RESEARCH ARTICLE

Compulsory Military Service and Its Impact on Subsequent Civilian Wages: Evidence From Recent Young Veterans in South Korea

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Abstract: Using the Youth Panel survey spanning the years from 2015 to 2018, this paper attempts to find new evidence on the relationship between veteran status and subsequent civilian wages in the Korean youth labor market. As the estimated returns to conscription obtained from OLS are biased due to the non-random selection of the conscripts, this study accounts for this selection on observables by implementing a nonparametric propensity score matching (PSM) method. Through the use of the PSM framework, this article provides some evidence in favor of the existence of negative wage impacts of compulsory military service, suggesting that the costs of performing military service outweigh its benefits. The results from the PSM approach highlight the importance of selection effects in the relationship between conscription and subsequent civilian labor market outcomes of conscripts by illustrating the direction of selection bias and the large discrepancy between OLS and PSM estimates.

Keywords: Compulsory military service, conscription, young veterans, civilian wages, South Korea

Military recruitment practices vary considerably both across countries and over time. Since the end of the Cold War, a number of countries, such as France and Germany, have abolished compulsory military service (CMS). Most recently, CMS ended in Taiwan (officially the Republic of China) in 2018, despite the ongoing possibility of military conflict with China. However, many countries, especially in Europe, have still relied and continue to rely on the CMS system to build up armed forces (e.g., Austria, Greece, Russia, and Turkey). South Korea (hereafter denoted as Korea) is also among the dwindling number of countries that still use mandatory military service as a way of maintaining its armed forces. Yet, various other countries around the world are still seriously considering a transition to an all-volunteer force. In Korea, the issue of ending CMS has recently been raised again by the Institute for Democracy, a think tank of the ruling party. Motivated in part by recent decisions/discussions to end CMS, there is renewed interest in investigating the relationship between military conscription and several life course outcomes, including earning (e.g., Paloyo, 2010; Angrist & Chen, 2011; Angrist et al., 2011; Grenet et al., 2011; Card &

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Cardoso, 2012), education (e.g., Cipollone & Rosolia, 2007; Maurin & Xenogiani, 2007; Keller et al., 2010; Bauer et al., 2012), health (e.g., Dobkin & Shabani, 2009; Autor et al., 2011), and even crime (e.g., Galiani et al., 2011).

Because CMS most often occurs when young men (and sometimes women) make important decisions related to various facets of life such as education, employment, and marriage, it is not an isolated event in the life-course transition into adulthood. Most young men in Korea, for instance, are typically called for military conscription during a period of their lives that they would otherwise devote to higher education; conscripts are typically between 19 and 23, which coincides with one's college years. In this case, the time spent in the military means that men who served in the military as conscripts (i.e., veterans) graduate from a higher educational facility at a later age than men who were exempted from military service (i.e., nonveterans). More generally, from the human capital perspective, veterans may suffer from a deterioration of their human capital stock previously accumulated through education and work experience prior to military conscription during military service. This is because CMS is a uniformed life event that occurs in a period of conscripts' lives that is usually characterized by human capital investments, which are disrupted by military conscription.

Given the importance of military conscription in young people's life-course pathways, understanding the impact of CMS on a wide range of labor market outcomes is of great importance not only for young men facing the risk of military conscription but also for policymakers. Policymakers, in particular, need to know these impacts to decide whether veterans need to be given some sort of government compensation or benefit. If CMS has significant negative implications on subsequent civilian labor market performance, one needs to determine ways of ensuring fair compensation or benefits for veterans. Until recently, however, relatively little attention was paid to examining the costs and benefits of young men serving their conscription tour of duty in Korea. Given the fact that Korea has maintained a policy of military conscription since the 1950s, empirical analysis of labor market challenges facing veterans relative to nonveterans has been much neglected so far in the economics literature.

This paper attempts to present new empirical evidence on the labor market impact of CMS in Korea by focusing on subsequent civilian wages of young veterans. However, identifying these effects is problematic due to unobserved factors that could bias the estimated wage effects of veteran status. Because men who enter the military in Korea are actually screened for minimum standards of health and intellectual capacity that may be difficult to measure in surveys and that may be directly related to subsequent labor market outcomes, veterans are not a random subset of all men. In order to consider this selection bias issue that may be present in nonexperimental data, this paper adopts an estimation approach based on the propensity score matching (hereafter denoted as PSM) method. The PSM is a technique that allows researchers to estimate the difference in outcomes between the treated group and the control group that is attributable to a particular program (e.g., CMS). More specifically, the PSM is a commonly used quasi-experimental approach for estimating causal treatment effects using observational data. The PSM method controls covariate imbalance that produces the selection bias and ensures that the results are unaffected by biases that may arise from individual unobserved characteristics. This is crucial because it facilitates interpretations of the findings as the reflection of differences in the policymakers' perspectives.

Background

One of the classic topics in the literature on the individual impacts of military conscription is given to the economic costs of CMS. Although conscription is generally well-known as an inexpensive way for the government to provide military service, much prior research has focused on the estimation of the implicit income tax placed on people who serve in the military, with evidence suggesting that CMS imposes opportunity costs on the conscripts which do not show in fiscal budgets and that the social cost of CMS is sizeable (note: this tax equals the difference between the income that conscripts could earn in the civilian labor market and the usually lower income from CMS.). For instance, Lau et al. (2004) showed that the opportunity costs imposed on conscripts exceed budgetary costs by the maximum amount conscripts are willing to pay to avoid conscription in Germany. Many existing studies in the economics literature on military service also suggest that the voluntary military system

should be preferred due to structural inefficiencies and potential long-run costs that may arise in CMS (Bauer et al., 2012). Although these opportunity costs and externalities are important, this paper, instead of estimating them, concentrates on the topic of labor market implications of CMS.

