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Unemployment Among the Recent U.S. Veterans

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Unemployment Among the Recent Veterans

Abstract: This paper examines the unemployment impact of prior military service on the recent veterans. In order to control for non-random selection into the military, this paper introduces new set of instrumental variables exploiting the variation in economic and military characteristics of the states when young people make their enlistment decisions. Using Integrated Public Use Microdata Series from the American Community Survey (ACS) from 2008 to 2014, I find that among those in the civilian non-institutional labor force, veterans are equally likely to be unemployed as comparable non-veterans once they are in the labor force.

JEL Codes: J01, J15, J16, J24

1. Introduction

The Volunteer era of the military started in 1973, after the Vietnam War ended. Beginning with the Volunteer era, the military had to compete with the private sector for young adults in order to fill its vacancies. Each year thousands of young men and women are screened and enlisted to various branches in the Volunteer Armed Forces. It has become a major[1] source of employment for young men and women aged 18 to 25, who make up the 49.6% of the active duty component (Department of Defense, 2014). Military service, which is the largest vocational institution in the country, may provide skills that are transferable to the civilian labor market (Mangum & Ball, 1987).

Many young adults make a decision after high school whether to continue their education in college, or to enter the labor force and acquire work experience. Joining the military is one of the main choices young adults consider when graduating from high school. Many among those young adults choose military with the hope of gaining employment and educational benefits in the civilian labor market after the service. Questions in mind would be whether the military experience would bring better employment opportunities than entering the labor force directly or whether the military experience on the resume would be valuable to employers. The effect of the military service on the aggregate human capital of the economy may be larger than any other institutional source of training other than the public education system (Bryant, Samaranayake, & Wilhite, 1993).

[1] As of March 2016, number of active duty military personnel serving in the U.S. Armed Forces is 1,344,747 (DMDC, 2016).

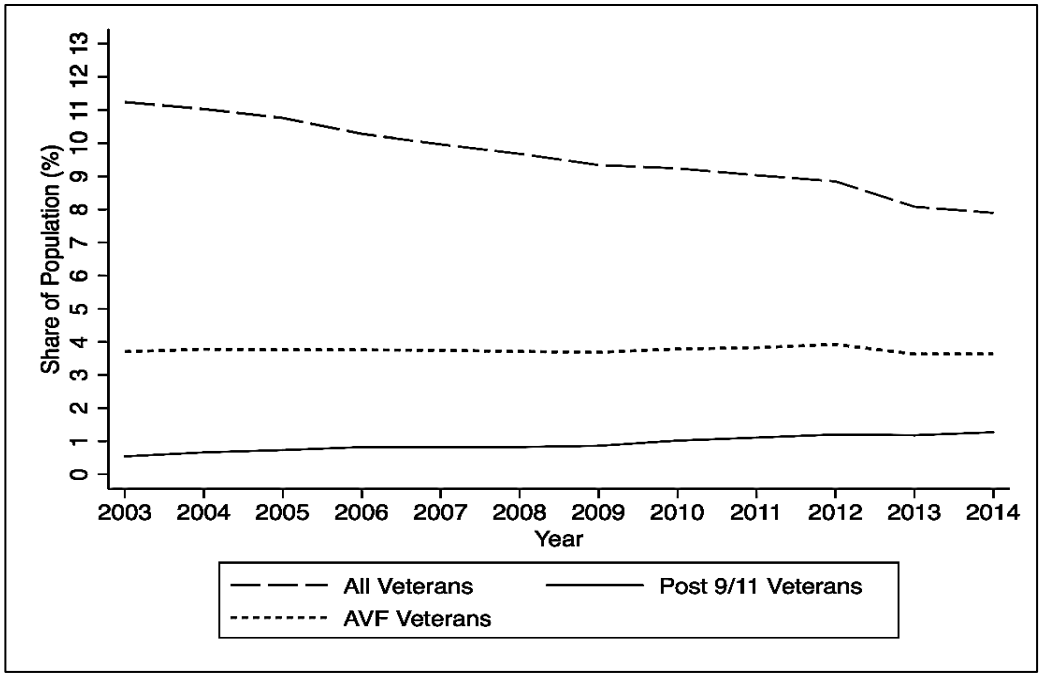

Figure 1 Veteran Population as a Share of Civilian Population

Note: Data drawn from the Integrated Public Use Microdata Samples (IPUMS) from the American Community Survey (ACS). Sample is limited to those ages 18 and over.

Figure 1 presents the share of veteran[2] populations by service periods in U.S. civilian population ages 18 and over. Over the years, share of veterans in civilian population decreases from 11% to 8% in 2014. However, as veterans of the Global War on Terrorism (GWOT) return to civilian life, their share of civilian population increases. According to Bureau of Labor Statistics, there were 3.6 million veterans who had served during the post-9/11 era (Labor Statistics, 2016).

The post-service outcomes of veterans have been a popular topic of interest for many social science researchers and policymakers since the beginning of the Volunteer era. Labor

[2] In data, Veterans are self-identified as men and women who served formerly in the active duty component of the U.S. military in time of peace or war anywhere in the world and who were civilians at the time these data were collected. https://usa.ipums.org/usa-action/variables/VETSTAT#description_section Active duty means full-time service as a member of the Army, Navy, Air Force, Marine Corps, and Coast Guard. Individuals who train in the national guard or reserve component of the military are not counted as active unless called to active duty and serve the full period (Szymendera, 2015). However, in data those veterans who were called up to active service are not explicitly differentiated from normal veterans.

economists have focused on investigating the effect of military service on the civilian labor market performance of veterans. Over the last decade, the military has been more active because of the 9/11 terrorist attacks. It has had two major overseas deployments in the Global War on Terrorism (GWOT) including Afghanistan (Operation Enduring Freedom) and Iraq (Operation Iraqi Freedom), deploying over two million U.S. troops since October 2001 (Cesur, Sabia, & Tekin, 2013).

