,864 dollars higher than those of associate degree holders, and only 5,316 dollars higher than those of high school graduates. These figures indicate that the substantial earnings gains enjoyed by college graduates in the U.S. market accrue mostly to those who are not classified as underemployed.

*Underemployed bachelor's work in occupations with lower cognitive skill intensity.*— For each occupation in the Standard Occupational Classification (SOC) system, O*NET provides

skill importance ratings, based on questionnaires administered to incumbents in each occupations as well as ratings from occupational analysts. Table A5 provides examples of skills and ratings. I aggregate the occupational skill scores for employees with less than a college degree, for bachelor's degree holders who are underemployed, and for degree holders not classified as underemployed. Figure 2 illustrates that the average skill score in occupations held by underemployed bachelor's is considerably lower than that of matched bachelor's, and in fact very similar to the average skill score for employees with no college degree.

*Underemployment persists beyond early career stages.*—Appendix Figure A1 shows that the fraction of college graduates classified as underemployed decreases systematically between the ages of 24 and 34. However, the underemployment rate persists at rates above 20 percent for older employees as well. Using longitudinal data from the NLSY79 cohort, Clark et al. (2017) show that, among workers with at least some college education, the underemployment rate (which they measure using a mode-based statistical indicator) decreased over the first 12 years of labor market experience, but only from 62.3 percent to 50.4 percent.

*The rate of overeducation differs systematically across college majors.*—Students majoring in STEM, Health or Education fields have the lowest rates of overeducation, while business, social sciences and liberal arts majors have the highest overeducation rates (online Appendix Table A3).

*Welfare implications*— Underemployment has been associated in the management literature with lower job satisfaction (Tsang et al. (1991)) and higher turnover (Sloane et al. (1999)). In Table A4, I present results from an analysis of a sample from the Survey of Recent College Graduates (NSCG). I find that underemployment is associated with lower job satisfaction, higher turnover, lower on-the-job training and fewer professional development opportunities. Despite such potential drawbacks, some graduates may work in occupations that do not require a degree because of preferences (Agopsowicz et al. (2020)), amenities, or other compensating differentials. Regardless of labor market occupational mismatch status, college graduates likely enjoy many of the positive externalities associated with college attainment.

Lochner (2011) reviews evidence of such positive externalities as reduced crime, better health outcomes and behaviors, or increased civic participation. It is not clear whether such positive spillovers are lower in the case of underemployed individuals, but there is evidence that the underemployed status is associated with negative health outcomes such as depression (Bracke et al. (2013)).

# 2 Institutional Background

## 2.1 WWII

The U.S. Army manpower needs during WWII led to mass conscription of troops, instituted through the Selective Service Act of 1940. Figure 4 shows that the fraction of the birth cohort reporting WWII service in the U.S. Census was above 60 percent for individuals born between 1919 and 1927. Title II of the G.I. Bill (Serviceman's Readjustment Act, Public Law 346, 1944) provided educational benefits to men who served between September 1940 and July 1947. Servicemen could choose to use their benefits to pay for vocational training, apprenticeships or college tuition. When enrolled in college, they also received a monthly stipend for living expenses. Any veteran who had served at least 90 days was eligible for one year of educational benefits. Additional educational benefits, up to 36 months, or 4 academic years, were awarded for every additional month of service.

The federal financial aid program for WWII veterans led to a sharp increase in the number of bachelor's degree holders (Bound and Turner (2002); Stanley (2003)). Many returning servicemen would have attended college even without the aid of the G.I. Bill stipend, but some individuals were induced to attend college, as they could not have afforded to do so in the absence of the federal subsidies. This quasi-exogenous increase in the number of college graduates may have fueled the rate of underemployment. A simple supply and demand argument would suggest that the sharp rise in the number of college graduates may not have found its match in the number of jobs requiring a college degree. As such, some of the college

graduates would have had difficulties finding jobs that require a college education. Second, the stipend, which allowed veterans to attend a four-year college, was not conditional on prior academic ability. There is evidence that the generous tuition subsidies afforded veterans prompted colleges to lower academic standards. For example, universities accepted students who had not graduated from high school, providing them with college preparatory work, counted military training as credit hours, and offered yearlong courses to allow students whose benefits expired to fully use them (Mettler (2005)). While the G.I. Bill stipend was not conditional on prior academic ability, U.S. policymakers were initially concerned whether a college education was a good option for returning servicemen. The initial plans for the G.I. Bill were less generous in terms of tuition support, and more selective in terms of academic ability, than the bill eventually signed into law. These plans had been drawn up by a committee of educators, called in 1942 to devise plans for the post-war education of returning veterans. President Roosevelt presented Congress with the committee's proposals in 1943. The initial plans limited educational benefits to one year. Additional benefits would have been provided based on merit criteria, state quotas, and estimates of manpower needs in various occupations. In the ensuing policy debate, the American Legion (the WWI U.S. veterans organization) submitted a more generous proposal, which extended the duration of educational benefits to four years. Such an expansion did not receive unanimous support. Congressman John E. Rankin, then chairman of the House Veterans' Affairs Committee, argued against the expanded educational benefits, as he believed they would result in millions of "overeducated and undertrained" GIs, studying with "red [sic] professors" (Skocpol (1996)). The educational benefits were eventually expanded from one to four years, as the American Legion lobbied intensely and drew public support.

## 2.2 The Vietnam War draft

Between 1964 and 1973, almost two million men were drafted in the Army for up to three years, potentially serving in the Vietnam War. Men between the ages of 19 and 25 faced the

risk of induction, although they were allowed to defer the draft for a number of reasons, most notably enrollment in a four-year college. The college deferment process was institutionalized through the Military Service Act of 1967, which stated that college students in good academic standing could defer induction until they received a bachelor's degree or until they turned 24. While still technically eligible for induction until the age of 35, college enrollment significantly reduced the chances of being drafted. Using data from the Occupational Changes in a Generation 1973 survey, Card and Lemieux (2001b) estimate that, for cohorts born 1945-1947, individuals who obtained a college degree prior to service were only one-third as likely to serve in Vietnam, compared to individuals who did not hold a college degree. The college deferral option led to a spike in college enrollment and graduation rates during the Vietnam War draft period. Several analysts have exploited this source of quasi-exogenous variation in college attainment to explore such outcomes as the effect of education on earnings (Card and Lemieux (2001b); Angrist and Chen (2011)), migration decisions (Malamud and Wozniak (2012)) or mortality (Buckles et al. (2016)).

Following Card and Lemieux (2001b), I calculate the national induction risk for each cohort of 19 year-olds as the average number of inductees for cohorts aged 19-22, divided by total cohort size at age 19. Figure 5 shows the strong association between the higher induction risk and the rise in the male college graduation rate. Cohorts exposed to higher induction risk also graduated at higher rates. The college completion rate increased by about eight percentage points over the war draft period, and subsequently decreased to pre-draft levels for cohorts which no longer faced the risk of induction. The observed association is explained by the availability of G.I. Bill educational benefits, as well as by the option to defer military service through college attendance.

## 2.3 The Post-9/11 G.I. Bill

In recent decades, returning servicemen and servicewomen continue to be eligible for educational benefits, under the Montgomery G.I. Bill (MGIB), passed in 1984. The availability

of educational benefits is conditional on opting in the program at the beginning of active duty, and participants pay 100 dollars per month for their first 12 months of duty in order to later receive a maximum of 36 months of educational benefits, if they fulfill the usual active-duty minimal contract duration of three years with an honorable discharge.[11] In October 2007, the benefits stood at 1,101 dollars per month for veterans engaged in full time institutional training.

These subsidies were considerably expanded through the passage of the Post-9/11 G.I. Bill, voted upon in 2008 and implemented starting August 2009. Veterans serving since the September 11, 2001 attacks were now eligible for benefits covering all tuition and fee payments as in-state students at public universities, or up to 17,500 dollars per academic year at private institutions. In addition, veterans who enrolled at least half time in college could receive a monthly housing allowance, a 1,000 dollar books and supplies stipend, and a one-time relocation benefit if they resided in rural areas prior to attending college. Unlike the MGIB benefits, the Post-9/11 G.I. Bill awards did not require recipients to have previously signed up for the benefit or contribute 100 dollars monthly in their first year of service. The expanded benefits could be applied to enrollment beginning August 2009. Figure 6 illustrates the timeline of the benefit eligibility and availability. Veterans serving 36 months or more were eligible for the entirety of the benefit, while shorter periods were eligible for a fraction of the total amount. Payments increased from 40 to 100 percent in 10 percent increments for every additional six months of active duty, from a minimum of 90 days to the 36 months that quaranteed the maximum benefit. In addition, veterans with 30 days of active duty who were discharged because of a service connected disability automatically qualified for the full benefit.

[11]The description of the program applies to Category I educational benefits, and draws from the Veterans Benefit Administration presentation of the program, $https://www.benefits.va.gov/gibill$. Other types of benefits are offered for individuals who serve shorter periods, enter the Selected Reserve or are involuntarily separated.

# 3 Data and empirical strategy

## 3.1 WWII

One of the provisions of the WWII G.I. Bill was that returning veterans should begin using their educational benefits by July 1951. As such, by the time of the 1960 Census, WWII servicemen who enrolled in college would have fully utilized their benefits. I proceed to use the IPUMS 1960 Census 5 percent sample, the two 1970 state 1 percent samples, and the 1980 5 percent sample (Ruggles et al. (2023)). The analysis is restricted to U.S.-born white men,[12] 1923-1932 cohorts, who would have been aged 28-37 in 1960, 38-47 in 1970 and 48-57 in 1980, respectively. This timespan allows the analysis to capture their labor market outcomes at various points in their careers.

Underemployment is measured using the indicators described in section 2. Some of the analyses conducted below use data for individuals observed in the labor market as early as 1960, but the underemployment indicators are constructed based on recent labor market circumstances and expert and employee opinions. Nevertheless, the average educational attainment in almost all occupations has increased since 1960.[13] As such, contemporary expert or employee opinions about required education in an occupation are likely to be conservative when applied to occupational educational requirements in the past. Nevertheless, to address this potential limitation, I also present results using a statistical measure of underemployment based on the educational composition of occupations observed in each of the 1960, 1970 and 1980 Census samples. I also employ measures from the fourth edition of the Dictionary of Occupational Titles (U.S. Employment Service (1977), linked to 1970 Census occupational

[12]The sample size for black men is considerably lower. Turner and Bound (2003) analyze the effect of the G.I. Bill policy for Black men, and find limited impact for individuals living in the South, with positive effects for Black veterans who could attend colleges outside the South.