Following the elimination of CMS in the United States in 1973, there has been a substantial increase in the number of publications on the estimation of the effects of CMS on important components of one's life course, such as socioeconomic attainment (e.g., Little & Fredland, 1979; Martindale & Poston, 1979; DeTray, 1982; Card, 1983; Fredland & Little, 1985; Angrist & Krueger, 1994; Paloyo, 2010; Teachman, 2004; Angrist & Chen, 2011; Card & Cardoso, 2012). A large part of the study in this area has mainly focused on the impact of military conscription on subsequent civilian wages. In theory, the wage consequence of CMS in the subsequent civilian labor market is ambiguous because the stock of human capital brought to the labor market depends on the stock acquired in the military relative to the stock foregone as a consequence of the time of military service and, therefore, the net effects of the transmission mechanism is unclear (Bryant & Wilhite, 1990). One may argue that human capital (such as skills, knowledge, experience, and abilities) previously acquired before military service and not used in the military may depreciate while on active duty. If military experience is not considered as equivalent to labor market experience by civilian employers, then veterans would suffer a wage penalty in the subsequent civilian labor market (i.e., forgone labor market experience). These costs can get larger as the length of military service increases. In contrast, some researchers claim that the military can serve as a means of obtaining enhanced human capital skills and experience that can substitute for civilian labor market experience. Bryant and Wilhite (1990), for instance, argued that outside of the public education system, the military is probably the largest institutionalized source of training. If education or training received in the military improves veterans' productivity that can transfer to the civilian labor market through increased human capital, then there would be a veteran wage premium.

The empirical evidence has also not reached an agreement on the labor market value of CMS, even though much of this literature generally agrees that military conscription is one of the major determinants of wage levels in the subsequent civilian labor market. Stated another way, the conclusions of various empirical studies on the impact of CMS on subsequent civilian wages are mixed, that is, the wage premium vs. the wage penalty. Revealed preference arguments suggest that CMS exerts a negative influence that leads to a wage penalty for veterans in the subsequent civilian labor market (e.g., Martindale & Poston, 1979; Schwarts, 1986; Imbens & vad der Klaauw, 1995; Buonanno, 2006; Keller et al., 2010; Bauer et al., 2012). Nevertheless, some studies have argued that there exists a positive relationship between military conscription and subsequent civilian wages, particularly for minorities (e.g., Little & Fredland, 1979; Martindale & Poston, 1979; DeTray, 1982; Berger & Hirsch, 1983). Using the Vietnam draft lottery as a natural experiment, Angrist (1990) found that CMS reduced wages by about 15% for American conscripts relative to their nonveteran counterparts of the same cohort. Angrist and Krueger (1994) argued that WWII veterans earn less than nonveterans in the United States. Imbens and Van der Klaauw (1995) showed that conscription in the Netherlands reduced wages for conscripts by about 8% when compared to the earnings of non-drafted men during the 1980s and early 1990s. In contrast, Albrecht et al. (1999) found conscription increases civilian wages in Sweden. Bauer et al. (2012) and Grenet et al. (2011) claimed that there are no wage consequences of conscription for West German and British veterans, respectively. In a recent re-analysis of Vietnam-era draftees, Angrist and Chen (2011) showed that 50-year-old Vietnam-era veterans' earnings only slightly differ from that of nonveterans.

Compulsory Military Service in Korea

Military service systems can be generally divided into two categories: Compulsory systems and voluntary systems, and the form of the system should be determined by taking into account such factors as geopolitical situation, the tendencies of neighboring states, political and economic situations, nationality, culture, and tradition. Because Korea shares a tense relationship with North Korea, as well as the fraught geopolitical situation in Northeast Asia, CMS is seen as essential to national defense in Korea. In a compulsory system, military service is required under all citizens of a nation (regardless of gender and political and

religious affiliation) are responsible for the defense of their country.

CMS system was introduced in the early 20th century in Korea. The changes in the military service administration have followed the development of the country since the Liberation of Korea in 1945. On November 13, 1945, the U.S. Military Government Office hastened the establishment of the regular armed forces by carrying out Military Administration Order No. 28. On April 8, 1946, the Ministry of National Defense was established as a result of the reorganization of the Military Government Office, but a systematic military service administration was not yet established. The pullout of the U.S. troops after the establishment of the Republic of Korea Armed Forces necessitated the reinforcement of the military defense power. Thus, the Ministry of National Defense started the preparation of the Military Service Law for establishing a mandatory conscription system and announced the Act on the Temporary Measures for the Military Service for Establishment of the Volunteer Military Personnel to Save the Nation to recruit reserve forces on January 20, 1949. This Act was a temporary act until the establishment of the full version of the Military Service Law. On August 6, 1949, the Military Service Law consisting of 8 Chapters and 81 Articles and Addenda was announced. This law details conscription rules, and according to this law, everyone over 20 years of age must receive a physical examination for potential conscription. For the first time in history, a nationwide conscription physical examination was held on January 6, 1950, but due to the cap on the size of the 100,000 Persons Structure Restriction of the Armed Forces, the need for such regular conscription was deemed unnecessary, and the Military Service Bureau was dissolved on March 4, 1950 (note: for details, visit the official government website of the Ministry Manpower Administration - www.mma.go.kr.).