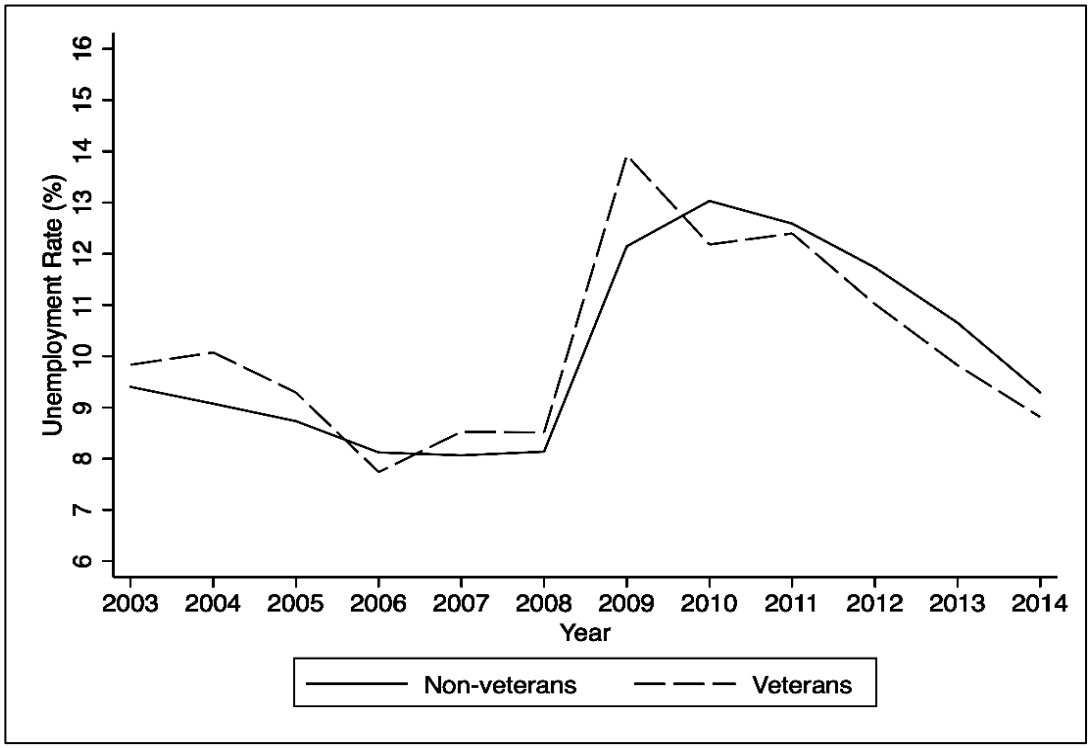

Figure 1.1 Rate of Unemployment by Veteran Status

Note: Data drawn from the Integrated Public Use Microdata Samples (IPUMS) from the American Community Survey (ACS). Sample is limited to those ages 18 to 40.

These wars have had enormous financial costs to the U.S. government, but at the same time they have had a large impact, whether positive or negative, on the young American labor force. This period of long-lasting overseas deployments is the first challenge the all-volunteer forces have ever experienced since the draft era ended. Particularly, with the unfavorable effect

of the recent recession on employment, civilian labor market performance of veterans has been questioned in the media several times (Hicks, 2014; Plumer, 2013; Steenwyk, 2012).

This paper estimates the impact of the post-9/11 military service on the probability that the veterans are unemployed using three different approaches introducing a new set of instrumental variables. Limited past empirical studies are inconclusive about how former military service is related to subsequent civilian labor market outcomes. Most studies find positive labor outcomes for the World War II veterans; however, it is found the opposite for the Vietnam veterans. And studies on the all-volunteer era veterans are not clear yet. A key contribution of this chapter relative to broader literature is the use of new methodological approach. Particularly, in the volunteer era, veteran status is reflecting nonrandom selection into the military. Veterans are self-selected and screened by the military, thus without controlling for self-selection, estimates will be biased and models will not be causal. In order to identify and isolate the net effect of veteran status, I make use of average unemployment rate and sum of veteran and military populations as a share of youth population in state during high school years of individuals using an adequately large data from the American Community Survey of the Integrated Public Use Microdata Samples from 2008 to 2014. IV(2SLS) results show that the military experience has no effect on the probability that a veteran is unemployed once they are in the labor force. Also, results suggest that veterans are more likely to be employed and more likely to be in the labor force.

The rest of the paper is structured along the following lines. In Section II, brief summary of the related literature and the theoretical background are presented. Section III describes the data and presents the preliminary statistics. Section IV details the estimation procedure and interprets the results. Section V concludes and discusses the results.

2. Background

2.1. Theoretical background

There are several channels related to how military service would be associated with positive or negative civilian labor market performance. For a positive return to military service, several explanations are present in the literature showing that veterans are more employable and earn more. Some researchers have stated that the military experience may serve as a bridging environment for racial and ethnic minorities so that they can benefit most by gaining the common values in the society they lacked before joining the military (Browning, Lopreato, & Poston, 1973; Martindale & Poston, 1979). In this perspective, the military provides the individuals with certain soft skills such as discipline, communication and following orders in the strict hierarchical organization that helps them transition from young adulthood to the civilian labor market. These skills are especially valuable in higher paying occupations in the civilian sector.

On the other hand, in particular for the Vietnam veterans, military service is found negatively related with the subsequent civilian labor market performance of the veterans. Studies report that the Vietnam veterans may be stigmatized such that public perceived the military as unfavorable considering the abuse of drugs among soldiers, and so that the veterans were not welcomed as well as the World War II veterans (Cohen, JereWarner, Rebecca L.Segal, 1995; Schwartz, 1986). Another possible negative aspect of military service is that veterans exposed to combat and deaths during service return to civilian life with high rate of mental disorders, such as Post Traumatic Stress Disorder (PTSD) (Cesur et al., 2013; Maclean, 2010). Employers may assess veterans returning from wartime military service as less productive than usual.