[13]I compare the share of college graduates for each occupation under the 2010 Standard Occupational Classification in the 1960 Census and the 2010-2014 5-year ACS sample. The share of college graduates decreased in only seven occupations. In six of these occupations the decrease is small, occurs from very high or very low initial levels, and does not influence the underemployment classification (Educational Administrators; Chemical Engineers; Postsecondary Teachers; Other teachers and instructors; Human Resource Assistants, Except Payroll; Stationary Engineers and Boiler Operators). The one exception is the "Athletes, Coaches, Umpires and Related" category, where the decrease is larger, from 63 percent to 37 percent.

codes, which are likely to better reflect occupational requirements in earlier samples. The DOT assessed the complexity of occupations based on a General Educational Development (GED) scale, which ranked occupations on a six point scale on "reasoning development", "mathematical development" and "language development". I additionally use measures of job-specific aptitudes,[14] such as "Verbal", "Numerical" and "Intelligence" aptitudes.

The basic empirical specification follows Bound and Turner (2002) in estimating the "first stage" effect of between-cohort variation on college attainment:

$$Y_j = \alpha + \beta V_j + q_t + q_{st} + \delta_s + \epsilon_j, \tag{1}$$

where $Y_j$ represents the college graduation rate for cohort $j$, and the main independent variable $V_j$ is the share of the quarter-of-birth cohort which served in WWII. The specification also includes a time trend $q_t$, state of birth time trends $q_{st}$ and state of birth fixed effects $\delta_s$. Identification of the effect of the availability of the G.I. Bill comes from between-cohort variation in military service. Figure 4 shows the considerable variation between quarter of birth cohorts in the fraction of individuals reporting WWII service. Conscription initially targeted individuals born 1919-1924, and was later extended to cohorts born 1919-1927. Cohorts before 1919 had considerably lower rates of military service, as service was voluntary for older men. Cohorts born after 1925 also see a drop in likelihood of military service, as these younger men were inducted around the time WWII was ending. To assess the effect of between-cohort variation on the underemployment rate and skill content of jobs, I employ a reduced form specification,

$$Y_j = \alpha + \beta V_j + q_t + q_{st} + \delta_s + \epsilon_j, \tag{2}$$

where $Y_j$ stands for underemployment measured later in individuals' careers, as well as a 2SLS

[14]The Dictionary of Occupational Titles ranked occupations based on "specific capacities or abilities required of an individual in order to facilitate the learning of some task or job duty."

specification, which regresses the underemployment status indicator on college attainment $\hat{C}$, instrumented using the cohort fraction veteran. The 2SLS estimates can be interpreted as a local average treatment effect, the underemployment rate for individuals induced to attend college by the G.I.Bill subsidies.

$$Y_j = \alpha + \beta \hat{C}_j + q_t + q_{st} + \delta_s + \epsilon_j, \tag{3}$$

I also estimate a reduced form specification that additionally controls for between-cohort variation in average experience, and fraction of the cohort attending graduate school:

$$Y_j = \alpha + \beta_1 V_j + q_t + q_{st} + \delta_s + \beta_2 E_j + \beta_3 E_j^2 + \beta_4 G_j + \epsilon_j, \tag{4}$$

For each individual, experience is imputed as *age- years of schooling - 6* for non-veterans and *age- years of schooling - 9* for veterans, acknowledging that the average length of military service in WWII was 33 months,[15] approximately three years. Controlling for the fraction of the cohort that attended graduate school addresses the issue that returning servicemen might have different propensities to attend graduate school than individuals who did not serve in the Army, as they would have been older when finishing college.

Individuals who were drafted late during WWII could have also served during the Korean War (see Figure 4), although men who served in WWII were technically exempt from Korean War service. As such, the control group for WWII veterans is not solely non-veterans, but a mix of non-veterans and Korean War veterans. To complicate matters, Korean War veterans were also eligible for G.I. Bill benefits. Moreover, individuals who could have been drafted for WWII and were later drafted for the Korean War would have been older at the time when they could have benefited from the Korean War G.I. Bill. To address these issues, I exclude Korean war veterans in the main specification sample, to achieve a simple comparison of

[15] Source: Research Starters: US Military by the Numbers, National WWII Museum, https://www.nationalww2museum.org

WWII veterans and non-veterans. In robustness checks, following Bound and Turner (2002), I present results which include controls for both the cohort of birth fraction of WWII veterans and the fraction of Korean War veterans, with and without additional time trend interactions with the fraction of Korean veterans. The additional time trends are meant to capture the fact that the conscription regime for Korean recruits was different. Specifically, after 1951, deferments for college attendance were introduced.

## 3.2 Vietnam War

For Vietnam cohorts, the analysis focuses on men born 1942-1955, whom I observe at ages 25-38 in the 1980 Census, 35-48 in the 5 percent IPUMS sample of the 1990 Census, and later in their careers, at ages 45-64 in the 5 percent sample of the 2000 U.S. Census, and the American Community Survey 2001-2015 yearly samples.

I estimate the following linear probability model:

$$Y_{ic} = \beta IR_c + \lambda_{1s} + \lambda_{2b} + \delta_t + \eta_b + \gamma X_i + \epsilon_{ic}, \tag{5}$$

where $Y_{ic}$ indicates the outcome of interest for an individual $i$ in year of birth cohort $c$ (college graduation, underemployment status, or occupational skills score), $IR_c$ is the national-level induction rate for cohort $c$, $\lambda_{1s}$ a set of state of residence fixed effects, $\lambda_{2b}$ denotes state of birth fixed effects, $\delta_t$ is a birth year time trend, $\eta_b$ a set of state of birth time trends, and $X_i$ includes controls for race (Black) and ethnicity (Hispanic). This estimation strategy differs from the one employed for the WWII cohorts, as information on quarter of birth is not available in the 1990 and 2000 Census samples. Instead, the induction rate instrument measures year of birth variation in the risk of conscription.

## 3.3 Post-9/11 G.I. Bill

The Current Population Survey 1995-2020 Veterans Supplements[16] provide information on exposure to combat, service-connected disabilities, duration of active duty and year of separation from active duty, in addition to the usual demographic and labor market variables collected in the CPS. These variables are crucial for determining eligibility for the Post-9/11 G.I. Bill benefits. According to the sliding benefit scale described in section 2.3, individuals separating in 2002 could only qualify for 40 to 50 percent of total benefits, since their post-9/11 period of service was either below six months (40 percent eligibility) or between six months and a year (50 percent eligibility). Similarly, individuals separating in 2003 could potentially access a maximum benefit of 70 percent, while those separating in 2004 could receive 80, 90 or 100 percent, depending on whether they had served between 24 to 30, 30 to 36, or 36 or more months after September 11, 2001.

The CPS sample is restricted to ages 24-45, and to veterans who last served five or more years before the time they were interviewed in the CPS (allowing for a window of five or more years for college attendance and graduation). I estimate the following specification, separately for men and women:

$$Y_{it} = \alpha_0 + \beta_1 V_i + \beta_2 Post911 + \pi_V X_V + \pi_X X_i + f\left(Exper\right) + \delta_{YOB} + \lambda_t + \gamma_s + \epsilon_{it} \qquad (6)$$

where $Y_{it}$ is either an indicator for college degree attainment in year $t$ for a veteran who separated from active duty five or more years before year $t$, or an outcome of interest such as underemployment or cognitive skill intensity. The main variable of interest, $Post911$, ranges from 0 to 1, indicating eligibility for partial or full Post-9/11 Benefits. All honorably discharged servicepeople serving more than 36 months after 2001 are entitled to the maximum G.I. Benefit, with a sliding scale for shorter periods of service.[17] $V$ is an indicator for veteran

[16] These surveys were conducted every two years between 1995 and 2009 and yearly after 2009.

[17] In practice, as service durations recorded in the CPS and official cut-offs do not exactly match, I assign 0.4 eligibility for one year of post-2001 service and 0.6 benefit eligibility for two years of post-2001 service.

status, and $X_V$ a set of veteran specific covariates such as exposure to combat or the presence of a service-related disability. These controls address the fact that the Army experience of servicemembers will have fundamentally changed after the September 11 attacks, specifically through higher exposure to combat relative to previous cohorts. $X_i$ is a set of individual level covariates such as race, ethnicity, marital status and residence in a metropolitan area, and f(Exper) is a quadratic function of imputed potential labor market experience. For non-veterans, *Exper= age-years of schooling- 6*, while for veterans, *Exper=age-years of military service- years of schooling-6*. Finally, $\lambda_t$ is a set of year fixed effects and $\gamma_s$ state of residence fixed effects. As a robustness check, I also estimate specification (6) only among college graduates, including a control for graduate degree attainment.

# 4 Results

## 4.1 WWII cohorts

Table 1 reports the effects of between-cohort variation in the fraction of WWII veterans on college completion and underemployment. The fraction of the cohort serving in WWII ranges between 0 and 0.7. As such, the effect of the cohort fraction of veterans on college completion, 6.5 percentage points, implies a maximal effect of 4.55 percentage points. The magnitude of the effects on college attainment is large, considering the average college attainment rate stood at 18.1 percent for the 1922-1932 cohorts of men. The reduced form results indicate that cohorts with higher rates of military service —and hence increased availability of G.I.Bill subsidies— experienced higher rates of underemployment. The increases range between 1.2 percentage points for the joint indicator to 4.4 percentage points for the objective measure. The 2SLS results show the underemployment rate among individuals induced to attend college by the higher rate of military conscription and associated educational benefits. For the joint indicator, the 2SLS estimate indicates that 19.1 percent of college graduates induced to attend college by the WWII G.I. Bill could be classified as underemployed.

Comparing the 2SLS estimates to the average underemployment rate for the period reveals that individuals induced to attend college by the G.I. Bill experienced considerably higher rates of underemployment: 19.1 percent under the 2SLS joint indicator estimates, compared to an average 12.8 percent underemployment rate among male non-veterans in the same birth cohorts. Results are similar, but larger in magnitude, under the subjective, statistical and objective indicators: all 2SLS results indicate that WWII veterans who attended college experienced higher rates of underemployment than non-veteran college-goers. The bottom panel of Table 1 benchmarks these estimates against the average rate of underemployment among college graduates, for all individuals born in the 1922-1932 cohorts, and separately for veterans and non-veterans. The fraction veteran among men born in these cohorts stood at 48.3 percent. As such, the overall impact on the magnitude of the underemployment rate was high, as the underemployment rate among veterans using the joint indicator was 1.1 percentage points higher than that of non-veterans. Reduced form results which include additional controls for experience and graduate school attainment are smaller, but close in magnitude to the basic specification, indicating that the higher rates of underemployment experienced by veterans cannot be entirely explained by lower labor market experience (as a consequence of military service) or lower graduate school attainment (potentially resulting from lower propensity to enroll at older ages for returning veterans).

While the sample in Table 1 excludes Korean War veterans, I proceed, in Table A6, to include the quarter of birth fraction of Korean War veterans as an additional independent variable of interest. The specification in Table A7 additionally adds controls for a separate time trend for Korean war veterans, meant to capture the distinct recruitment and G.I. Bill regime for these cohorts (notably the college deferment option after 1951). Magnitudes of the effect of fraction veterans on the underemployment rate are comparable, somewhat larger than the baseline specification.