Today, Korea still relies on the CMS system to acquire the necessary manpower for military service. For all Korean citizens, military conscription is legislated as one of the Four Constitutional Duties along with taxes, education, and labor. Article 39(1) of the Constitution of Korea (1987) provides that all citizens shall have the duty of national defense under the conditions prescribed by the Constitution. The current Military Service Act (2011) however, applies only to male citizens of a particular birth cohort aged between 18 and 35. Under Article 3(1) of this law, men of Korean nationality must sincerely fulfill their military service obligation in a satisfactory manner. The current military service system requires all able-bodied men above 19 years old—no disabilities, for example—to serve in the armed forces for up to 21 months. Women are exempt from CMS, but they are allowed to join the army as professional military officers if they so desire.

In principle, the regulations governing conscription are simple. Articles 8 to 14 of the Military Service Act (2011) stipulate that all males of a particular birth cohort are automatically registered as conscripts. Conscripts are called up for mandatory medical and psychological examination in the year they turn 19 years old to determine whether they are fit for the military service, and are placed in seven grades of military suitability:

(1) those who are healthy enough to perform active or recruit military service are placed in Grade I, II, III, or IV, according to their physical constitution and the state of their health;
(2) those who are incapable of active or recruit military service, but capable of second militia service (i.e., civil defense in peace), are placed in Grade V;
(3) those who are incapable of military service owing to any disease or mental and physical incompetence, are placed in Grade VI; and
(4) those who are unable to be graded according to subparagraphs (1) through (3), owing to any disease or mental and physical incompetence, are placed in Grade VII.

Based on the grades described above, most Korean males are categorized as being fit for service in the military. There is no element of choice or discretion. The first three grades are assigned to active military service, the fourth to recruit military service, the fifth to military service in time of war only, the sixth to complete exemption from military service, and the seventh is required to complete a repeat checkup within two-year. There are some forms of exemption from military service. However, exemptions for having certain medical conditions having excess tattoos, being overweight/underweight, holding foreign citizenship or residency, and being of non-Korean ethnicity have

all been restricted. Exemptions are mainly limited to physical or mental deficiencies. There is no exemption for conscientious objection. After a June 2018 Constitutional Court decision, the government is required to provide alternative forms of national service for conscientious objectors. To be assigned to recruit military service, a conscript must qualify for exemption from active military service. In addition, males that are physically and mentally fit are not necessarily called up immediately. Those who are enrolled in high school or higher education can defer their military service until age 28. After reaching the age limit, postponement is no longer possible. Males with temporary health problems are also deferred from service within a period of 60 days from the date of being declared temporarily unfit initially by the draft medical examination.

Throughout the 20th century, a series of laws reduced the duration of military service from its maximum of 36 months just after the Korean War (June 1950-July 1953). Between 1968 and 1977, the duration of service also reached 36 months. The most recent change was made in July 2018, which shortened the duration of active military service ranges 18 to 22 months. Depending on the branch involved, the duration of service varies as follows: 18 months for the Army and Marine Corps, 22 months for the Air Force, and 20 months for the Navy. In the case of recruit military service, the duration of service is up to 23 months. According to Articles 26 to 33 of the Military Service Act, recruit military service is mainly performed as public service personnel at national or local government agencies, public organizations, or in social welfare facilities, for the purpose of public interests. All those who have completed active military service or recruit military service are required to perform a combined 160 hours of reserve training in each of the eight years following discharge.

The YP2007 Data

The paper makes use of data taken from the latest four waves of the Youth Panel (hereafter denoted as YP) survey, from 2015 through 2018. The Korea Employment Information Service Labor Institute (KEIS) initiated the YP survey in 2001 with the main aim of providing comprehensive information and national-level estimates for the Korean youth population regarding school activities, socioeconomic activities, labor force behavior, and other associated events. The YP is a micro-level, ongoing, nationally representative, and publicly available data set (note: a detailed description of the Youth Panel survey can be found online on the official Employment Survey website at https://survey.keis.or.kr/index.jsp). The first project began in 2001 and was completed in 2006 with a total of six surveys collected over the period (hereafter denoted as YP2001). The YP2001 has provided information on the youth who were born during the years 1972 through 1986. To compensate for the aging issues of the YP2001 sample, the second version of YP was started in 2007 on a sample of 10,206 that represents Korean youth with an age range of 15 to 29 years as of 2007, by adding a new set of more recent and representative statistics of current youth (hereafter denoted as YP2007). The YP2007 has provided information on the youth who were born during the years 1978 through 1992. Such an accumulation of data is not only very useful for the researchers in investigating both the career path planning and the process of transition of youth from school to the labor market but also highly useful for policymakers in resolving youth labor market issues by properly utilizing it.

For the present study, the YP data offers several advantages compared with other available datasets in Korea. Fortunately, individual military service records are available in the YP survey. Characteristics of military service, such as current veteran status, are measured using a set of retrospective questions embedded in various rounds of the survey that allow the identification of persons who have served in the military. The dataset also includes detailed information about demographic, social, and economic characteristics that enables one to control for several factors that may affect the relationship between military conscription and subsequent civilian wages. In other words, the YP is a unique survey simultaneously containing information about military service records and labor market activities for approximately 10,000 nationally representative current youth in Korea.

Several restrictions are imposed on the YP2007 data spanning the years from 2015 to 2018 to define the sample used for the current analysis. Women are excluded from the original sample because the current effective conscription law applies only to males in Korea. Veterans who served as professional military personnel are also excluded. This restriction is mainly

driven by the desire to focus on men who served as conscripts. The latter selection helps to identify a more accurate relationship between military conscription and subsequent civilian wages in this analysis. The study further restricts only salaried workers, so that self-employed and unpaid family-employed workers are excluded from the sample. These restrictions result in a sample of 9,081 young men. There are 8,407 (resp. 672) individuals who are veterans (resp. nonveterans), making up about 92.6 % (resp. 7.4%) of the sample. Table 1 provides definitions of the full set of variables used in this work. Table 2 reports the sample statistics of the variables used in the analysis, separately for veterans and nonveterans for the baseline sample in this study.