Another explanation for a positive return to military service is that the military experience can act as a positive signal to employers (De Tray, 1982). They can use this signal to distinguish productive workers from less productive workers because all recruits are screened first and then selected into the military. The Department of Defense has strict requirements for people to enter the armed forces. Being a veteran may signal to employers that he or she has passed several physical and cognitive exams and served in a bureaucratic organization requiring strict work habits and high moral standards. Among the apparent characteristics of the veterans, leadership skills, punctuality, hard work and discipline may make veterans more employable and thus provide them with an earnings premium.

2.2. Related Literature

The previous literature on the effect of military service on the civilian labor market performance of returning veterans has not been conclusive. The effect of military service that has been found in past studies varies according to economic or non-economic reasons, like whether veterans serve in a peacetime or wartime period, or whether they are drafted or not. Previous results, therefore, may be categorized in terms of historical context such as findings on World War II veterans, Vietnam veterans and all-volunteer era veterans. Studies are mostly consistent in finding a positive effect of military service on the labor market performance of veterans of World War II and Korea but the situation appears different for the Vietnam era veterans (J. D. Angrist, 1990; J. Angrist & Krueger, 1994; Martindale & Poston, 1979; Rosen & Taubman, 1982; Schwartz, 1986; Teachman, 2004).

The Volunteer era comes with its own difficulty of identifying veteran status because they are all self-selected and screened by the military. Findings about the impact of military

service in the all-volunteer era are also inconclusive. Different results may be the product of the time period of military service or the data and methodologies used in the analyses.

Using Social Security Administration data, Angrist (1998) finds that veterans of the 1980s had higher employment rates after service than the comparable non-veterans. However, the author shows this employment gain does transform to a small increase in earnings for non-white veterans and a modest decrease in earnings of white veterans. Angrist uses two identification strategies for veteran status including matching methods comparing applicants who enlisted with applicants who did not enlist and the instrumental variables approach exploiting the error in the scoring of screening exams of the military prior to 1977. However, the latter approach may not be used for the veterans of the post-9/11 era.

Providing a comprehensive literature on the labor market impacts of voluntary military service on the veterans, Hirsch and Mehay (2003) compare earnings between reservists who are veterans and reservists with no active duty experience. The authors used a matched comparison strategy in order to identify veteran status using data from the Reserve Component Surveys. They find that veterans earn more than non-veterans by about 3% and this wage premium largely results from the officer veterans.

Without using an identification strategy in order to reduce self-selection bias, Kleykamp (2013) finds that recent veterans are more likely to be unemployed than non-veterans using a pooled sample from Current Population Survey (CPS). Also, she shows that employment penalty is higher among female veterans than male veterans but veterans on average earn more than non-veterans.

In a recent investigation using samples from the National Longitudinal Survey of Youth (NLSY), Routon (2014), finds that minority veterans gain about 10% wage premium as

compared to non-veterans, but he finds no significant difference between veterans and nonveterans in terms of employability. His identification strategy to reduce self-selection bias uses sibling fixed effect and propensity score matching. He chooses the NLSY because it provides rich information about military and family background; however, NLSY is weakened by the small sample sizes of veterans, which is less than 400. This may bring up the question of external validity.

A key contribution of this study to the related literature is the use of new instrumental variables to identify the veteran status using an adequately large nationally representative data from the American Community Survey (ACS) Integrated Public Use Microdata Samples (IPUMS). In order to estimate employment of veterans, this chapter uses three different methodologies; ordinary least squares, instrumental variables (2SLS) and bivariate probit. IV (2SLS) and bivariate probit models make use of instrumental variables approach that minimizes the likelihood that the effects of unobserved characteristics produce biased results. My method of analysis exploits the variation in state-level economic and military population characteristics at the time of the enlistment decision to construct instrumental variables that affect the probability of enlistment but are not a direct determinant of the labor market outcomes when they return to civilian life after service. These new set of instruments, which are matched with individuals when they are 17 years old, are average state unemployment rate during high school years of a person (ages 15, 16, and 17) as an indicator of labor market conditions of the state and sum of military and veteran populations as a share of youth population in state (ages 18 to 24).

3. Data and Summary Statistics

The empirical investigation in this study uses data from various sources. The primary data comes from the American Community Survey (ACS) Integrated Public Use Microdata Samples (IPUMS) from 2008[3] to 2014, which is the latest publicly available data set (Ruggles et al., 2015). The ACS is an annual survey that collects information about basic demographics and economic characteristics of the U.S. population. It surveys a nationally representative sample of approximately 250,000 different households every month and is reported as a single-year sample annually. Pooled data consists of one percent year samples including records on over 3 million individuals.

This adequately large dataset is suitable for analysis not only because it collects information about veteran status, but also because it contains information about individuals' state of birth[4]. In my empirical strategy individuals' state of birth are critical in order to identify veteran status. Calculations[5] show evidence that people are more likely to stay in their state of birth until the age of 17. After this age, they tend to leave their state of birth for economic or educational reasons. For that reason, to increase the accuracy, I restrict the sample to those who were born in the U.S.[6]

Department of Defense (DoD) requires that individuals must be at least 17 years old to be enlisted into the military. By the end of high school, most young adults, particularly men,

[3] The year 2008 is mainly chosen because it is the beginning of a significant economic phenomenon, the Great Recession. This period was a hard time for the U.S. labor market and unemployment peaked. During the recession and the following years employment performance of returning veterans as compared to non-veterans drew attention by policy makers and the media (Hicks, 2014; Loughran, 2014; Plumer, 2013; Steenwyk, 2012).
[4] For my study, the Current Population Survey (CPS) is another option. However, since the CPS does not provide birthplaces in state levels, which is critical for identification of veteran status, I continue with the ACS.
[5] In 2014 about 80% of all individuals age 17 stay in their state of birth.
[6] I have also run my regressions without excluding individuals who were born abroad, but there is not significant difference at all with what is presented here. In order to be consistent with my approach I present only results with excluding them.

have already made a decision whether to go to college or to the military (Bachman, Segal, Freedman-Doan, & O'Malley, 2000). And their decisions are correlated with the economic conditions and the environment they face at the age of 17.

