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The Civilian Labor Market Experiences of Vietnam-Era Veterans: The Influence of Psychiatric Disorders

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Abstract

Background: Most research on the civilian labor market experiences of veterans has focused on the extent to which the skills and experience acquired in the military are rewarded in the civilian employment sector. While studies have been mindful of the need to analyze this question in a multivariate framework, controlling for other factors that might independently affect labor market outcomes, they have met this goal with limited success. As a result, an important element of the employment and wage determination process—psychiatric health—has been absent from this literature.
Aims of the study: Using a nationally representative survey of Vietnam-era veterans, this study analyzes the contribution of psychiatric health toward explaining differences in the post-service civilian wages, hours worked, and employment probabilities among male veterans.
Methods: The analysis is based on data from the National Survey of the Vietnam Generation, a survey, completed in the late 1980s, of persons who were on active duty during the years of the Vietnam War, 1964–1975. Three outcome variables are studied—the hourly wage rate, usual hours worked per week, and a 0–1 indicator for whether the respondent is currently working. Lifetime diagnoses of four categories of mental disorders—major depression, anxiety disorders, substance abuse/dependence, and combat-related posttraumatic stress disorder (PTSD)—were constructed from the US NIMH Diagnostic Interview Schedule, administered by the survey. The employment probability equation was estimated using probit; the hourly earnings and hours worked equations via ordinary least squares conditioned on being employed.
Results: The study finds that PTSD significantly lowered the likelihood of working and, for those veterans who were working, their hourly wages. On average, a veteran with a lifetime diagnosis of PTSD was 8.5 percentage points less likely to be currently working than was a veteran who did not meet diagnostic criteria. Among those who were employed, veterans with PTSD earned, on average, $2.38 less per hour ($3.61 in 1999 U.S. dollars). Anxiety disorders and major depression had nearly as large an effect on employment rates, as did PTSD. Major depression was also found to have lowered hourly wages by an average of $6.77 per hour ($10.17 in 1999 US dollars). However, psychiatric health did not affect typical hours worked per week.
Discussion: This study contributes new information to several literatures. Previous research on the extent to which PTSD interferes with readjustment to civilian life has focused on quality-of-life outcomes such as overall well-being, physical health, and homelessness. Previous research on mental health and earnings has focused on annual earnings. This study makes hourly wage comparisons, a closer measure of productivity differences since they represent differences in pay for the same input of time. Finally, this study demonstrates that the effects of psychiatric health are as important as the influence of non-health characteristics that are thought to signal earnings potential in the civilian labor market (education and experience). These findings, however, may not apply generally. The importance of PTSD may be specific to veterans of the Vietnam War and may not pertain to persons suffering non-combat-related PTSD.
Implications for Health Care Provision and Use and Health Policy Formulation: The magnitude of our estimates implies potentially large benefits from developing effective treatments for PTSD and from insuring access to these treatments.
Implications for Future Research: Future research should examine the relationship between work and PTSD in the general population and should explore the indirect effects of mental health, such as its effects on the post-service educational attainment and occupational choices of veterans.

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The civilian labor market experiences of veterans have been of long-standing interest to labor market scholars. Much research has focused on the extent to which the skills and experience acquired in the military are rewarded in the civilian employment sector. This interest is driven by policy efforts to compensate veterans sufficiently for their services. In their review of the literature and in their own analysis, Mangum and Ball conclude that the rewards vary by length of military service, era of service, education levels, and military occupation.[1] A newer generation of work has established that the observed differences between veteran and non-veteran civilian wages reflect, in part, a nonrandom selection process that leads to the enlistment of persons whose average civilian earnings potential differ from the average in the general population. When this process is accounted for in wage comparisons, the results suggest that male veterans from all eras incur a civilian wage penalty.[2,3,4]

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Most studies have been mindful of the need to analyze these questions in a multivariate framework, controlling for other factors that might independently affect earnings and that might also be correlated with covariates related to veteran status and military experience. Because of data limitations, however, studies have met this goal with varying levels of success. This paper examines an often-neglected element of the employment and wage determination process—psychiatric health. Research based on large-scale general population surveys, known for the sophisticated design of their psychiatric screening instruments, has shown that certain psychiatric diseases significantly lower income and employment opportunities.[5,6,7,8,9,10] Only one study has used these data to consider the consequences of emotional distress for the civilian labor market experiences of veterans, a particularly vulnerable population.[11]

Using a uniquely rich source of demographic and health data on Vietnam-era veterans, this article analyzes the contribution of psychiatric health toward explaining differences in the post-service civilian wages and employment probabilities among male veterans. We find that, relative to non-health characteristics, many psychiatric diseases have a surprising large influence on the earnings and employment rates of veterans.

Methods

Sample

Our empirical analysis is based on data from the National Survey of the Vietnam Generation (NSVG), a survey, completed in the late 1980s, of persons who were on active duty during the years of the Vietnam War, 1964–1975.[12] The primary goal of the survey was to assess the prevalence and effects of psychological problems among Vietnam-era veterans. The survey's method of psychiatric assessment closely parallels two concurrent general population surveys, the Epidemiological Catchment Area Survey (ECA) and the National Comorbidity Survey (NCS). The NSVG is better suited for our purposes, however, for it combines clinically based assessments of psychiatric health with detailed information on wartime experiences that might exacerbate the consequences of mental illness.