Empirical Model and Methodology

The main aim of the paper is to evaluate the impact of veteran status on subsequent civilian wages in the youth labor market in Korea. For this purpose, the following wage equation of the form is estimated:

$$lnW_{it} = \beta_0 + \beta_2 \text{VETERAN}_{it} + X_{it}\beta_2 + \varepsilon_{it} \quad (1)$$

where i indexes the individual. The dependent variable lnW_{it} represents the log monthly wage of the individual worker i earned in year t. The treatment variable VETERAN_{it} is a dummy variable, equal to 1 if the individual who served in the military as a conscript (i.e., veterans) and 0 otherwise. X_{it} is a vector of

Table 1

Definition of Variables

Variables	Definitions
(Panel *A*) Dependent Variable:	
LNMW	The natural logarithm of monthly wages
(Panel *B*) Socio-Demographic Characteristics:	
VETERAN	Dummy variable: 1 if veteran status
MARRIED	Dummy variable: 1 if married
HEAD	Dummy variable: 1 if head of household
SEOUL	Dummy variable: 1 if living in the capital area (i.e., Seoul, Incheon, and Gyeonggi-do)
YREDU	Years of education completed as well as qualifications
(Panel *C*) Employment Characteristics:	
EXT	Years of potential labor market experience (age - years of education - 6)
EXPSQ	Quadratic (squared) years of potential labor market experience /100
TENURE	Years of job tenure on current job
PUBLIC	Dummy variable: 1 if employed in the public sector
PERT	Dummy variable: 1 if permanent employment contract
FULL	Dummy variable: 1 if full-time employment
UNION	Dummy variable: 1 if member of labor unions
Firm Size	
SMALL	Dummy variable: 1 if working in a firm that has less than 300 workers
MEDIUM	Dummy variable: 1 if working in a firm that has 300 to 999 workers <Reference group>
LARGE	Dummy variable: 1 if working in a firm that has more than 1,000 workers

Table 2

Summary Mean Statistics

Variables	Veteran	Nonveteran
(Panel *A*) Dependent Variable:		
LNHRW	14.813(0.376)	14.645(0.425)
(Panel *B*) Socio-Demographic Characteristics:		
MARRIED	0.369(0.483)	0.214(0.410)
HEAD	0.497(0.500)	0.374(0.484)
SEOUL	0.530(0.499)	0.394(0.489)
YREDU	11.695(1.611)	11.120(1.715)
(Panel *C*) Employment Characteristics:		
EXT	14.015(4.469)	12.497(4.678)
EXPSQ	2.164(1.288)	1.780(1.322)
TENURE	3.600(3444)	3.410(3.246)
PUBLIC	0.118(0.323)	0.128(0.334)
PERT	0.879(0.326)	0.820(0.385)
FULL	0.976(0.154)	0.970(0.170)
UNION	0.169(0.375)	0.135(0.342)
Firm Size		
SMALL	0.586(0.493)	0.664(0.473)
MEDIUM	0.116(0.320)	0.088(0.283)
LARGE	0.298(0.457)	0.248(0.432)

Note. Standard deviations are in parentheses.

Note. The sample is salaried workers from the YP data spanning the years from 2015 to 2018, including 8,409 veterans (92.6%) and 672 nonveterans (7.4%).

the explanatory variables listed in Table 1 and is a conventional mean zero disturbance.

The Mincer wage equation is a highly stylized model with the wage effect of military service in the economics literature. The specification of a regression model for this study is also based on the Mincerian wage function that includes a dummy for veteran status among covariates. The dependent variable (lnW_{it}) is the natural of the monthly wages. The measure of veteran status (*VETERAN*), which is of central interest to this study, is a dichotomy, indicating whether the respondent is a veteran or not. If performing military service affects the productivity of conscripts, then veteran civilian wages should reflect that change. The basic assumption is that conscription increases or decreases the human-capital stock of conscripts and thus influences their subsequent civilian labor market performance. Because theory does not provide a clear guide as to the proper functional form, the semi-log function is adopted in this analysis. The semi-log function is the standard form for this type of model and transforms the distribution of wages from strongly skewed to normal. In addition, estimated parameters are easily transformed into percentage changes.

Measuring the wage effects of veteran status in the post-conscription era presents a classic treatment evaluation problem. However, identifying these effects is problematic. Given the non-random nature of the military conscription process, a fundamental concern for this study is that unobserved individual heterogeneity between veterans and nonveterans will confound the estimate of the impact of military conscription, that is, the endogeneity problem. As noted earlier, many young men in Korea were indeed exempted from conscription for health-related reasons that might affect their future labor market outcomes. To proceed more formally, under the potential outcome model developed by Rubin (1974), let V_{it} be a binary treatment indicator that equals 1 if the treatment is applied (i.e., an individual *i* served in the military as a conscript) and is 0 otherwise (i.e., an individual *i* with no military experience). X is a vector for determining personal and structural characteristics discussed in the previous section. The variable Y_i denotes potential outcomes (i.e., subsequent civilian wages) for an individual *i*. Y_{1i} (resp. Y_{0i}) is potential outcome under (resp. without) the treatment. Each individual has an outcome pair (Y_{1i}, Y_{0i}).