This paper introduces new instrumental variables to identify veteran status: average state unemployment rate as percentages during high school years (when they were 15, 16, 17); sum of veteran and military populations as a share of youth population (ages 18 to 24), as percentages, in individuals' state of birth when they were 17. These key variables are created from different data sources such as the U.S. Bureau of Labor Statics (BLS website), the Defense Manpower Data Center (DMDC) and the Current Population Survey's (CPS) Veteran Supplement dataset.

The analytic sample is restricted to those who are in the civilian non-institutional labor force[7], consisting of individuals who are employed or unemployed. Individuals are employed if they had a paid job during the reference week, and they are unemployed if they had no paid job but were seeking employment.

Recent veterans come from all-volunteer era, instead of a draft era, and are mostly subject to overseas deployments to Iraq or Afghanistan or both. For a credible comparison between recent veterans and non-veterans, I restrict my analytic sample to those ages 18 to 40 in the survey years. The lowest age is set to 18 because there is almost no returning veteran at a lower age. Age 40 reflects the time a veteran who enlisted at age 18-22 would start to receive retirement pension. Veterans receiving retirement pension may reduce labor supply.

Descriptive statistics for the analytic sample is presented in Table 1. There are significant differences between veteran and non-veteran populations across covariates. On average veterans have lower unemployment rate, which is below 10 percent, than non-veterans.

[7] The U.S. civilian labor force excludes active duty military personnel.

Table 1 Summary Statistics by Veteran Status

	Unemployment	
Variables	**Veterans**	**Non-veterans**
Unemployment	0.092***	0.108
Labor Force Participation	0.872***	0.786
Employment to Population	0.791***	0.701
Disability status	0.217***	0.042
Female	0.157***	0.503
Age	32.615***	29.049
Married	0.573***	0.396
Divorced/Widowed/Separated	0.165***	0.077
Never married	0.262***	0.527
< High School	0.012***	0.072
High School/GED	0.256***	0.250
Some College	0.505***	0.370
BA+	0.228***	0.308
White, non-hispanic	0.751***	0.734
Black, non-hispanic	0.117***	0.107
Other, non-hispanic	0.043***	0.051
Hispanic	0.088***	0.108
Urban residence	0.714***	0.735
Any child < 6 years old at home?	0.274***	0.216
Enrolled in school	0.173***	0.211
Average State Unemployment	5.836***	5.772
Share of Military and Veteran Pop.	11.077***	9.436
N	134,903	3,621,941

Notes: This table shows sample means from the ACS IPUMS 1 percent year samples from 2008 to 2014. Sample is restricted to those ages 18 to 40 and who were born in the U.S. Stars indicate significance levels from t-test of mean equality across veteran status. * $p<0.05$,** $p<0.01$, ***$p<0.001$

Table 2 Mean Unemployment Across Veteran Status within Sub-samples

	Unemployment		
	Veterans	**Non-veterans**	**Difference**
Ages 18 to 29	0.135	0.140	-0.005**
Ages 30 to 40	0.074	0.074	-0.001
Female	0.100	0.099	0.001
Male	0.091	0.118	-0.027***
White, non-Hispanic	0.083	0.087	-0.004***
Black, non-Hispanic	0.138	0.210	-0.072***
Other, non-Hispanic	0.117	0.140	-0.023***
Hispanic	0.098	0.140	-0.041***
Less than High school	0.173	0.268	-0.095***
High school/GED	0.125	0.156	-0.032***
Some college	0.095	0.101	-0.007***
BA+	0.047	0.041	0.007***
N	134,903	3,621,941	

Notes: This table shows sample means from the ACS IPUMS 1 percent year samples from 2008 to 2014. Sample is restricted to those ages 18 to 40 and who were born in the U.S. Stars indicate significance levels from t-test of mean equality across veteran status within each sub-sample. * p<0.05,** p<0.01, ***p<0.001

Veterans are more likely to be in the labor force and more likely to be employed. Although increasing, female population in the military is far less than men, which is recorded 14.9 percent in the active duty component of Department of Defense in 2014, which reflects a similar veteran composition in the civilian population (Defense, 2014). On average veterans are older, more likely to be married, have higher rate of college degree but lower rate of bachelor or higher degree, and have higher rate of disability[8] than non-veterans.

[8] In data, disability status self-reportedly indicates whether an individual has one or more kinds of difficulties, which include cognitive difficulties (such as learning, remembering, making decisions), conditions limiting one's physical activities and making it difficult for them to take care of their own personal needs and having severe blindness or

Table 2 shows the mean unemployment for each veteran and non-veteran sub-samples. On average veterans have lower unemployment among all sub-samples except among those who have bachelors' or higher degree. However, there is no significant difference among older age group and female samples. Among race/ethnicity samples, the biggest employment gain is among African Americans.

4. Estimation and Results

4.1. Empirical Strategy

The main goal of this paper is to estimate the employment impact of the recent military service on the veterans of the Global War on Terrorism. If the individuals were randomly selected into the military, ordinary least squares (OLS) estimation of the following probability model would provide the average treatment effect of the military service:

$$Y_i = \alpha + Veteran_i \Upsilon + X_i \beta + \varepsilon_i \quad (1)$$

Y_i is unemployed equals 1 if an individual i is unemployed during the survey time; α is an intercept; $Veteran_i$ is an indicator whether the individual i is a veteran; Υ is the parameter denoting military treatment effect; X_i is a set of observable explanatory variables; β is the vector of parameters; ε_i is the unobservable error term. Similar to social programs in evaluation research, military service can be seen as a treatment given to a treatment group, and the effect of military service on veterans' civilian labor market performance can be seen as the treatment effect on the treated group.