Table 3 shows the effect of the fraction of veterans on occupational skill scores, specifically verbal and numerical aptitude, intelligence and the average GED score. The implied maximal

effect (considering a 70 percent cohort draft rate) in Table 3, column 1 is a decrease of 1.65 points in the average GED percentile, indicating a higher fraction of veteran college graduates is associated with employment in occupations with lower educational requirements. The average score for the WWII sample is 78.6, with a standard deviation of 13.3. As such, the implied effect is a 0.12 standard deviation decrease. I estimate similar effects on the 'Verbal', 'Numerical' and 'Intelligence' aptitude scores. For example, the 2.9 point decrease in verbal aptitude translates, given the maximal effect size, into a 0.14 standard deviation decrease in the verbal aptitude score for the jobs held by college graduates.

## 4.2 Vietnam War cohorts

For Vietnam cohorts, results in Table 2 indicate that a ten-percentage point increase in the risk of induction (approximately the range of the induction risk variable) is associated with a 8.81 percentage point increase in college completion for men, a substantial jump relative to the baseline mean of 32.7 percent.

The reduced form estimates indicate that a higher induction rate increased the share of underemployed college graduates. A ten-percentage point increase in induction risk would increase the fraction of underemployed graduates by 2.48 percentage points under the joint indicator, relative to a baseline of 7.3 percentage points. The 2SLS estimates indicate the underemployment rate for college graduates induced to attend college by the increase in induction risk. They stand at 28.2 percent for the joint indicator, higher than the average for the 1942-1955 birth cohorts, which was 21.4 percent for nonveterans. Given the relatively high fraction of veterans, the underemployment rate in the overall population is 22.4 percent, one percentage point higher than in the non-veteran population. Reduced form estimates including additional controls for accumulated experience and graduate degree attainment are only slightly smaller in magnitude than the unrestricted estimates. Results are similar for other underemployment indicators.

The induction risk effects on occupational aptitude scores are presented in Table 3,

column 2. Vietnam War induction risk is associated with lower average GED and verbal, numerical, and intelligence occupational scores. Considering the range of the induction risk variable, a 10-percentage point increase in the risk of induction reduces the aptitude scores by 0.4-0.8 points. These effects are somewhat smaller in magnitude than the WWII effect, but occupational skill scores in general are lower for the Vietnam War sample, as college degree attainment stood at much higher rates than for WWII cohorts. As the DOT measures developed in the fourth edition (1977) may not be an accurate reflection of the skills required for Vietnam War veterans who are observed in the labor force in the analysis sample up to 2015, I also employ contemporary O*NET measures of occupational skill requirements. In Table 4, I present the effect of induction risk on the skill scores for the most common ten skills in occupations held by college graduates. The increase in induction risk resulted in an across-the-board decrease in the cognitive skill scores of occupations held by college graduates.

## 4.3 Post-9/11 cohorts

Table 5 presents the results of the analysis of the effect of Post-9/11 G.I. Bill availability on college completion and underemployment for men, and appendix Table A8 shows results for women. Eligibility for the Post-9/11 benefit is associated with a 6.5 percentage point increase in four-year college completion for men, which narrows the relatively large gap between veterans and non-veterans in college completion (which stood at 13.4 percentage points in this sample). Combat exposure and service disability have a positive, albeit weak association with college attainment. For women, eligibility for post-9/11 benefits does not appear to increase college attendance, but female veterans exposed to combat and those with a service disability exhibit higher rates of college attainment in general.

Post 9/11 benefit eligibility results in a 3.4 percentage point increase in the proportion of underemployed college graduates among men. The implied underemployment rate among post 9/11 benefit recipients is calculated as the ratio between the increase in the population

of underemployed college graduates (implied by the post 9/11 benefit coefficient) and the effect of the post 9/11 benefit on college completion. For the joint underemployment indicator, this rate stands at 56.7%, suggesting the majority of veteran recipients were underemployed. The magnitude of this effect is large, but consistent with the significant gap in the overall underemployment rate observed between 1995 and 2020: the rate of underemployment among veterans stood at 33.3 percent, compared to 24.7 percent among non-veterans. Combat exposure and service disability do not have statistically significant effects on the underemployment rate. The sample, is, however, restricted to individuals who are employed full time.[18]

Table 6 shows the effect of the Post-9/11 G.I. benefit on underemployment among male college graduates. First, a service disability considerably increases the probability of being unable to work. Among those college graduates who are employed, male veterans experience underemployment rates between 11 and 16.5 percent higher than those of male non-veteran college graduates. In turn, post-9/11 benefit recipients experience even higher underemployment rates. The effects of combat exposure and service disabilities on underemployment are not statistically significant in the sample of employed college graduates. Graduate degree holders are considerably less likely to be classified as underemployed. Attaining a graduate degree reduces the probability of underemployment by 15 to 21 percentage points, depending on the underemployment indicator. The observed increase in the underemployment rate is matched by decreases in the cognitive skill score, defined here as the average O*NET occupational score for the 10 most common skills in jobs held by college graduates. While male veterans in general hold jobs with a lower cognitive skill score, cohorts with higher availability of benefits have scores 2.7 points lower. The cognitive skill measures indicate that veterans who were exposed to combat and veterans with a service-connected disability work in occupations with lower average cognitive skill scores.

[18]The effect of service disabilities on labor market outcomes are more salient when analyzing labor force participation. In this sample, veterans with a service disability are 7.8 percentage points more likely to be classified as "Not in the Labor Force, Unable to Work."

For female veteran college graduates, evidence in Table A8 is more mixed, with statistically significant impacts of the Post-9/11 G.I. benefit only on the subjective underemployment indicator and cognitive skill scores. Given the small sample sizes for female veterans, these results should however be interpreted with caution.

## 4.4 Impact on earnings

To what extent does underemployment explain the wage penalty experienced by veteran college graduates? To answer this question, I begin by estimating a Mincerian equation, regressing the log of wages on an indicator for college attendance, veteran status, and the interaction of the two variables, controlling for state of birth fixed effects, a quadratic in potential experience, an indicator for graduate degree attainment, state of birth time trends and a linear year of birth time trend. I then estimate an additional specification that includes an indicator for underemployment status (measured using the joint indicator). I estimate these models across the three main samples, using information on yearly wage and salary income from Census records for WWII and Vietnam cohorts, and weekly earnings from the CPS sample for Post-9/11 cohorts.

Results in Table 7 indicate that while male college graduates enjoy significant wage premia, the earnings of male college graduate veterans are systematically lower than those of non-veterans. The penalty is 4.5 percent for WWII cohorts in specification (1), 6.4 percent for Vietnam college graduate veterans in specification (3), and 12.1 percent for post 9-11 cohorts in specification (5). To quantify what fraction of the college graduate veteran penalty is explained by underemployment, I include controls for underemployment status in specifications (2), (4) and (6). Comparing the magnitude of coefficients for groups of veterans across specifications, underemployment explains approximately seven percent of the WWII veteran college graduate penalty, 25 percent of the penalty for Vietnam cohorts, and 27 percent for post 9/11 veterans. For recent cohorts, specification (7) additionally controls for combat exposure and service disability indicators, which explain a further five percent of

the veteran college graduate penalty among employed veterans, as having a service disability has a statistically significant negative impact on earnings.

# 5 Discussion

The results in this paper point to sizable increases in the overall underemployment rate following army induction efforts accompanied by generous G.I. Bill subsidies. These results are driven by several potential mechanisms. First, as highlighted in the results above, the relatively lower labor market experience and the lower probability of graduate degree attainment increase the underemployment rate among veterans. For example, results in Tables 1 and 2 indicate that controlling for experience and graduate degree attainment leads to lower estimates of the effect of the cohort fraction veteran or induction rate on the cohort underemployment rate. These results are consistent with recent survey and qualitative evidence that points to veterans having a particularly high risk of underemployment as they may have difficulties translating military experience and skills into civilian jobs, being older than other recent graduates, and having pressing family responsibilities that prevent them from conducting an extended labor market search for a job matching their qualification (Barrera and Carter (2017); Boatwright and Roberts (2020); Davenport et al. (2022)).

Veterans also face unique health challenges that may impact their labor market outcomes. Results in Table 5 point to positive but statistically insignificant effects of combat exposure and service disabilities on underemployment, but statistically significant negative effects on cognitive skills scores. War-related posttraumatic stress disorder (PTSD) has been linked to poor employment outcomes for veterans. For example, Smith et al. (2005) find that more severe PTSD symptoms were associated with not working or working part-time, and, among employees, with having a sales or clerical position, outcomes which would likely correspond to underemployment for veteran college graduates. The measures used in this paper (from the CPS Veterans Supplement) quantify the presence, but not the severity, of a diagnosed

service-related disability, and as such may not capture the full effect of combat exposure and PTSD on underemployment.

Veterans benefitting from G.I. Bill subsidies may also have lower academic preparedness than traditional students. Table A9 shows that the average SAT score of veteran students in recent cohorts has been trailing behind that of non-veterans. Veterans are also more likely to be first generation college-goers. In the 2012 National Postsecondary Student Aid Study, 55 percent of veteran students had a parent with some college education, compared to 68.58 percent of non-veterans. One channel through which lower academic preparedness and first-generation college-going status may translate into higher rates of underemployment is the choice of college major.[19] As shown in section 1, the underemployment rate is systematically different between fields of study. As such, one reason for the higher underemployment rate of veteran college graduates may be their choice of major. In Table 8, I explore this hypothesis, regressing the joint underemployment measure on an indicator for veteran status, controlling for year of birth, state of residence, race, ethnicity, and graduate attainment. A second specification adds field of study controls from the American Community Survey 2009-2019 samples. I perform this exercise for all male veterans, and separately for Vietnam War and Post-9/11 veterans. Comparing the coefficient on veteran status across all samples and between specifications, I find that field of study controls explain about 19 percent of the veteran higher rate of underemployment for all male veterans, 6 percent for Vietnam War veterans and about 11 percent for post-9/11 male and female veterans.