The paper is primarily interested in estimating the average treatment effect on the treated (hereafter denoted as ATET) as follows:

$$\Delta_i = E\{Y_{1i}|V_i = 1, X\} - E\{Y_{0i}|V_i = 1, X\} \qquad (2)$$

Δ_i is defined as the outcome differences between treated and untreated states. Eq. (2) therefore indicates a veteran wage premium or penalty in the subsequent civilian labor market. However, Δ_i can never be identified because individuals cannot be simultaneously observed in both states above. More specifically, because individuals are either $V_i = 1$ or $V_i = 0$ and $E\{Y_{0i}|V_i = 1, X\}$ cannot be observed, Δ_i is not directly observable. This is a missing counterfactual problem in treatment evaluations in this analysis.

Eq. (2) can be rewritten as:

$$\begin{aligned}\Delta_i = &[E\{Y_{1i}|V_i = 1, X\} - E\{Y_{0i}|V_i = 0, X\}] \\ &+ [E\{Y_{0i}|V_i = 0, X\} - E\{Y_{0i}|V_i = 1, X\}]\end{aligned} \qquad (3)$$

There are two terms on the right-hand side of Eq. (3). Both objects on the first term are observable, whereas the unobservable counterfactual situation ($E\{Y_{0i}|V_i = 1, X\}$) exists in the second term, often called selection bias. The key to effective treatment evaluations is to solve the problem of selection bias in the second term.

In theory, individuals who are randomly assigned to treatment or control groups are free from the troublesome selection bias issues. The randomization of individuals into a treatment (V_i=1) and a control group (V_i= 0) solves the missing counterfactual problem under the following assumption: $E\{Y_{0i}|V_i = 0, X\} - E\{Y_{0i}|V_i = 1, X\}$. In such situations, the control group serves as a perfect counterfactual, and thus the potential outcomes for individual *i* are given by

$$\Delta_i = E\{Y_{1i}|V_i = 1, X\} - E\{Y_{0i}|V_i = 0, X\} \qquad (4)$$

Unfortunately, the sample of veterans is generally not a random sample of the total working population in Korea. Veterans are individuals who perform military service because they are actually screened and are only deemed qualified for military service if they meet some criteria such as physical or psychological impairments, educational or behavioral standards, and so forth. Access to information on individual characteristics that determine draft status for CMS would enable researchers to identify the causal effects of veteran status by correcting for sample selection bias. However, this information is usually not available to researchers.

In reaction to such deficiencies, one potential alternative approach is to use instrumental variables (IV), which are correlated with veteran status but do not directly impact subsequent civilian wages. Some previous studies in the literature have already relied on the IV method to solve the problem of selection bias (e.g., Angrist, 1990; Angrist & Krueger, 1994; Imbens & van der Klaauw, 1995). In the case of the United States, for instance, conscripted military service was not universal but was the result of a draft lottery plus deferments and exemptions. This lottery aspect is advantageous because the control group is more likely a random assignment (see Angrist, 1990). However, it is hard to find suitable instruments for the probability of being drafted for CMS in the Korean context.

Another method to address the problem of unobserved heterogeneity is to use PSM estimators. The paper essentially adopts a PSM framework, generalized to check for the possible presence of biases arising from unobserved heterogeneity. To

identify any possible presence of biases arising from unobserved heterogeneity, this paper employs a PSM model where the propensity score is defined as the conditional probability of receiving a treatment given certain determining characteristics

$$pScore(X) = Pr\{Y_{1i}|V_i = 1/X\} - E\{Y_1|V_i/X\} \quad (5)$$

where $Y_{1i}|V_i$ is a binary term indicating exposure to the treatment, and X is a vector of determining characteristics. The PSM approach consists of matching treated (i.e., veterans) with untreated individuals (i.e., nonveterans) based on their observable characteristics X and then comparing the behavior of treated and untreated individuals that have the same treatment propensity score. ATET is obtained by averaging individual-level differences in behavior between treated and untreated groups.

There are a number of matching algorithms that can be employed. The most common matching algorithms used in PSM include nearest-neighbor matching, radius/caliper matching, kernel matching, and stratification matching (note: this paper will not discuss the technical details of each estimator here. See Becker and Ichino (2002) and Smith and Todd (2005) for more details.). Given that no particular matching algorithm is generally accepted as superior in every context (each involves a trade-off between efficiency and bias (Smith & Todd, 2005)), a nearest-neighbor matching technique is employed in this study. Nearest-neighbor matching is the most straightforward matching estimator, and this method is widely used in the literature. In this algorithm, the individual from the comparison group is chosen as a matching partner for the individual from the treated group that is closest in terms of the propensity score.

Results and Discussion

OLS Results

Table 3 reports the OLS results from the wage regression for the whole sample. This study estimates the following three specifications. Specification 1 (Model 1) contains only standard controls used in the conventional labor market analysis. In an attempt to account for both demand and supply of labor covariates, this specification includes a large set of controls for age, marital status, region of residence, educational attainment, the existence of labor union, full-time employment contract, public sector employment, firm size, and so forth. Specification 2 (Model 2) is a simple linear regression model including only a veteran status indicator (*VETERAN*) which is a key variable in this study as a single regressor. Model 2 illustrates a simple relationship between veteran status and subsequent civilian wages in the Korean youth labor market. Specification 3 (Model 3) adds a measure of veteran status (*VETERAN*) to Model 1. The central research question of whether a veteran wage premium or penalty exists will be answered in this model. Columns (1) through (3) show results for Model 1, Model 2, and Model 3, respectively. Each column represents separate regression estimates, and robust standard errors are reported in parentheses.