Identifying the net effect of active duty military experience on the civilian labor market performance of the volunteer-era veterans is not a straightforward mission because individuals

deafness. Disability status also includes whether a veteran has a service-connected disability, which is determined by disability rating, assigned by the U.S. Department of Veterans Affairs.

are self-selected into the military. Veterans may have some prior differences from non-veterans before they enter the armed forces. Maybe, the veterans are the ones who can get the most benefit from entering the military. Therefore, veteran status is likely to be correlated with the error term that veterans may differ from non-veterans along unobserved individual characteristics and economic conditions at the time of enlistment decision (Bryant et al., 1993). These differences may change the probability that they enlist relative to non-veterans. Without controlling for the non-random selection into the military, the effect of veteran status will be biased.

In this study, the problem of self-selection bias is overcome by adopting instrumental variables (2SLS) approach by exploiting the variation in state-level military and economic characteristics to construct instrumental variables correlated with the veteran status but uncorrelated with the other determinants of unemployment. For the validity of instruments, there are two conditions to be met; the instruments should be relevant and sufficiently correlated to veteran status, and they must not be correlated to unobserved error term of the structural model. In order to test that these instrumental variables are relevant channels affecting the attitude of individuals toward enlistment, I run first stage regressions of veteran status and present joint F statistics.

Exogeneity of the instruments require that the instruments can affect veteran status and must not affect post-service employment of veterans directly. For the over-identified models, in which the number of instruments exceeds the number of endogenous variables, there is a formal procedure testing whether the excluded instruments are valid, that is uncorrelated with the error term in structural model. As presented in Table 1.4, probability value from over-identification test, Hansen J test, suggests that two instruments used in the models are valid.

One concern about the validity of the average unemployment instrument is that unemployment rates may be persistent overtime in states and individuals may stay in their same states, then past unemployment would be correlated with the current employment status. However, veterans are most likely to leave their state of birth as they are enlisted and return to civilian life after several years of service. Another concern is that Oreopoulos, von Wachter, and Heisz (2012) find that initial labor market conditions for Canadian college graduates affect their future earnings adversely but the effect disappears in ten years. Again, considering life trajectory of veterans, they leave the labor force and serve in the military for years and then return to potentially different state than their state of birth. Furthermore, Arkes (2010) examines the effect of schooling on wages and instruments average unemployment during high school years for years of schooling. Arkes (2010) finds no evidence of correlation between average unemployment rate during high school years of individuals and their current earnings.

4.2. Identification of Veteran Status

In order to isolate and identify the veteran status, we need to understand what factors affecting the propensity to enlist across states. Researchers have studied the effect of state unemployment rate on enlistment decisions, as it is an indicator of the condition of the local labor market. It is argued that higher state unemployment reflects lower work opportunities for young adults considering employment rather than college (Bryant, Richard Wilhite, 1990; Bryant et al., 1993; Kilburn & Klerman, 1999; Teachman, 2005). In the literature, another key factor affecting enlistment decisions is presence of higher military and veteran populations in the state (Boyer & Schmitz, 1995; M. A. Kleykamp, 2006; Moore & Griffis, 1999). It is argued that higher presence of military personnel and veteran population in state affects young adults

Table 3 First Stage Regressions of Veteran Status

Variables	Model 1	Model 2	Model 3	Model 4
State Unemployment	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Share of Military and Veteran Pop.	0.001***	0.001***		
	(0.001)	(0.001)		
Disability status	0.129***	0.129***	0.129***	0.129***
	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.050***	-0.050***	-0.050***	-0.050***
	(0.001)	(0.001)	(0.001)	(0.001)
Married	-0.033***	-0.033***	-0.033***	-0.033***
	(0.001)	(0.001)	(0.001)	(0.001)
Divorced/Separated	0.015***	0.015***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
Education: <High School	-0.008***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Education: Some college	0.026***	0.025***	0.026***	0.025***
	(0.001)	(0.001)	(0.001)	(0.001)
Education: BA+	0.045***	0.044***	0.045***	0.044***
	(0.001)	(0.001)	(0.001)	(0.001)
Non-Hispanic, Black	0.009***	0.008***	0.009***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Non-Hispanic, Other	-0.001	-0.002***	-0.001	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Hispanic	-0.001***	-0.002***	-0.001***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Urban residence	0.002***	0.001***	0.002***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)
Any child < 6 years old at home?	0.001***	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)
Enrolled in regular school	0.015***	0.015***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.048***	0.047***	0.052***	0.052***
	(0.002)	(0.002)	(0.002)	(0.002)
Year FE	Yes	Yes	Yes	Yes
State FE		Yes		Yes
N	3,756,844	3,756,844	3,756,844	3,756,844
R-squared	0.061	0.063	0.061	0.063
F-statistics	138.5	163.6	255.4	286.7

Notes: This table reports first stage results estimated in separate regressions for each column. Regressions include state of birth and year of birth dummies. Robust standard errors are reported in parentheses. Stars indicate significance levels * p<0.05,** p<0.01, ***p<0.001

toward enlistment by increasing the possibility of getting contact with and get to know more about the military opportunities.

Instrumental variables used in this paper are defined as average unemployment during high school years of a person (ages 15, 16 and 17), and sum of military and veteran populations as a share of youth population ages 18 to 24 when persons are 17 years old.