Over-sized graduating cohorts are another potential channel driving the higher rate of underemployment for G.I. Bill beneficiaries. There is a body of evidence showing that cohort sizes at the time of graduation impact labor market outcomes (for example, Katz and Murphy (1992) and Card and Lemieux (2001b)). Cohorts whose educational trajectory had been curtailed by WWII graduated at the same time as regular college-age cohorts, fueling the competition for jobs in the skilled sector. At the same time, the generous tuition

[19]Students with lower academic preparedness or who do not benefit from parental role models or advice may choose majors with poor job market prospects.

subsidies opened a path to college education for individuals from lower socio-economic backgrounds, fueling the overall number of students. For Vietnam War cohorts, the possibility of deferring military service induced many individuals who would have not attended college to do so (Card and Lemieux (2001b)). Figures 3 and 5 show stark differences in the college graduate/population ratio at age 23 during and after the Vietnam War. While I am not able to disentangle the cohort size impact separately from selection effects arising from the changing composition of college-goers, I illustrate the association between cohort sizes at time of graduation and underemployment outcomes in Table A10. Using data from the 1968-1989 Annual Social and Economic Supplement (ASEC) of the CPS, I am able to observe the impact of graduating cohort sizes on the underemployment outcomes of young workers. I estimate equation (7), regressing an indicator for underemployment $Y_i$ on the fraction of the population holding a bachelor's degree at age 23 ($CS$), controlling for a quadratic time trend ($q_t, q_t^2$), state of residence fixed effects $\delta_s$ and controls $X_i$ for race and metropolitan area status. I estimate equation (7) separately for men and women, using either the overall age 23 college graduate/population ratio or the gender-specific college graduate/population ratio.

$$Y_i = \alpha + \beta CS + q_t + q_t^2 + \delta_s + X_i + \epsilon_i \tag{7}$$

I also estimate models for all college graduates, including additional interactions of the graduating cohort size with gender ($F$), as well as an additional interaction of the time trend by gender ($q_t \times F, q_t^2 \times F$).

$$Y_i = \alpha + \beta_1 CS + \beta_2 CS \times F + \beta_3 F + q_t + q_t \times F + q_t^2 + q_t^2 \times F + \delta_s + X_i + \epsilon_i \tag{8}$$

Results in Table A10 point to statistically significant effects of the college graduation rate at age 23 on the underemployment rate of young college graduates, particularly those aged 22-24. Effects for men are much smaller and weakly statistically significant for ages 25-28, and not statistically significant for college graduates observed employed at other ages. These

results suggest that the swelling graduating cohort sizes at the time of the Vietnam War draft impacted the underemployment rate for young workers, who faced increased competition for entry-level jobs after college. While panel data on occupations, education and employment is scarcer in the late 1940s/early 1950s, veterans and regular college-goers graduating after WWII also experienced unusually large graduating cohort sizes. The fraction of bachelor's degree holders out of the total population was 8.1 percent in 1939, but reached 18.2 percent in 1940, largely driven by increases in the male college graduate rate, which almost tripled (National Center for Education Statistics (ED) (1993)).

The risk of underemployment may also be higher for veterans whose college experience was affected by overcrowding and low instructional quality. As discussed in section 2, the early days of the G.I. Bill program saw an influx of graduates which put pressure on the resources of existing colleges, and led to the opening of many opportunistic educational institutions in search of federal money. To give just an example of the impact of the WWII G.I. Bill on campuses, enrollment at Syracuse University was 5,716 in 1945 but reached 19,698 in 1948.[20] More recently, the instructional quality of institutions attended by Post-9/11 G.I. Bill beneficiaries has come into question. Kofoed (2020) estimates that about one third of Post-9/11 GI Bill veteran recipients used their benefits at a for-profit college but veterans at for-profit colleges were 9 percentage points less likely to graduate than similar veterans who attended public colleges. The U.S. Senate Health, Education, Labor, and Pensions Committee (2012) investigation into the practices of for-profit colleges found systematic attempts at several for-profit colleges to manipulate data referring to whether graduates were finding employment in their field of study. Other authors (Deming et al. (2012), Hoxby (2017)) have pointed out the lower returns to schooling experienced by for-profit students relative to similar students at public or nonprofit institutions. The pricing policies of institutions actively recruiting veteran recipients of G.I. Bill subsidies have also been called into question (Baird et al. (2022)).

[20] Syracuse University, GI Bill Transforms Syracuse's Veterans Enrollment https://www.syracuse.edu/stories/gi-bill-transforms-veteran-enrollment/.

# 6 Summary and Conclusion

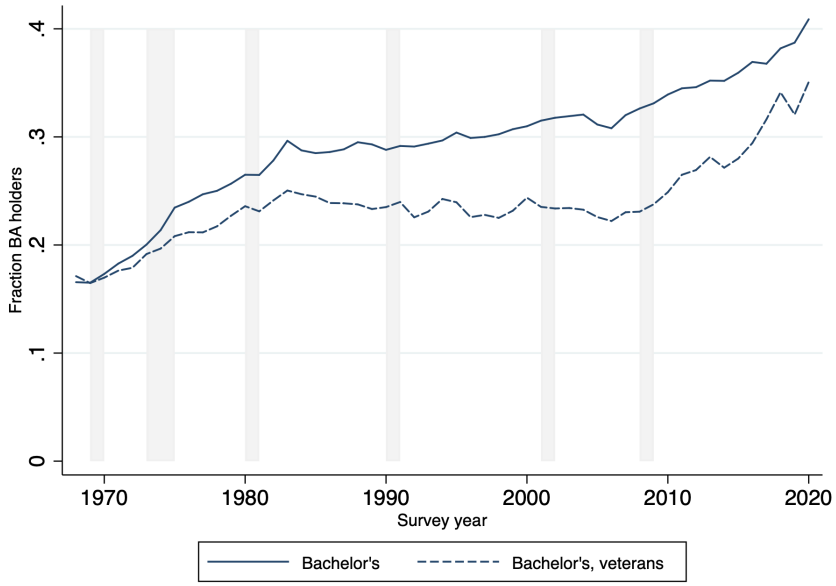
The U.S. military involvement in WWII, Vietnam, Afghanistan and Iraq wars led to a significant increase in the number of college graduates, as returning servicemen were awarded generous educational benefits. For Vietnam War cohorts, the option to defer military service by enrolling in college further encouraged individuals who may not have attended or completed college to do so. The rate of underemployment for cohorts exposed to conscription was higher than that of peacetime cohorts throughout their careers. College graduates in cohorts more likely to benefit from the G.I. Bill also worked in occupations with lower average cognitive skill requirements. The magnitude of increases in the underemployment rate brought by these conscription events (2.3-4.4 percent) is comparable to the effect of recessionary spells. Underemployment also explains a sizeable share of the earnings penalty experienced by college educated veterans, over and above lost labor market experience, lower graduate school completion and combat exposure.

On a more positive note, the G.I. Bill has had a powerful impact on American society, opening a path to college to many first-generation college-goers. The support afforded to returning veterans also extends to many other housing, health, unemployment, and vocational training programs. Beyond the relative increase in occupational mismatch analyzed in this paper, the G.I. Bill college experience is likely to have led to many positive externalities for veteran recipients, for example lower rates of mortality (Buckles et al. (2016)).

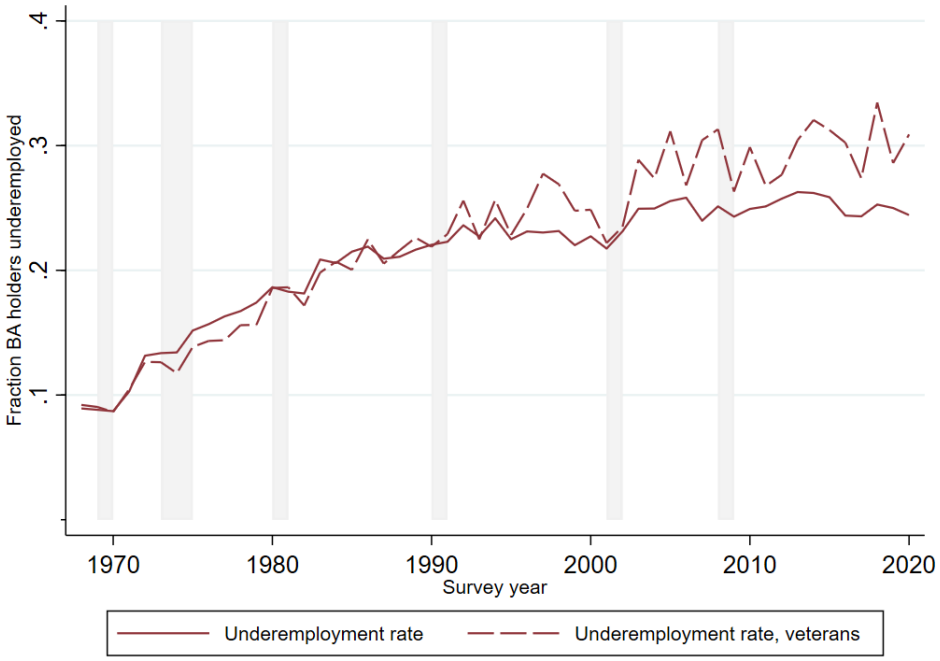
Veteran underemployment however remains a pressing policy concern, and this paper discusses several mechanisms, some of which are policy-actionable. As veterans are older when graduating from college, they have a lower likelihood of attending graduate school than non-veteran college graduates. Veterans with service disabilities face additional health challenges in finding employment matching their qualifications. WWII and Vietnam veterans were part of large graduating cohorts, and the size of the graduating cohort is likely to impact the chances of finding jobs matching educational qualifications. Veterans may also have lower academic preparedness for college and they choose college majors which are more

likely to be associated with underemployment. Finally, the instructional quality at for-profit institutions that actively target veteran students has been called into question, creating scope for university "gainful employment" accountability policies linking access to federal funds to graduates' labor market outcomes. Further research and data collection efforts could uncover the joint effects and the interactions between these channels, as well as the effectiveness of policies aiming to reduce underemployment.