In regards to the hypothesis testing for coefficients in columns (1) - (3), obviously, the likelihood-ratio tests reject the null hypothesis that all slope coefficients in each regression are jointly zero at all conventional significance levels. Although coefficient estimates are presented based on a large number of variables, most findings are consistent with the results from conventional labor market studies, that is, wages are higher for individuals who are older, better educated, married, head of household, living in the capital region, of better labor market status (such as more labor market experience and longer job tenure), working at large firms. Turning especially to Model 3, the model itself appears to be well specified, with all covariates behaving according to prior expectations, explaining approximately 43% of the variation in wages. In terms of the impact of veteran status on subsequent civilian wages, the findings are robust across Models 3-4 in that the veteran status dummies (*VETERAN*) have a positive and statistically significant effect, indicating a veteran wage premium. This association is in accordance with the findings from a number of earlier studies in the literature, such as Little and Fredland (1979), Fredland and Little (1985), Hisnanick (2003), and Teachman and Tedrow (2007), among others. In Model 2, veteran status is clearly associated with an 18.3% pay raise (note: for dummy variables, $[e^{(\text{the coefficients of variables})} - 1] \times 100$ yields the percent change in wages). It indicates the raw wage differentials between veterans and nonveterans. Similar results are shown in Model 3. Young veterans are found to earn, on average, 4.2% more than their nonveteran counterparts. Although Model 3 still shows the existence of a significant positive wage premium

for veterans, the percentage of a veteran premium is sharply reduced. The magnitudes of the coefficient estimates generally become smaller when including additional controls. However, the results presented in Models 2-3 suggest that controls for both demand and supply of labor covariates explain approximately 80% of the veteran wage premium. In Table 3, veteran status is apparently associated with more favorable labor market characteristics and higher subsequent civilian wages within labor market characteristics. This would indicate that performing military service enhances better labor market characteristics of young men in Korea. Controlling for this positive effect is what lowers the pure wage premium.

Table 3

Veteran Status and Subsequent Civilian Wages - Full Sample

Variables	Model 1 (1)	Model 2 (2)	Model 3 (3)
(Panel *A*) Socio-Demographic Characteristics:			
VETERAN	-	0.168 (0.015)***	0.041 (0.011)***
MARRIED	0.063 (0.009)***	_	0.062 (0.009)***
HEAD	0.063 (0.008)***	_	0.063 (0.008)***
SEOUL	0.079 (0.006)***	_	0.078 (0.006)***
YREDU	0.054 (0.002)***	_	0.053 (0.002)***
(Panel *B*) Employment Characteristics:			
EXP	0.045 (0.004)***	_	0.044 (0.004)***
EXPSQ	-0.089 (0.014)***	_	-0.087 (0.014)***
TENURE	0.011 (0.001)***	_	0.011 (0.001)***
PUBLIC	-0.161 (0.010)***	_	-0.161 (0.010)***
PERT	0.203 (0.010)***	_	0.202 (0.010)***
FULL	0.311 (0.020)***	_	0.312 (0.020)***
UNION	0.116 (0.009)***	_	0.115 (0.009)***
Firm Size			
SMALL	-0.129 (0.010)***	_	-0.128 (0.009)***
LARGE	0.203 (0.011)***	_	0.064 (0.010)***
Constant	13.174 (0.041)***	14.645 (0.015)***	13.152 (0.042)***
Observations		9,081	
R-square	0.440	0.013	0.440
Prob. > F	0.000	0.000	0.000

Note. Standard errors in parentheses for OLS; *** p<0.01, ** p<0.05, * p<0.1.

Table 4 split the sample by education level to assess whether the wage premium associated with veteran status may vary by level of educational attainment. The basic idea behind this approach is that if CMS affects the subsequent civilian wages of conscripts, those effects impact certain groups of conscripts more than others. This approach, in part, tests whether CMS provides less-educated veterans with a bridging environment that facilitates the movement of veterans from pre-conscription life to post-conscription civilian life. It reflects the idea that CMS can be a second chance, a place of equal acceptance and involvement despite prior social disadvantages, a chance to get ahead, and an avenue for social and career mobility (Hisnanick, 2003).

Table 4

Veteran Status and Subsequent Civilian Wages - by Education Level

Variables	Model 1 (1)	Model 2 (2)	Model 3 (3)
(Panel *A*) Socio-Demographic Characteristics:			
VETERAN	0.139	0.017	-0.021
	(0.020)***	(0.021)	(0.018)
MARRIED	0.049	0.068	0.068
	(0.019)***	(0.017)***	(0.012)***
HEAD	0.077	0.054	0.052
	(0.016)***	(0.015)***	(0.011)***
SEOUL	0.024	0.064	0.102
	(0.013)*	(0.012)***	(0.008)***
(Panel *B*) Employment Characteristics:			
EXP	0.066	0.030	0.045
	(0.010)***	(0.009)***	(0.007)***
EXPSQ	-0.143	-0.004	-0.092
	(0.032)***	(0.031)	(0.027)***
TENURE	0.007***	0.012	0.014
	(0.002)	(0.002)***	(0.002)***
PUBLIC	0.020	-0.165	-0.193
	(0.027)	(0.029)***	(0.012)***
PERT	0.117	0.208	0.258
	(0.016)***	(0.017)***	(0.016)***
FULL	0.380	0.124	0.375
	(0.036)***	(0.036)***	(0.032)***
UNION	0.112	0.167	0.098
	(0.022)***	(0.018)***	(0.011)***
Firm Size			
SMALL	-0.097	-0.068	-0.160
	(0.026)***	(0.019)***	(0.013)***
LARGE	-0.025	0.082	0.069
	(0.029)	(0.023)***	(0.013)***
Constant	13.392	13.973	13.804
	(0.089)***	(0.076)***	(0.053)***
Observations	2,002	2,112	4,967
R-square	0.366	0.413	0.430
Prob. > F	0.000	0.000	0.000

Note. Standard errors in parentheses for OLS; *** p<0.01, ** p<0.05, * p<0.1.