"First-stage" regressions for the determination of veteran status are linear probability models identified by the exclusion of instruments from equation (1). Although binary dependent and endogenous variables introduce nonlinearity, linear probability model is preferred as an ideal specification (Conley & Heerwig, 2011; Heckman & Macurdy, 1985). I estimate the following first-stage regression by OLS:

$$Veteran_i = \theta_0 + Z_i\theta_1 + X_i\theta_2 + \eta_i, \quad (2)$$

where Z_i is the vector of instruments, X_i is the set of control variables and η_i is unobserved error term. In addition to demographic control variables described in Table 1.1, regressions include year fixed effects since pooled samples drawn from 2008 to 2014. In order to let exogenous variation in veteran status come from the within-state differences over time in instrumental variables relative to other states, regressions include state of birth and year of birth dummies. By using year of birth dummies, I can also control for age effects on unemployment. Furthermore, including year of birth dummies is important so that I can control for yearly changes in policies, college fund benefits, bonuses, incentives determined by the Department of Defense and also, as a disincentive, combat deaths in the Global War on Terrorism, since these changes and effects are constant across states.

I estimate separate regressions using both instruments while controlling for a set of covariates. Model 1 is the base model, and in model 2, I add state fixed effects to increase the

accuracy of treatment effect. Table 3 shows that instruments are strongly significant in all regressions as evidenced by the sufficiently large F-statistics, exceeding 10 suggested by (Stock, Wright, & Yogo, 2002). Thus, these instruments are plausible predictors of veteran status. For instruments are state level measures, I alternatively estimate controlling for within-state standard error correlation, although not reported here, calculating cluster-robust standard errors. There is not any change and I find that the instruments are statistically significant when F-statistics are adjusted for clusters.

4.3. Estimation Results for Unemployment Analysis

In this section, I estimate the impact of recent voluntary military service on the probability that a post-9/11 veteran is unemployed. A reasonable preliminary approach is to use a linear probability model to estimate the likelihood of being unemployed of a veteran. Estimation results from the OLS regressions of equation (1) with different specifications are presented in Table 4. These OLS estimation results are presented as a benchmark model to IV (2SLS) results. Across all OLS results, keeping else constant veterans have about 1 percent less odds of being unemployed. All models include year dummies in order to control for aggregate year effects. The first column presents the results from the base model. In the second model, I add state fixed effects to increase the accuracy of the effect of veteran status. The effect of veteran status does not change much across the models after state dummies are included.

As is regular in the 2SLS approach, I estimate the second-stage regressions, equation (1), by OLS using the fitted values from the first-stage regression, which is carried out using STATA13 **ivregress** command, using the White's heteroskedastic robust standard errors. Table 4 also shows the 2SLS results for unemployment effects of military service in two specifications. In two models, active military service has no significant effect on the likelihood

Table 4 OLS and IV(2SLS) Regressions of Unemployment

	OLS	OLS	IV(2SLS)	
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Veteran Status	-0.010***	-0.009***	0.168	0.092
	(0.001)	(0.001)	(0.100)	(0.092)
Disability status	0.099***	0.099***	0.076***	0.086***
	(0.001)	(0.001)	(0.013)	(0.012)
Female	-0.010***	-0.010***	-0.001	-0.005
	(0.000)	(0.000)	(0.005)	(0.005)
Married	0.094***	0.094***	0.100***	0.098***
	(0.001)	(0.001)	(0.003)	(0.003)
Divorced/Separated	-0.048***	-0.048***	-0.051***	-0.050***
	(0.000)	(0.000)	(0.002)	(0.001)
Education: <High School	-0.077***	-0.077***	-0.076***	-0.077***
	(0.000)	(0.000)	(0.001)	(0.001)
Education: Some college	-0.042***	-0.041***	-0.047***	-0.044***
	(0.000)	(0.000)	(0.003)	(0.002)
Education: BA+	0.004***	0.005***	-0.004	0.000
	(0.001)	(0.001)	(0.005)	(0.004)
Non-Hispanic, Black	0.093***	0.093***	0.091***	0.093***
	(0.001)	(0.001)	(0.001)	(0.001)
Non-Hispanic, Other	0.037***	0.036***	0.038***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)
Hispanic	0.017***	0.016***	0.017***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)
Urban residence	-0.006***	-0.009***	-0.006***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Any child < 6 years old at home?	0.006***	0.006***	0.006***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)
Enrolled in regular school	-0.002***	-0.002***	-0.005**	-0.003*
	(0.000)	(0.000)	(0.002)	(0.001)
Year effects	Yes	Yes	Yes	Yes
State effects		Yes		Yes
Constant	0.106***	0.108***	0.092***	0.099***
	(0.003)	(0.003)	(0.007)	(0.007)
N	3,756,844	3,756,844	3,756,844	3,756,844
R-squared	0.071	0.072	0.063	0.072
Hansen J (P value)			0.324	0.462

Notes: Regressions include state of birth and year of birth dummies. Robust standard errors are reported in parentheses. Stars indicate significance levels * p<0.05,** p<0.01, ***p<0.001

of unemployment, that is, veterans are as employable as non-veterans. Although the average effect of veteran status reduces in the second specification, it is still not significant.

4.4. Sub-population Analysis

Although I do not introduce heterogeneous treatment effect notation for reasons of simplicity, I investigate whether the effect of military service varies along demographics. I estimate unemployment of veterans in sub-samples of age groups, gender, race and educational attainment. Table 5 suggests that veterans are as employable as non-veterans once they are in the labor force and the effect of military service does not differ along demographic characteristics, such as gender and education. However, among younger age group, who are aged 18 to 29, and among non-white population veterans are more likely to be unemployed than their comparable peers. These estimates are bigger than expected. They may be driven by small p-value from the over-identification test. Estimates from just-identified model using average unemployment are smaller but also positive and significant

4.5. Alternative Strategies

4.5.1. Bivariate Probit Approach

The main strategy to overcome the potential self-selection bias due to non-random selection into the military uses linear instrumental variables approach. Although adopting linear instrumental variables to calculate average treatment effect of a binary treatment on a binary outcome is fairly common and supported by many scholars (J. D. Angrist, 1998; J. D. Angrist & Chen, 2011; J. D. Angrist & Pischke, 2009; Heckman & Macurdy, 1985), there is a growing body of literature uses bivariate probit in models with an endogenous binary treatment and binary outcome (Altonji, Elder, & Taber, 2005; Bhattacharya, Goldman, & McCaffrey, 2006; Chiburis, Das, & Lokshin, 2012).