Figure 1: College Completion and Underemployment



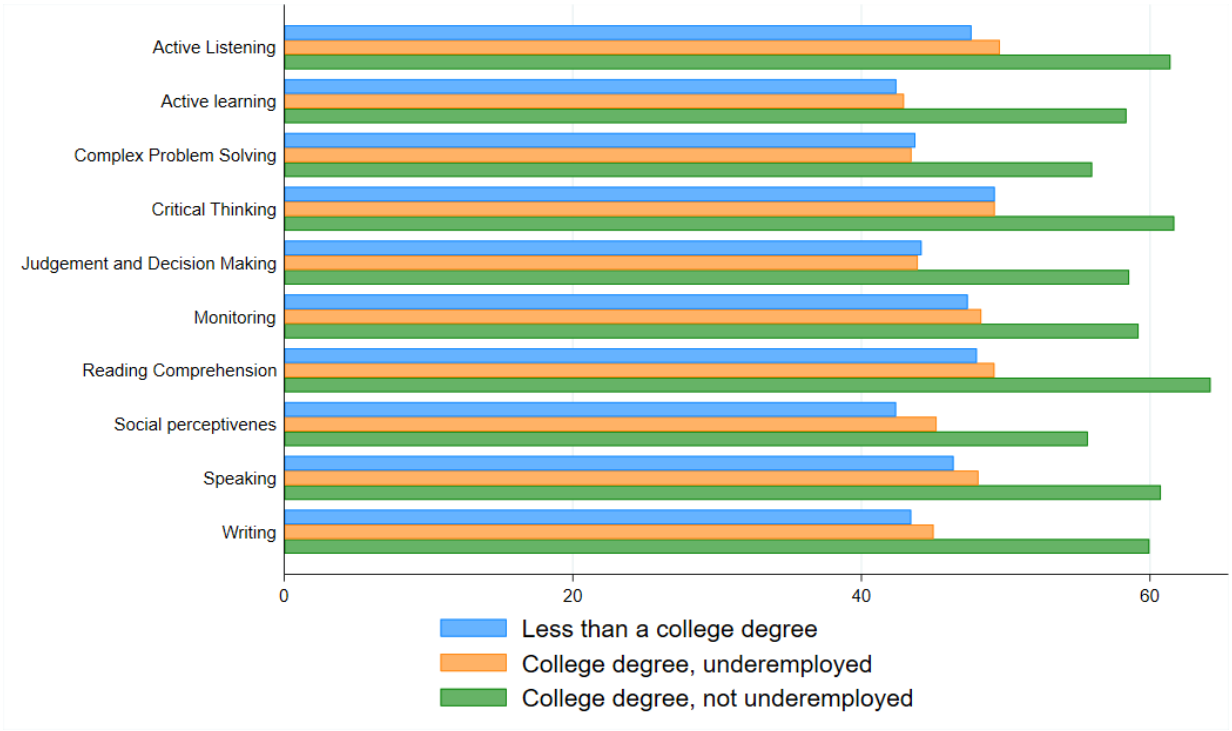

A. Fraction of employees holding a BA degree




B. Fraction of BA holding employees classified as underemployed

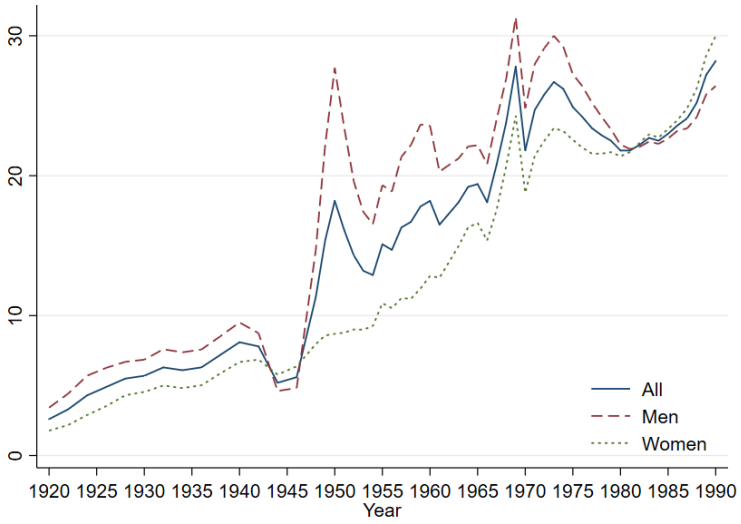
*Notes:* [IPUMS CPS ASEC supplement, 1969-2020] Figures plot the percentage of employed 24-54 year olds who hold a four-year college degree, and the percentage of college graduates who are classified as underemployed under the joint indicator defined in section 1. NBER-defined recessionary periods are highlighted in grey.

Figure 2: Occupational Skill Requirements and Underemployment Status



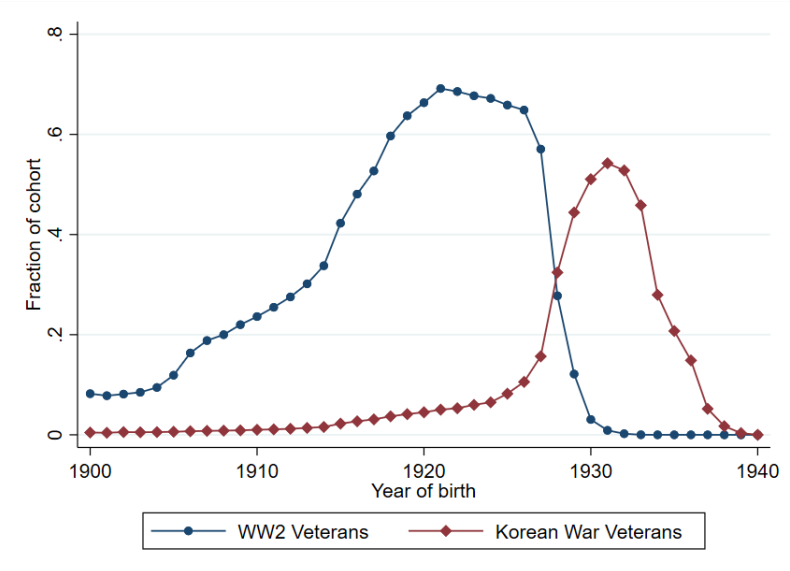

*Notes:* [U.S. Census and ACS surveys, 1980-2015] Figure plots the average O*NET skill score for the top 10 skills required in jobs held by college graduates (as identified in Appendix Table A5). Underemployment is defined using the joint indicator defined in section 1.

Figure 3: Percentage of 23-year-olds Holding a Bachelor's Degree: 1920 to 1990



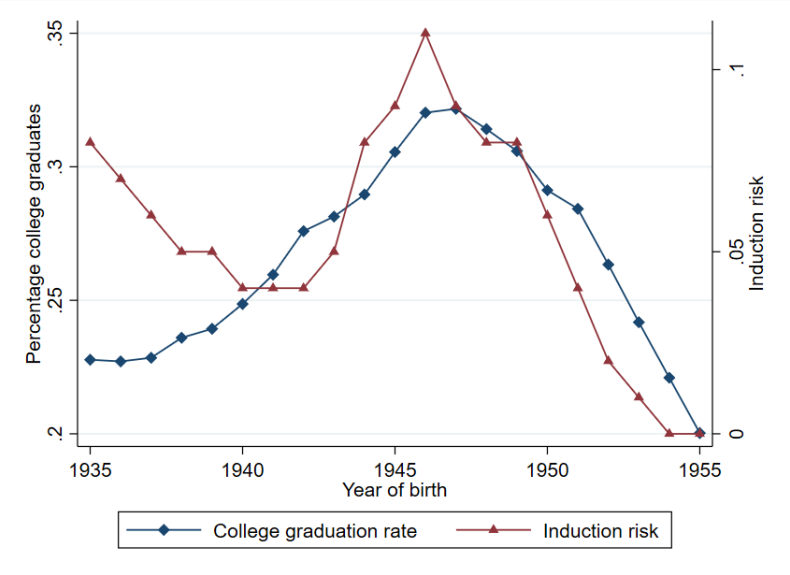

*Notes:* [National Center for Education Statistics (ED) (1993),Table 28.—Degrees conferred by institutions of higher education, by sex and level] Values until 1960 also include first professional degrees.

Figure 4: Fraction Serving in WWII and the Korean War, by Year of Birth




*Notes:* [IPUMS 1960 5 percent sample, 1970 1 percent samples, 1980 5 percent sample] The figure plots the fraction of men who report being a WWII veteran or a Korean War veteran. As some men served in both WWII and Korea, there is some overlap of the two plots.

Figure 5: Vietnam War Induction Risk and College Graduation




*Notes:* Following Card and Lemieux (2001b), the induction rate is calculated as the average number of inductees for cohorts aged 19-22, divided by total cohort size at age 19. Induction risk data kindly provided by Abigail Wozniak.

Figure 6: Post-9/11 G.I. Bill Eligibility

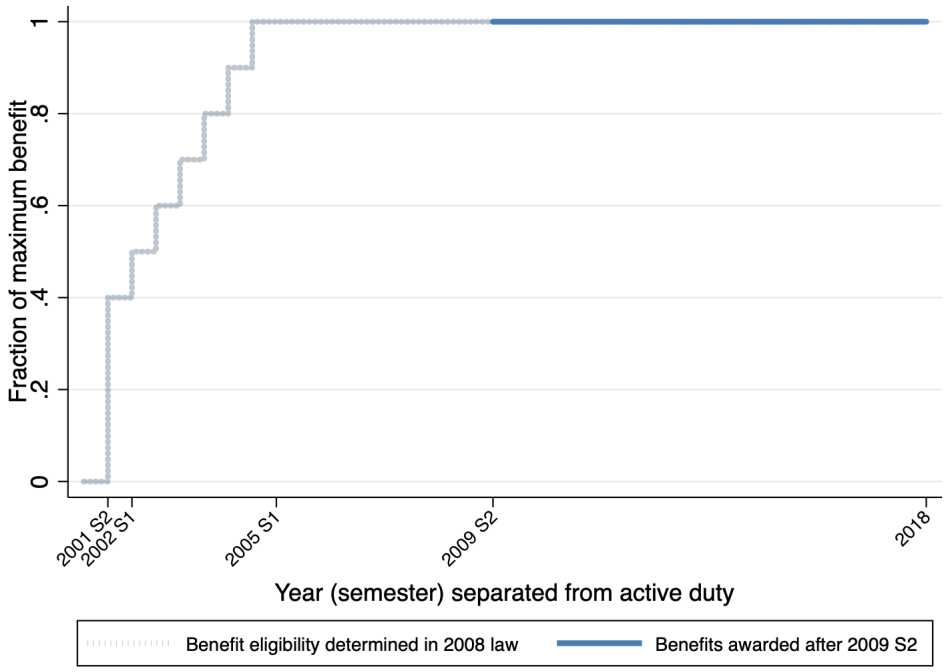
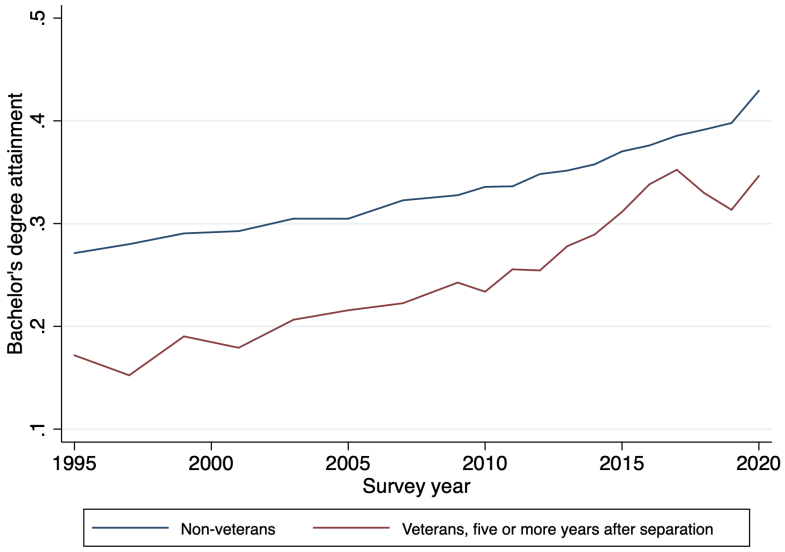
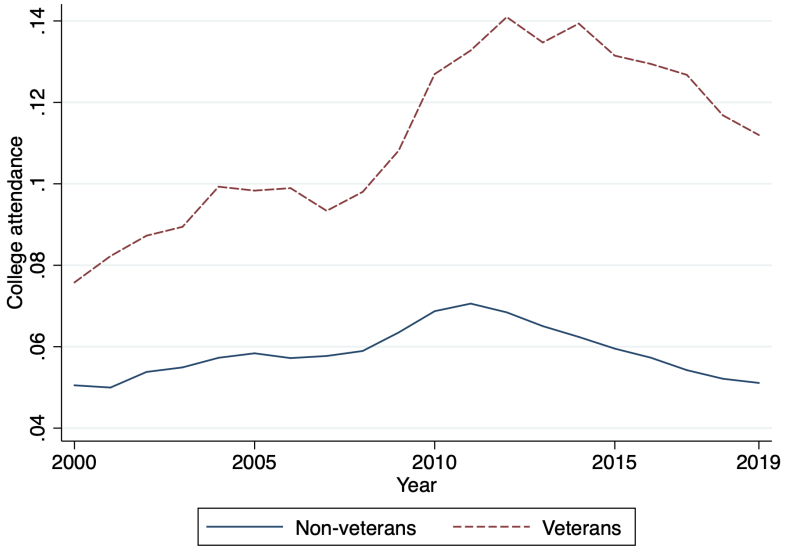


Figure 7: College Attendance and Bachelor's Degree Completion, Ages 24-45




(A) College graduation rate, ages 24-45




(B) College attendance, ages 24-45

*Notes:* College graduation data from Current Population Survey Veterans Supplement 1995-2018. College attendance data from the American Community Survey 2000-2017 IPUMS yearly samples. The veteran sample is restricted to individuals who last served five of more years before being surveyed in the CPS Veterans supplement.