In Table 4, three models are well specified, with high school graduates in column (1), junior college graduates (2-3 year program) in column (2), and university graduates in column (3), reporting R^2 statistics 0.37, 0.41, 0.43, respectively. The results for three different education groups show that the wage impact of veteran status varies substantially by the level of schooling but in a non-uniform fashion. There is only limited evidence of the veteran wage premium, with an approximately 15% wage premium occurring among veterans with a high school diploma (Model 1). No wage effects are evident for veteran status among both junior college (Model 2) and university graduates (Model 3). It is interesting to note that in the case of young high school graduates in Korea, CMS could represent an important opportunity to overcome the limitations imposed by a deprived educational background and veteran status could be more likely used as a better indicator of potential (labor) productivity. This evidence is generally consistent with the findings from previous studies on the bridging hypothesis that CMS acts as a bridge between a disadvantaged background and a more advantaged social position (e.g., Binkin et al., 1982; DeTray, 1982; Berger & Hirsch, 1983; Xie, 1992; Seeborg, 1994; Sampson & Laub, 1996).

PSM Results

The OLS results in Tables 3-4 suggest that veteran status is generally associated with considerable wage premiums and CMS among college and university graduates is potentially much more of a policy concern relative to the case of the high school graduate workforce in Korea. However, one must be cautious about reaching this conclusion, and some checks are necessary to ensure the reliability of these results, as OLS regression techniques implicitly assume that veterans and nonveterans all belong to the same unobserved characteristics distribution. This may not be the case. As noted earlier, many nonveterans in Korea were indeed exempted from CMS due to unmeasured individual characteristics concerning the relative value of labor market activities, such as physical inadequacies or insufficient education. Therefore, the estimated wage returns to veteran status obtained from OLS regression are biased due to the non-random selection of the conscripts. Some previous studies in the literature have suggested that the veteran wage premium observed in the OLS models is upwardly biased as a consequence of either selection bias or unobserved heterogeneity, generally attributed to higher ability levels of veterans (e.g., Bauer et al., 2012; Card & Cardoso, 2012; Paloyo, 2010). To ensure that the OLS estimates presented in Tables 3–4 are as free from unobserved individual characteristics, the paper adopts an estimation approach based on the principles of PSM. Under the PSM approach, the analysis matches individuals with like characteristics and, therefore, deals directly with any concerns relating to selection bias arising from unobserved confounding factors. To the extent that veteran status is associated with unobserved heterogeneity, these would be constant across both the treatment and control groups, implying that the PSM estimates will be robust with respect to unobserved individual heterogeneity bias.

Table 5

The Impact of Veteran Status (*OLS vs. PSM estimates*)

Sample	OLS (1)	PSM (2)
Full Sample	0.041	-0.175
	(0.012)***	(0.024)***
Education Level		
HSCHOOL	0.139	-0.062
	(0.019)***	(0.042)
COLLEGE	0.017	-0.061
	(0.021)	(0.036)*
UNIVERSITY	-0.021	-0.209
	(0.018)	(0.034)***

Note. Standard errors in parentheses for OLS; for PSM Bootstrap standard errors
(150 replications); *** p<0.01, ** p<0.05, * p<0.1.

In Table 5, the results of the PSM estimation using nearest-neighbor matching are compared with those of OLS estimation, which does not control for unobserved heterogeneity. The PSM estimates for ATET and bootstrapped standard errors based on 150 replications are reported in column (2). Column (1) provides OLS estimates from Tables 3–4 for the sake of comparison. With regards to the PSM results, the average wage penalty of veteran status for the whole sample is estimated at -17.5%. Although one estimate for the group of high school graduates is not statistically significant, the estimates are very robust across three education groups in that young veterans suffer a significant wage disadvantage relative to

their nonveteran counterparts. Specifically, estimated wage penalties are found to vary considerably by education level, suggesting that veteran status is significantly associated with a wage penalty that ranges between approximately 6% and 21%, depending on the education category the veteran belongs to. The veteran wage penalty is at its highest for university graduates. Junior college-educated veterans also suffer a significant wage penalty, around the 7% level. There is no evidence that high school graduates suffer a veteran wage penalty. These results indicate that the PSM results do not support the interpretation of the OLS results presented in the previous section. Importantly, the results of the PSM estimation are essentially quite different from those of the OLS, indicating that there may be evidence of unobserved individual heterogeneity bias in OLS estimates of the relationship between veteran status and subsequent civilian wages. Unlike the OLS estimates, the PSM estimates here illustrate that veteran status substantially lowers levels of wages of young men in Korea. This may suggest that the OLS results overestimate the wage effects of veteran status due to selection on observables.

Although the PSM framework is employed in this study to reduce biases generated by unobserved confounding factors, effective PSM estimation requires a rich data set that contains sufficient control variables that allow the property score to be efficiently modeled and matching to be performed for the assumption of homogeneity to hold the determining variables much be balanced given the property score. Consequently, using standardized bias suggested by Rosenbaum and Rubin (1985), further post-estimation tests on the estimates generated here are carried out to ensure that the data are sufficient for the control and treatment groups to be balanced on all covariates. In Table 6, the results show that the standardized bias after matching approximately drops considerably, indicating that the good balancing of the data and its impact on the difference between veteran and nonveteran samples is substantial (note, balancing in this context means that there is a small difference between the mean of the covariates of treated and control groups. Also, the low *Psedu-*R^2 along each specification also provides further evidence that there is no systemic difference between treatment and control groups after matching. In conclusion, from a methodological perspective, the evidence of veteran status in the Korean youth labor market arising from the results of this paper is strong and robust.