Table 5 IV(2SLS) Estimates of Unemployment Among Sub-samples of Age Groups, Gender, Race/Ethnicity, and Education Level

Variables	Age 18 - 29	Age 30 - 40	Female	Male	< BA	BA+	White	Non-white
Veteran Status	1.104***	0.015	0.224	0.066	0.131	-0.264*	0.052	0.923***
	(0.303)	(0.101)	(0.456)	(0.081)	(0.119)	(0.137)	(0.090)	(0.347)
Disability status	0.015*	0.002			-0.011*	-0.014***	-0.004	0.026*
	(0.009)	(0.007)			(0.006)	(0.005)	(0.005)	(0.016)
Female	0.012	0.082***	0.090***	0.082***	0.100***	0.115***	0.087***	0.011
	(0.027)	(0.018)	(0.026)	(0.015)	(0.013)	(0.031)	(0.012)	(0.037)
Married	0.123***	0.083***	0.106***	0.091***			0.085***	0.128***
	(0.007)	(0.005)	(0.004)	(0.004)			(0.003)	(0.009)
Divorced/Separated	-0.061***	-0.035***	-0.048***	-0.051***			-0.045***	-0.075***
	(0.002)	(0.003)	(0.003)	(0.002)			(0.001)	(0.006)
Education: <High School	-0.064***	-0.069***	-0.081***	-0.074***			-0.070***	-0.112***
	(0.005)	(0.001)	(0.001)	(0.002)			(0.001)	(0.002)
Education: Some college	0.117***	0.055***	0.079***	0.107***	0.114***	0.035***		
	(0.001)	(0.002)	(0.004)	(0.001)	(0.001)	(0.002)		
Education: BA+	0.046***	0.027***	0.033***	0.040***	0.052***	0.013***		
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
Non-Hispanic, Black	0.027***	0.003***	0.018***	0.013***	0.030***	0.012***		
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
Non-Hispanic, Other	-0.061***	-0.051***	-0.023***	-0.063***	-0.060***	-0.021***	-0.041***	-0.089***
	(0.007)	(0.003)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.010)
Hispanic	-0.044**	-0.007*	0.011	-0.014**	0.001	0.004	0.008**	-0.062***
	(0.018)	(0.004)	(0.008)	(0.007)	(0.006)	(0.005)	(0.004)	(0.017)
Urban residence	-0.015***	-0.002***	-0.009***	-0.008***	-0.016***	-0.006***	-0.007***	-0.018***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Any child < 6 years old at home?	0.007***	0.002**	0.022***	-0.006***	0.004***	-0.001	0.004***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
Enrolled in regular school	-0.023***	0.030***	-0.002	-0.000	-0.040***	0.031***	-0.002	-0.011**
	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.005)
N	1,937,716	1,819,128	1,843,827	1,913,017	2,610,232	1,146,612	2,760,024	996,820
F-stat	34.6	69.2	18.2	138.5	111.1	44.1	140.6	21.2
Hansen J_pval	0.104	0.671	0.886	0.328	0.905	0.105	0.056	0.004

Regressions include state of birth, year of birth dummies, year and state fixed effects. Constant terms are not reported due to space availability. Robust standard errors are reported in parentheses. Stars indicate significance levels * p<0.05,** p<0.01, ***p<0.001

Model framework involves two latent variable models;

$$y_1 = 1(\beta_0 + \beta_1 Veteran + \beta_2 X + \varepsilon_1 > 0) \quad (3)$$

$$Veteran = 1(\pi_0 + \pi_1 Z + \pi_2 X + \varepsilon_2 > 0) \quad (4)$$

where y_1 is outcome variable, unemployed equals 1 if unemployed; $Veteran$ equals 1 if individual is a veterans; X is the set of demographic control variables used as previously; Z is the set of instruments. The assumption for the framework is that random errors ε_1 and ε_2 are jointly normally distributed with correlation ρ. Joint estimation is required when $\rho \neq 0$, that is, the treatment variable is endogenous. As in 2SLS approach, we expect that instruments affect only veteran status but not directly outcome variable.

Table 6 reports average marginal effects of probit model. In model 1, veterans are less like to be unemployed by about 7 percentage points than non-veterans. Including state fixed effects in model 2, the effect of veteran status does not change much. These estimates are much closer to the OLS estimates. Correlation coefficient, rho, and probability value from the Wald test of $\rho = 0$, supports that two equations are strongly correlated, which we expect to see for joint estimation of two equations.

4.5.2. Employment to Population and Labor Force Participation

Unemployment is one measure of the economic health of the labor market. Another measure of employment level is the employment to population ratio. During or after the recession times, persistent high unemployment may discourage unemployed workers so that they may stop searching actively for a job. During such times, a decrease in the unemployment rate can be misleading. As a robustness check, I estimate the main structural model adopting previous 2SLS approach replacing unemployment with the employment to population ratio and labor

force participation. The analytic sample is not restricted to those who are in the labor force, instead it includes the entire population. Age is restricted to those aged 18 to 40. Regressions include all demographic control variables used in the previous estimates. IV (2SLS) results are presented in Table 7. Results suggest that veterans are more likely to participate in the labor force and they are more likely to be employed than non-veterans by about 70 percentage points. These estimates are big, even though it is reflecting the huge difference in labor force participation rate and employment to population ratio presented in Table 1. One possible explanation is that veterans have higher motivation to be in the labor force than non-veterans.