Table 1: Effects of WWII Conscription on College Graduation and Underemployment

| | College graduate | College graduate and underemployed *by type of underemployment indicator:* | | | | |
|---|---|---|---|---|---|---|
| | | Joint | Subjective | Objective | Statistical contemporary | Statistical historical[a] |
| First stage | 0.065*** | | | | | |
| | (0.018) | | | | | |
| Reduced form | | 0.012*** | 0.020*** | 0.044*** | 0.014*** | 0.033*** |
| | | (0.003) | (0.003) | (0.006) | (0.003) | ( .005) |
| 2SLS | | 0.191*** | 0.314*** | 0.683*** | 0.219*** | 0.516*** |
| | | (0.035) | (0.057) | (0.103) | (0.044) | (0.077) |
| Reduced form, addl. controls | | 0.010*** | 0.016*** | 0.037*** | 0.011*** | 0.021*** |
| | | (0.002) | (0.003) | (0.004) | (0.003) | (0.004) |
| Dep. var. mean | 0.181 | 0.024 | 0.036 | 0.079 | 0.029 | 0.054 |
| 1923-1932 cohorts, underemployment among college graduates: | | | | | | |
| All | | 0.132 | 0.197 | 0.425 | 0.159 | 0.324 |
| Veterans | | 0.139 | 0.208 | 0.447 | 0.166 | 0.333 |
| Nonveterans | | 0.128 | 0.192 | 0.414 | 0.156 | 0.319 |

*Notes:* 1960-1980 U.S. Census files, White men, born in the U.S. between 1923 and 1932. N=729,401.[a] The statistical historical indicator uses the educational composition within occupations at the time of the Census, while the contemporary one is based on data between 2000 and 2014. Standard errors clustered at the quarter of birth level ($n_c$=40). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 2: Effects of Vietnam War Conscription Risk on College Graduation and Underemployment

| | College graduate | College graduate and underemployed *by type of underemployment indicator:* | | | |
|---|---|---|---|---|---|
| | | Joint | Subjective | Objective | Statistical |
| Dep. var. mean | 0.327 | 0.073 | 0.094 | 0.148 | 0.081 |
| First stage | 0.881*** | | | | |
| | (0.116) | | | | |
| Reduced form | | 0.248*** | 0.321*** | 0.402*** | 0.277*** |
| | | (0.022) | (0.019) | (0.048) | (0.024) |
| 2SLS | | 0.282*** | 0.364*** | 0.456*** | 0.314*** |
| | | 0.027 | 0.028 | 0.021 | 0.032 |
| Reduced form, additional controls | | 0.241*** | 0.321*** | 0.365*** | 0.268*** |
| | | (0.022) | (0.019) | (0.042) | (0.025) |
| 1942-1955 cohorts, underemployment among college graduates: | | | | | |
| All | | 0.224 | 0.289 | 0.454 | 0.247 |
| Veterans | | 0.254 | 0.327 | 0.480 | 0.276 |
| Nonveterans | | 0.214 | 0.279 | 0.438 | 0.239 |

*Notes:* 1980-2000 IPUMS Census samples and 2001-2015 ACS yearly supplements., U.S.-born employed men. N=4,254,441. Standard errors clustered at the state of birth-cohort level. Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 3: Effect of WWII Cohort Conscription Rate and Vietnam War Induction Risk on Occupational Skill Scores

| | Effect of fraction WWII veterans (1) | Effect of Vietnam induction risk (2) |
|---|---|---|
| *Outcomes:* | | |
| Average GED score [0-100 scale] | -2.356** | -4.336*** |
| | (.859) | (0.989) |
| Verbal aptitude [0-100 scale] | -2.917*** | -5.275*** |
| | (.941) | (1.337) |
| Numerical aptitude [0-100 scale] | -2.784* | -6.108*** |
| | (1.462) | (1.523) |
| Intelligence [0-100 scale] | -4.280*** | -8.270*** |
| | (1.424) | (1.703) |
| Mean (s.d.), college graduates | | |
| | WWII sample | Vietnam sample |
| Average GED score | 78.59 (13.35) | 66.32 (12.37) |
| Verbal aptitude | 74.01 (14.38) | 71.24 (17.11) |
| Numerical aptitude | 61.64 (17.98) | 60.59 (18.25) |
| Intelligence | 66.97 (19.54) | 64.88 (21.44) |

*Notes:* Each coefficient comes from a separate regression. The table reports the mean and standard deviation of the occupational skill measures among college educated men in 1922-1932 cohorts (WWII sample) and 1942-1955 cohorts (Vietnam sample). Specification (1) follows equation (4) in the text, and specification (2) implements equation (5) with additional controls for experience and graduate school attendance. Data, sample restrictions and clustering levels are the same as in Table 1 for specification (1) and Table 2 for specification (2). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 4: Effect of Vietnam War Induction Risk on the Skills Content of Jobs Held by College Graduates

| Skill category | Effect of Induction Risk *coef.* *(s.e.)* | |
|---|---|---|
| Average of top 10 college graduate skills[a] | -3.175*** | (0.562) |
| Active Learning | -4.315*** | (0.685) |
| Active Listening | -1.705*** | (0.541) |
| Monitoring | -2.348*** | (0.584) |
| Complex Problem Solving | -4.021*** | (0.683) |
| Critical Thinking | -3.079*** | (1.523) |
| Judgement and Decision Making | -2.958*** | (0.715) |
| Reading comprehension | -5.461*** | (0.713) |
| Social perceptiveness | -1.232* | (0.655) |
| Speaking | -2.712*** | (0.564) |
| Writing | -3.921*** | (0.675) |

*Notes: a.* The top 10 most common O*NET Database 20.0 skills among college graduates are indicated in Table A2. Each row presents results from a separate regression. The sample includes 1,227,565 observations from the 1980, 1990 and 2000 IPUMS samples, as well as 2000-2015 American Community Survey samples, restricted to men who are employed, not enrolled, hold a college degree and are born between 1942 and 1955. Regressions include a quadratic control for experience, controls for graduate studies, state of residence year fixed effects, state of birth fixed effects, a year of birth trend, controls for race and ethnicity, and state-of-birth time trends. Observations are weighted using ACS person weights. Standard errors in parantheses are clustered at the state of birth-cohort level. Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 5: Effect of the Post 9/11 G.I. Bill on College Degree Attainment and Underemployment

| | College graduate | College graduate and underemployed *by type of underemployment indicator:* | | | |
|---|---|---|---|---|---|
| | | Joint | Subjective | Objective | Statistical |
| Dep. var. mean | 0.345 | 0.087 | 0.112 | 0.111 | 0.096 |
| Post 9/11 Benefit | 0.065*** | 0.034** | 0.042*** | 0.052*** | 0.031** |
| | (0.019) | (0.011) | (0.012) | (0.015) | (0.012) |
| Veteran | -0.132*** | -0.009** | -0.018*** | -0.039*** | -0.013*** |
| | (0.005) | (0.003) | (0.003) | (0.004) | (0.003) |
| Combat exposure | 0.014 | 0.001 | 0.000 | 0.009 | 0.002 |
| | (0.009) | (0.006) | (0.006) | (0.009) | (0.006) |
| Service disability | 0.016 | 0.014 | 0.001 | 0.005 | 0.015* |
| | (0.013) | (0.008) | (0.007) | (0.011) | (0.008) |
| Implied underempl. rate | | 0.567 | 0.644 | 0.779 | 0.533 |
| 1995-2020 comparison group underemployment rate: | | | | | |
| All | | 0.253 | 0.326 | 0.489 | 0.275 |
| Veterans | | 0.333 | 0.401 | 0.573 | 0.352 |
| Nonveterans | | 0.247 | 0.321 | 0.484 | 0.270 |

*Notes:* Current Population Survey Veteran Supplement 1995-2020, restricted to men aged 24-45. n=226,551. Veterans are included in the sample if they are observed five or more years after separation. In regressions where the dependent variable is an underemployment indicator, the sample is restricted to employed individuals. Observations are weighted using Veteran Supplement weights. Standard errors are clustered at the year of birth level ($n_c$=45). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 6: Effect of the Post 9/11 G.I. Bill on Underemployment among Graduates

| | Unable | Underemployment | | | | Cognitive |
|---|---|---|---|---|---|---|
| | to work | Joint | Subjective | Objective | Statistical | skill score[a] |
| Veteran | 0.003 | 0.117*** | 0.125*** | 0.165*** | 0.116*** | -4.622*** |
| | (0.004) | (0.014) | (0.015) | (0.016) | (0.014) | (0.433) |
| Post-9/11 | -0.001 | 0.065** | 0.090** | 0.103** | 0.061* | -2.742*** |
| benefit | (0.011) | (0.030) | (0.023) | (0.033) | (0.033) | (0.990) |
| Combat | 0.002 | 0.001 | 0.001 | 0.037 | 0.009 | -1.336*** |
| exposure | (0.008) | (0.025) | (0.019) | (0.022) | (0.019) | (0.597) |
| Service | 0.081*** | 0.030 | -0.014 | 0.007 | 0.036 | -2.282** |
| disability | (0.014) | (0.027) | (0.028) | (0.029) | (0.027) | (0.725) |
| Graduate | -0.000 | -0.159*** | -0.192*** | -0.215*** | -0.171*** | 4.169*** |
| degree | (0.003) | (0.008) | (0.007) | (0.008) | (0.007) | (0.306) |
| Dep.var mean | 0.007 | 0.253 | 0.325 | 0.483 | 0.278 | 58.33 |
| N | 89,596 | 78,074 | 78,074 | 78,074 | 78,074 | 76,349 |