Table 6

Balance Statistics for PSM (for the Veteran Group)

Sample	Pseudo R^2	Mean Bias	Median Bias
Full Sample			
Unmatched	0.356	25.8	19.7
Matched	0.038	6.5	4.5
Educational Level			
HSCHOOL			
Unmatched	0.416	35.3	31.1
Matched	0.020	7.4	5.8
COLLEGE			
Unmatched	0.266	23.1	18.8
Matched	0.072	5.2	3.7
UNIVERSITY			
Unmatched	0.519	31.5	24.6
Matched	0.085	6.8	5.5

Study Limitations

It is, nevertheless, important to note that this study has its limitations. Although the present paper attempts to correct or account for selection bias that can affect the results of the empirical analysis, it is generally not possible to consider all potential sources of selectivity in the wage equation. This is in part because it requires access to data that is not available in this study. The YP survey, for instance, does not contain data on specific reasons for exemption from military service that may be linked to wages of nonveterans, such as physical inadequacies, insufficient educational background, and various other domestic reasons such as the age limit, dual citizenship, and homosexuality. This information would help control for possible selectivity among nonveterans and test whether selection bias is considered the principal culprit in generating the significant effect of veteran status on subsequent civilian wages. In addition, the YP survey does not include information about performing military service that may actually impact the results of the analysis, such as military ranks, types of branches (i.e., the Army, Air Force, Navy, and Marine Corps), the military service period according to branch involved (e.g., 21 months for the Army and Marin Corps, 24 months for the Air force, and 23 months for the Navy, as of May 2011), and fields/occupations (such as infantry, armor, artillery, and engineering). Also, different kinds of applicants may have different perspectives on military service. Therefore, the results presented here may be subject to potential biases due to the omission of conscription-relevant information.

The results from the PSM approach presented in this analysis clearly highlight the importance of selection effects in the relationship between veteran status and subsequent civilian labor market outcomes of conscripts, such as employment and wages, by illustrating the direction of selection bias and the large discrepancy between OLS and PSM estimates. Although the PSM method employed in this study generally allows for selection bias on observables, this article does not claim to have necessarily solved the endogeneity problem. This is because the PSM technique simply estimates ATET and does not account for all potential sources of selectivity. It might also be a limitation of this study. Therefore, future research should take this source of bias seriously. The instrumental variables (IVs) approach could be considered an alternative treatment effects technique. This technique is used to determine the level of exogenous variation in the treatment and to make causal inferences.

Summary and Conclusions

CMS generally imposes certain restrictions on the education and employment decisions of young men. Military conscription in Korea is indeed required for most men between 18 and 35, and they often serve during college or in the early stages of their careers. This is especially a concern for Korea because the duration of military service is typically long. Since the 2010s, youth unemployment, economic instability, and social immobility have also led to growing social dissatisfaction with CMS in Korea. However, little attention has been paid to the costs and benefits of serving in the military for the conscripts themselves in Korea. In such circumstances, this paper attempts to examine the impact of veteran status on subsequent civilian wages within the Korean youth labor market. This issue is particularly relevant today in Korea as policymakers are considering more attractive and effective policies that would motivate young men to join military service, although the conscription is officially compulsory.

A proponent of maintaining CMS may point to the fact that, in terms of labor market outcomes such as employment and wages, veterans end up performing better than nonveterans. Using OLS regressions, the paper provides some evidence in favor of the existence of positive wage impacts of CMS, suggesting that the benefits of performing military conscription outweigh its costs. However, the estimated returns to CMS obtained from OLS are biased due to the non-random selection of the conscripts. The study accounts for this selection of observables by implementing a nonparametric PSM method instead of OLS. When the PSM approach corrects for the selection bias, CMS has a negative impact on the subsequent civilian wages of military conscripts, indicating that there are many young men who suffer a wage penalty associated with performing military service in Korea. It suggests that the OLS results could entirely be attributed to the manner in which conscripts were selected for military service. Consider the likely case wherein conscripts are healthier than their exempted counterparts, for

instance. To the extent that a better health status leads to better post-service labor market outcomes, it would be reasonable to say that veterans would have earned more than their nonveteran counterparts even without performing military service.

In summary, the two key arguments of the present study for advancing research on compulsory military service, at least in Korea, are as follows. First, because the estimated returns to compulsory military service obtained from the conventional OLS method are biased due to the non-random selection of the conscripts (such as unmeasured individual-specific characteristics like health and intellectual capacity), this paper accounts for this selection on observables by implementing a nonparametric PSM method. This PSM approach is used to control for unmeasured individual heterogeneity that could bias the estimated effect of being a veteran on subsequent civilian wages. Thus, this analysis would have more precise estimates of model parameters than the case of cross-sectional data. Second, through the use of the PSM framework, this article provides some evidence in favor of the existence of negative wage impacts of compulsory military service, suggesting that the costs of performing military service outweigh its benefits. Given this negative relationship between compulsory military service and subsequent civilian wages and the importance of conscription for active duty service in young men's life in Korea, policymakers need to determine whether the ways of fair compensation and benefits for those who served as conscripts.

Declaration of Ownership

This report is my original work.

Conflict of Interest

None.

Ethical Clearance

This study was approved by my institution.

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