Table 6 Bivariate Probit Results of Unemployment

Variables	Model 1	Model 2
Veteran Status	-0.067***	-0.072***
	(0.004)	(0.003)
Disability status	0.100***	0.101***
	(0.001)	(0.001)
Female	-0.012***	-0.012***
	(0.001)	(0.001)
Married	-0.047***	-0.046***
	(0.001)	(0.001)
Divorced/Separated	0.009***	0.010***
	(0.001)	(0.001)
Education: <High School	0.060***	0.059***
	(0.001)	(0.001)
Education: Some college	-0.039***	-0.039***
	(0.001)	(0.001)
Education: BA+	-0.080***	-0.080***
	(0.001)	(0.001)
Non-Hispanic, Black	0.084***	0.085***
	(0.001)	(0.001)
Non-Hispanic, Other	0.039***	0.038***
	(0.001)	(0.001)
Hispanic	0.017***	0.016***
	(0.001)	(0.001)
Urban residence	-0.006***	-0.009***
	(0.001)	(0.001)
Any child < 6 years old at home?	0.004***	0.004***
	(0.001)	(0.001)
Enrolled in regular school	0.004***	0.004***
	(0.001)	(0.001)
Year FE	Yes	Yes
State FE		Yes
N	3,495,470	3,495,470
Rho	0.192	0.211
P-Value (Chi2)	0.000	0.000

Notes: This table reports average marginal effects of probit models computed as average changes in predicted outcome. Derivatives for factor variables is a discrete change from the base level. Regressions include state of birth and year of birth dummies. Robust standard errors are reported in parentheses. Stars indicate significance levels * p<0.05,** p<0.01, ***p<0.001

Table 7 IV(2SLS) regressions of Employment and Labor Force Participation

	Labor Force Participation		Employment	
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Veteran Status	0.770***	0.646***	0.742***	0.678***
	(0.130)	(0.118)	(0.143)	(0.131)
Disability status	-0.342***	-0.332***	-0.350***	-0.345***
	(0.011)	(0.010)	(0.012)	(0.011)
Female	-0.049***	-0.055***	-0.036***	-0.039***
	(0.006)	(0.006)	(0.007)	(0.006)
Married	-0.104***	-0.108***	-0.134***	-0.136***
	(0.004)	(0.004)	(0.004)	(0.004)
Divorced/Separated	0.038***	0.040***	0.069***	0.071***
	(0.002)	(0.002)	(0.002)	(0.002)
Education: <High School	0.107***	0.108***	0.164***	0.165***
	(0.001)	(0.001)	(0.001)	(0.001)
Education: Some college	-0.024***	-0.021***	0.012**	0.014***
	(0.004)	(0.003)	(0.004)	(0.004)
Education: BA+	-0.001	0.005	-0.007	-0.004
	(0.006)	(0.005)	(0.007)	(0.006)
Non-Hispanic, Black	-0.008***	-0.005***	-0.075***	-0.073***
	(0.001)	(0.001)	(0.001)	(0.001)
Non-Hispanic, Other	-0.044***	-0.042***	-0.065***	-0.062***
	(0.001)	(0.001)	(0.001)	(0.001)
Hispanic	0.020***	0.022***	0.004***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Urban residence	0.004***	0.006***	0.007***	0.011***
	(0.001)	(0.000)	(0.001)	(0.001)
Any child < 6 years old at home?	-0.061***	-0.061***	-0.062***	-0.063***
	(0.001)	(0.001)	(0.001)	(0.001)
Enrolled in regular school	-0.177***	-0.175***	-0.151***	-0.150***
	(0.002)	(0.002)	(0.002)	(0.002)
Year effects	Yes	Yes	Yes	Yes
State effects		Yes		Yes
Constant	0.740***	0.740***	0.742***	0.678***
	(0.012)	(0.011)	(0.143)	(0.131)
N	4,760,687	4,760,687	4,760,687	4,760,687
R-squared	0.064	0.093	0.100	0.113
F-statistics	155.12	182.1	155.12	182.1
Hansen J (P_value)	0.042	0.032	0.134	0.060

Notes: This table reports IV(2SLS) estimates of Employment and Labor Force Participation. First Stage regressions are not reported but joint significance F-Statistics are reported. Regressions include state of birth and year of birth dummies. Robust standard errors are reported in parentheses. Stars indicate significance levels * p<0.05,** p<0.01, ***p<0.001

5. Concluding Remarks

Using Integrated Public Use Microdata Series from 2008 to 2014 of the American Community Survey (ACS), I estimate the causal effect of military service, including military training and on-the-job experience on the employment of recent veterans. This paper contributes to the related literature on the employment effects of being a veteran by introducing a new set of instrumental variables in order to control for nonrandom selection into the military. The new set of instrumental variables exploit the variation in state-level military and economic characteristics when individuals are 17. These new instrumental variables, average unemployment during person's high school years and sum of veteran and military populations as a share of youth population in state, proved to be valid instruments that are sufficiently correlated with veteran status but uncorrelated with other determinants of the unemployment and employment outcomes.

I find that veterans are as employable as comparable non-veterans once they participate in the civilian non-institutional labor force and this employment effect does not change across sub-populations of gender and education which is consistent with findings by Routon (2014). However, I find that younger veterans and non-white veterans are more likely to be unemployed. On the other hand, using bivariate probit approach I find that veterans are more employable than nonveterans by about 7 percentage point. And this is closer to OLS results in magnitude. These estimates differ from the findings by Kleykamp (2013) which conclude that recent veterans are more likely to be unemployed and female veterans have steeper unemployment penalty. One possible explanation is that both papers use different methodology, different data set and different time range.

Although this new set of instrumental variables is showed to be valid by presenting supporting test results and related literature that used them previously, there is space for improvement. Instead of using state level characteristics, we could use smaller geographic variable if I have county of birth so that I could reduce potential measurement error. Another point to consider is that parental background information is valuable in predicting persons' choices over military enlistment. Although large, public use micro data samples do not include such information. The National Longitudinal Survey of Youth samples include this type of information but this valuable data lacks enough observation on veterans.

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