*Notes:* Current Population Survey Veteran Supplement 1995-2018, restricted to U.S. men aged 24-45, employed full time. N=78,074. Veterans are included in the sample if they are observed five or more years after separation. In regressions where the dependent variable is an underemployment indicator, the sample is restricted to employed individuals, who usually work 30 or more hours per week. Observations are weighted using Veteran Supplement weights. Standard errors are clustered at the year of birth level ($n_c$=45). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 7: The Effect of Underemployment on Earnings

| | WWII | | Vietnam War | | Post 9/11 | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| College graduate | 0.539*** | 0.578*** | 0.384*** | 0.533*** | 0.277*** | 0.379*** | 0.366*** |
| | (0.005) | (0.005) | (0.004) | (0.004) | (0.011) | (0.013) | (0.013) |
| Veteran | 0.082*** | 0.083*** | 0.000 | 0.001 | -0.067*** | -0.064*** | -0.048** |
| | (0.004) | (0.004) | (0.003) | (0.003) | (0.018) | (0.017) | (0.017) |
| Veteran College graduate | -0.045*** | -0.042*** | -0.064*** | -0.048*** | -0.121*** | -0.088** | -0.082** |
| | (0.005) | (0.005) | (0.004) | (0.004) | (0.029) | (0.028) | (0.027) |
| College Graduate and Underemployed | | -0.220*** | | -0.488*** | | -0.311*** | -0.311*** |
| | | (0.008) | | (0.004) | | (0.016) | (0.016) |
| Exposed to combat | | | | | | | -0.056 |
| | | | | | | | (0.032) |
| Service disability | | | | | | | -0.126** |
| | | | | | | | (0.039) |
| N (number of obs) | 637,758 | 637,758 | 3,643,683 | 3,643,683 | 51,626 | 51,626 | 51,626 |

*Notes:* The baseline specifications (1), (3) and (5) regress the log of wages on an indicator for college attendance, veteran status, and the interaction of the two variables, controlling for state of birth fixed effects, a quadratic in potential experience, an indicator for graduate degree attainment, state of birth time trends and a linear national year of birth time trend. The additional specifications include and indicator for underemployment status. Specifications are estimated using the same sample restrictions and levels of clustering as used for the specifications in Tables 1, 2 and 5. Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table 8: Veteran Underemployment and Field of Study

| | (1) Basic controls | (2) Including controls for field of study | N |
|---|---|---|---|
| 1. All male veterans | 0.044*** | 0.036*** | 2,198,860 |
| | (0.002) | (0.001) | |
| 2. Vietnam War male veterans, 1942-1955 birth cohorts | 0.032*** | 0.030*** | 425,674 |
| | (0.002) | (0.002) | |
| 3. All Post 9/11 male veterans | 0.155*** | 0.138*** | 1,020,098 |
| | (0.004) | (0.004) | |
| 4. Post 9/11 veterans, by gender | | | 2,201,787 |
| Post 9/11 veterans | 0.158*** | 0.143*** | |
| | (0.004) | (0.004) | |
| Post 9/11 female veterans | -0.053*** | -0.049*** | |
| | (0.006) | (0.006) | |
| Female | -0.016*** | -0.009*** | |
| | (0.001) | (0.001) | |

*Notes:* 2009-2019 American Community Survey. Each of the coefficients in rows 1-3 comes from a different regression. Row 4 breaks down the effects reported in specification 3 by gender. Specifications regress the joint underemployment measure on an indicator for veteran status, controlling for age, race, ethnicity, state of residence and survey year fixed effects, indicators for graduate school attainment, and, in specification 2, detailed controls for field of study (184 fields). Standard errors in parentheses clustered at the year of birth level ($n_c$=82). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01

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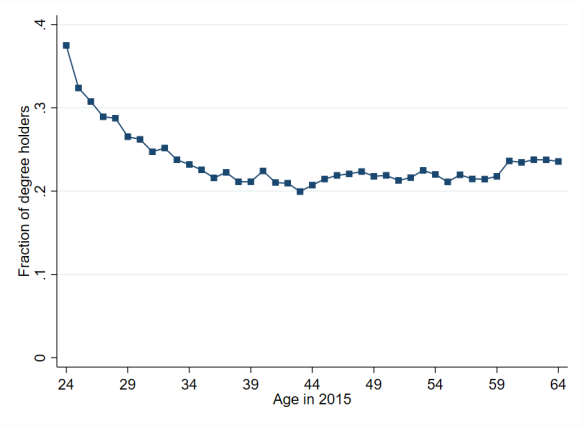
# Appendix

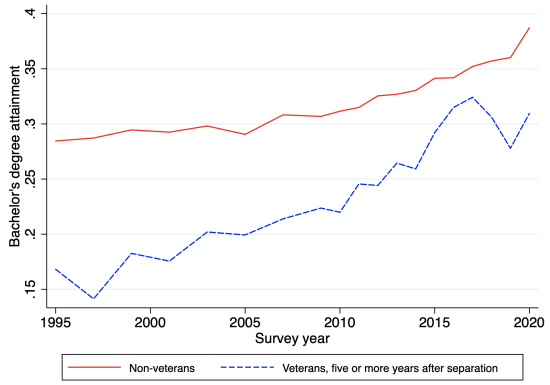
## A Additional tables and figures

Figure A1: Fraction of College Degree Holders Classified as Underemployed, by Age

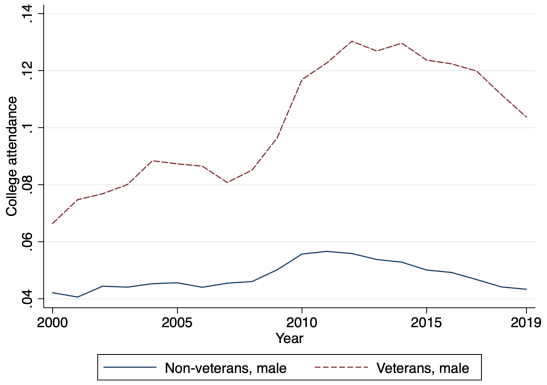



*Notes:* [American Community Survey, 2009-2014] Figure plots the fraction of 24-64 year olds who hold at least a college degree and are classified as underemployed under the joint indicator.

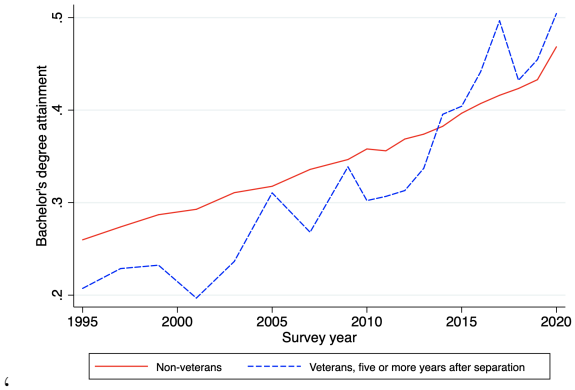
Figure A2: Four-year College Attendance and Bachelor's Degree Completion, Ages 24-45



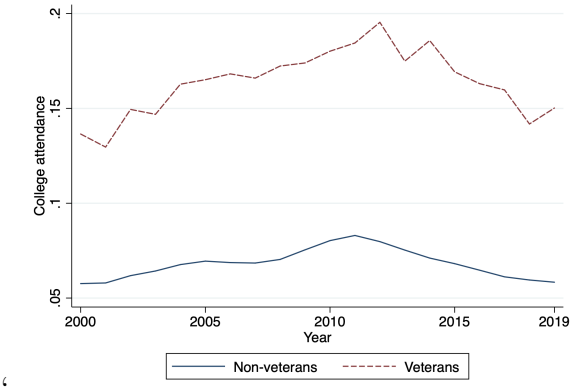

(A) College completion, men aged 24-45




(B) College attendance, men aged 24-45




(C) College completion, women aged 24-45




(D) College attendance, women aged 24-45

*Notes:* [Current Population Survey Veterans Supplement 1995-2018] The veteran sample is restricted to individuals who last served five of more years before being surveyed in the CPS Veterans supplement.

Table A1: Summary Measures for Underemployment Indicators

| | Statistical | Objective | Subjective |
|---|---|---|---|
| Percent of college degree holders | 24.58 | 43.20 | 30.29 |
| *Correlation matrix:* | | | |
| Statistical | 1 | | |
| Objective | 0.6070 | 1 | |
| Subjective | 0.7959 | 0.6427 | 1 |

*Notes:* 2000 U.S. Census and 2001-2014 American Community Survey. Sample includes individuals aged 24-64, employed (not in the military) and not enrolled in school, who have a bachelor's or graduate degree. Observations are weighted using person weights.

Table A2: Average Earnings by Educational Attainment and Underemployment Status

| Educational attainment | Yearly earned income |
|---|---|
| Graduate degree | 98,332 |
| Bachelor's, not underemployed | 79,715 |
| Bachelor's, underemployed | 50,019 |
| Associate's degree | 47,155 |
| Some college | 44,703 |
| HS diploma | 38,583 |

*Source:* 2015 American Community Survey. *Notes:* Sample includes individuals aged 24-64, employed and not enrolled in school. Underemployment defined using the joint indicator.

Table A3: Underemployment Status by College Major

| College Major | Fraction of all bachelor's | *Percent underemployed, by type of indicator:* Statistical | Objective | Subjective | Joint |
|---|---|---|---|---|---|
| Liberal arts | 25.15 | 37.90 | 61.23 | 46.07 | 36.73 |
| Social sciences | 17.97 | 36.06 | 60.12 | 42.86 | 35.10 |
| Business | 21.36 | 36.08 | 54.27 | 42.83 | 33.36 |
| STEM | 19.84 | 25.40 | 41.36 | 28.00 | 23.56 |
| Health | 6.04 | 16.55 | 26.69 | 20.48 | 16.24 |
| Education | 9.64 | 16.46 | 27.61 | 18.52 | 16.14 |
| Total | 100 | 31.50 | 50.49 | 37.21 | 30.02 |

*Notes:* 2009-2014 American Community Survey. Sample includes 297,994 bachelor's degree holders aged 24-30, employed (not in the military) and not enrolled in school. Observations are weighted using person weights.

Table A4: Differences in Job Satisfaction and Amenities by Underemployment Status

| Outcome of interest | Job requires bachelors expertise | Does not require bachelor expertise |
|---|---|---|
| Dissatisfied with salary | .101 | .282 |
| Dissatisfied with intellectual challenge | .059 | .302 |
| Attended professional conferences or meetings in past 12 months | .527 | .292 |
| Age | 43.69 | 44.08 |
| Years since received first BA | 19.61 | 19.32 |
| Female | .439 | .490 |
| Average salary | 77,258 | 49,428 |
| Received training in past 12 months | .676 | .489 |
| Number of observations | 108,634 | 22,629 |
| Percentage of responders | 82.76 | 17.23 |

*Notes:* Data from the National Survey of College Graduates. Sample includes individuals surveyed in the 2003 and 2013 waves of the NSCG, who have attained a bachelor's degree, are U.S. citizens, born in the U.S., and currently working. Observations are weighted using survey weights. The indicator for underemployment is constructed using respondents' assessment of whether their job required technical expertise at the bachelor's level or higher. Specifically, respondents were asked the following question: "Did your duties on this job require technical expertise of a bachelor's degree in engineering, computer science, math, or the natural sciences?" The same question was asked replacing the field of expertise: "technical expertise of a bachelor's degree in the social sciences?" and "in some other field [e.g., health, business or education]?". I classify bachelor's degree holders as underemployed if they answered that bachelor's level technical expertise was not required (regardless of the field) to perform their duties on the job.

Table A5: O*NET Occupational Skill Scores, by College Degree Attainment

| O*NET Skill Category | Non-degree holders | College degree holders |
|---|---|---|
| Reading Comprehension | 48.00 | 60.86 |
| Critical Thinking | 49.24 | 59.07 |
| Active Listening | 47.63 | 58.79 |
| Speaking | 46.39 | 57.93 |
| Monitoring | 47.37 | 56.78 |
| Writing | 43.45 | 56.62 |
| Judgement and Decision Making | 44.17 | 55.29 |
| Active Learning | 42.42 | 54.93 |
| Social Perceptiveness | 42.40 | 53.36 |
| Complex Problem Solving | 43.74 | 53.20 |
| Coordination | 46.76 | 53.06 |
| Persuasion | 40.94 | 51.74 |
| Time Management | 43.96 | 51.36 |
| Instructing | 40.41 | 50.60 |
| Learning Strategies | 38.30 | 49.43 |
| Systems Evaluation | 36.21 | 49.43 |
| Negotiation | 38.80 | 49.22 |
| Service Orientation | 40.97 | 48.67 |
| Systems Analysis | 36.57 | 48.18 |
| Managing Personnel Resources | 38.62 | 47.71 |
| Mathematics | 36.59 | 46.06 |
| Operations Analysis | 27.43 | 41.08 |
| Managing Financial Resources | 24.62 | 35.51 |
| Managing Material Resources | 26.82 | 34.32 |
| Quality Control Analysis | 38.02 | 33.05 |
| Operation Monitoring | 39.52 | 32.39 |
| Operation and Control | 35.88 | 24.70 |
| Troubleshooting | 31.40 | 20.70 |
| Technology Design | 15.83 | 19.83 |
| Programming | 10.36 | 19.01 |
| Equipment Selection | 22.80 | 13.74 |
| Equipment Maintenance | 25.57 | 9.90 |
| Repairing | 24.81 | 9.37 |
| Installation | 11.11 | 4.49 |

*Notes:* [O*NET 20.0 database] The table reports, for each skill category, the average skill requirement score across all occupations. O*NET skill scores are recorded on a scale of 0-7, which has been converted to a scale of 0 to 100. Occupations are sorted in descending order of skill importance for jobs held by college graduates (column 2). The sample is restricted to employed men aged 24-64, born 1942-1955.

Table A6: Effects of WWII Conscription on College Graduation and Underemployment, Korean Draft Robustness Checks (I)

| | | College graduate | College graduate and underemployed *by type of underemployment indicator:* | | | | |
|---|---|---|---|---|---|---|---|
| | % Veterans | | Joint | Subjective | Objective | Statistical contemp. | Statistical hist. |
| First stage | WW2 | 0.091** | | | | | |
| | | (0.043) | | | | | |
| | Korea | 0.119* | | | | | |
| | | (0.069) | | | | | |
| Reduced form | WW2 | | 0.040*** | 0.052*** | 0.040** | 0.047*** | 0.027* |
| | | | (0.01) | (0.013) | (0.016) | (0.011) | (.016) |
| | Korea | | 0.059*** | 0.074*** | 0.038 | 0.069*** | .020 |
| | | | (0.016) | (0.021) | (0.027) | (0.017) | (.025) |
| 2SLS | | | 0.312*** | 0.463*** | 0.730*** | 0.357*** | 0.651*** |
| | | | (0.105) | (0.174) | (0.222) | (0.13) | (.201) |
| Reduced form, addl. controls | WW2 | | 0.036*** | 0.045*** | 0.025* | 0.041*** | 0.015 |
| | | | (0.01) | (0.012) | (0.014) | (0.011) | (.022) |
| | Korea | | 0.054*** | 0.066*** | 0.019 | 0.062*** | 0.013 |
| | | | (0.015) | (0.018) | (0.022) | (0.016) | (.037) |
| Dep. var. mean | | 0.181 | 0.024 | 0.036 | 0.076 | 0.029 | 0.055 |

*Notes:* 1960-1980 US Census files, White men, born in the U.S. between 1923 and 1932. N=970,607 observations. Standard errors clustered at the quarter of birth level ($n_c$=40). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01

Table A7: Effects of WWII Conscription on College Graduation and Underemployment, Korean Draft Robustness Checks (II)

| | | College graduate | College graduate and underemployed *by type of underemployment indicator:* | | | | |
|---|---|---|---|---|---|---|---|
| | % Veterans | | Joint | Subjective | Objective | Statistical contemp. | Statistical hist. |
| First stage | WW2 | 0.044 | | | | | |
| | | (0.04) | | | | | |
| | Korea | 0.021 | | | | | |
| | | (0.069) | | | | | |
| Reduced form | WW2 | | 0.034*** | 0.044*** | 0.032* | 0.042*** | 0.027 |
| | | | (0.011) | (0.013) | (0.018) | (0.012) | (0.018) |
| | Korea | | 0.041** | 0.050** | 0.016 | 0.054*** | 0.018 |
| | | | (0.016) | (0.017) | (0.023) | (0.019) | (0.033) |
| 2SLS | | | 0.193*** | 0.281*** | 0.413*** | 0.200*** | .302*** |
| | | | (0.049) | (0.069) | (0.061) | (0.053) | (.061) |
| Reduced form, addl. controls | WW2 | | 0.032*** | 0.044*** | 0.025* | 0.041*** | .031 |
| | | | (0.010) | (0.012) | (0.014) | (0.011) | (.020) |
| | Korea | | 0.043*** | 0.065** | 0.024 | 0.062** | .061* |
| | | | (0.017) | (0.021) | (0.027) | (0.019) | (.034) |
| Dep. var. mean | | 0.181 | 0.024 | 0.036 | 0.076 | 0.029 | 0.055 |

*Notes:* 1960-1980 US Census files, White men, born in the U.S. between 1923 and 1932. N=970,607. Specification includes and interaction of the time trend with the fraction of Korean war veterans. Standard errors clustered at the quarter of birth level ($n_c$=40). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01

Table A8: Effect of the Post 9/11 G.I. Bill on Underemployment, Female Veterans

| | All | | Among college graduates: | | | | |
|---|---|---|---|---|---|---|---|
| | College | Unable | Underemployment | | | | Cognitive |
| | degree | to work | Joint | Subjective | Objective | Statistical | skill score[a] |
| Veteran | -.093*** | 0.003 | .137*** | .154*** | .234*** | .146*** | -7.441*** |
| | | | (0.023) | (.029) | (.024) | (.025) | (.608) |
| Post-9/11 | -.008 | -.024 | .069 | .119** | .091 | .043 | -4.796** |
| benefit | (0.030) | (0.018) | (.056) | (.059) | (.064) | (.054) | (1.453) |
| Combat | .126** | .034* | -.042 | -.066 | .116 | -.022 | -1.646 |
| exposure | (.045) | (.018) | (.057) | (.060) | (.073) | (.057) | (1.517) |
| Service | .087** | .056** | .049 | .070 | .075 | .071 | -4.077 |
| disability | (0.032) | (.018) | (.043) | (.042) | (.048) | (.042) | (1.035) |
| Graduate | | -.001 | -.151*** | -.187*** | -.154*** | -.156*** | 0.418 |
| | | (.002) | (.006) | (.006) | (.011) | (.006) | (0.233) |
| Dep.var mean | 0.408 | 0.008 | 0.231 | 0.293 | 0.442 | 0.241 | 57.93 |
| N | 213,202 | 111,345 | 86,871 | 86,871 | 86,871 | 86,871 | 85,144 |

*Notes:* Current Population Survey Veteran Supplement 1995-2018, restricted to U.S women aged 24-45. Veterans are included in the sample if they are observed five or more years after separation. In regressions where the dependent variable is an underemployment indicator, the sample is restricted to employed individuals, who usually work 30 or more hours per week. Observations are weighted using Veteran Supplement weights. Standard errors are clustered at the year of birth level ($n_c$=45). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01.

Table A9: SAT Derived Composite Score[a] by Veteran Status, Undergraduates

| | 2008 | 2012 | 2016 | 2020 |
|---|---|---|---|---|
| Non-veterans | 1042.01 | 1037.88 | 1055.77 | 1144.89 |
| Veterans | 973.03 | 980.22 | 1024.81 | 1053.87 |
| Ratio veteran/ non-veteran | 0.93 | 0.94 | 0.97 | 0.92 |

*Source:* National Postsecondary Student Aid Study, Undergraduate, 2008-2020 waves. Data restricted to students enrolled in bachelor's programs. *a*.The SAT derived composite score is based on SAT scores, or, if not available, on ACT scores converted to SAT score using concordance table published by ACT and the College Board.

Table A10: Effect of Age 23 Graduating Cohort Size on the Underemployment Rate[a]

| | Age groups: | | |
|---|---|---|---|
| | 22-24 | 25-28 | 29-54 |
| 1. Men, overall cohort size | 0.013** | 0.005* | -0.000 |
| | (0.004) | (0.002) | (0.002) |
| 2. Men, male cohort size | 0.012** | 0.004* | -0.000 |
| | (0.003) | (0.002) | (0.001) |
| 3. Women , overall cohort size | 0.012*** | -0.002 | 0.002 |
| | (0.003) | (0.003) | (0.002) |
| 4. Women, female cohort size | 0.013*** | -0.001 | 0.004 |
| | (0.003) | (0.002) | (0.002) |
| 5. All | | | |
| Overall cohort size | 0.012*** | -0.000 | 0.003 |
| | (0.003) | (0.002) | (0.002) |
| Overall cohort size × Men | 0.000 | 0.004 | -0.004 |
| | (0.004) | (0.002) | (0.002) |

*Notes:* Current Population Survey, Annual Social and Economic Supplement 1968-1989. Sample restricted to employed college graduates. N= 248,818 overall, 155,094 men and 93,724 women. a. The underemployment rate is measured using the joint indicator defined in section 1. Graduating cohort sizes from National Center for Education Statistics (ED) (1993), Table 28.—Degrees conferred by institutions of higher education, by sex and level. Standard errors are clustered at the year level ($n_c$=22). Significance levels indicated by: * p<.10 ** p<.05 *** p<.01