The NSVG is also unique among the three in providing data on hourly wages. Assuming that a person's wage rate is determined by his productive effort, in population-based surveys hourly wage comparisons are regarded as the closest measure of productivity differences, since they represent differences in pay for the same input of time. The annual earnings measures from the ECA and the NCS include non-labor income (welfare, disability and social security benefits, e.g.) and can vary across individuals because of differences in hours worked. Strictly speaking, however, hourly wage comparisons tell us whether the job performance of persons suffering from mental disorders is valued less by employers. Hence differences in pay rates may not be due solely to differences in productive effort but also may reflect pure labor market discrimination against persons with psychiatric diseases. More direct measures of employee productivity, however, are only available in specialized data sets for industries and firms where output is easily quantifiable.*

The NSVG administered the National Institute of Mental Health's Diagnostic Interview Schedule (DIS), a highly structured interview designed for use by laypersons and non-specialists to simulate clinical diagnoses of psychiatric disorders.[14] The survey derived two diagnostic variables for each of several specific psychiatric diseases. One variable indicates whether the individual met psychiatric criteria for an illness at any time in his life (referred to as a lifetime diagnosis); the other indicates whether a person with a lifetime diagnosis presented symptoms within six months of the interview date (referred to as a current diagnosis).

Reliability studies of the DIS have shown it to be far preferable to standard survey measures based on the respondent's self-assessment of overall emotional health. Self-reported measures display systematic biases that vary with gender, education and ethnicity. Such biases have been shown to confound multivariate estimates of the independent effects of socioeconomic background and the effects of health status on wages and employment rates.[15,16] However, in validity studies, the DIS diagnoses have been shown to have high rates of disagreement with diagnoses based on direct physician appraisals, particularly for those diseases that are relatively rare in the male population.[17] Savoca has shown that when psychiatric diagnoses are entered into a regression at a highly disaggregated level, these discrepancies lead to substantive differences in the estimated inferences about the earnings effects of psychiatric diseases, depending on which type of psychiatric assessment is the benchmark of the analysis, the DIS or a direct clinical exam.[18] To mitigate this problem we condense the diseases into three categories: major depressive episode, anxiety disorders (obsessive compulsive disorder, panic disorder, generalized anxiety disorder), and substance abuse and dependence (alcohol and drugs).

In our analysis, we also include survey diagnoses of posttraumatic stress disorder (PTSD), based on the Mississippi Scale for Combat-Related PTSD, an indicator that was found to have the highest concordance with direct clinical appraisals.[12]

The NSVG also differentiates veterans along two war-related characteristics: whether or not a respondent served in the war theater (Southeast Asia) and whether or not a respondent was exposed to high levels of war-zone stress. To construct the latter indicator, the survey developed an index of war-zone stress based on the respondent's degree of exposure to combat, to abusive violence inflicted on enemy soldiers or civilians, and to deprivation, and

* Berndt *et al.*[13], for example, analyze the productivity effects of mental disorders for employees at a large insurance claims processing company using, as their measure of productivity, employer records on the average number of claims processed per day for each employee in their sample.

on whether the respondent was taken as a prisoner of war. Correlations between these war-related characteristics and the incidence of specific psychiatric diseases reveal that, regardless of where they served, veterans exposed to low levels of war-zone stress had prevalence rates similar to the estimates derived from the ECA for the general population. Veterans exposed to high levels of stress, however, displayed significantly higher rates of virtually all types of psychiatric disorder.[19]

Table 1 reports summary statistics on all of the variables used in our analysis for both the full sample and the sample of employed veterans. Indeed, the data from both samples show that veterans exposed to high levels of war-zone stress not only have higher rates of combat-related PTSD but also substantially higher rates of most other types of psychiatric disorders. With a few exceptions the other variables need no additional explanation. Hourly wage rates are directly available for workers who reported their pay on an hourly basis. For workers who reported weekly, monthly, or annual earnings, instead, the hourly wage was constructed from information on usual hours worked per week. The number of chronic medical conditions is a self-reported measure of active physical health problems. Non-labor income refers to income brought into the household

Table 1. Sample descriptive statistics. means (standard deviations)

	Full sample		Employed sample	
	All veterans	Veterans exposed to high levels of war-zone stress	All veterans	Veterans exposed to high levels of war-zone stress
Dependent variables				
Employed	0.872 (0.334)	0.844 (0.364)	—	—
Hourly wage	—	—	15.484 (64.432)	15.889 (76.665)
Hours worked per week	—	—	44.973 (10.300)	45.168 (10.836)
Independent variables				
Health status[a]				
Anxiety disorder	0.166 (0.372)	0.301 (0.459)	0.139 (0.346)	0.244 (0.430)
Substance abuse/dependence	0.411 (0.492)	0.491 (0.501)	0.391 (0.488)	0.458 (0.499)
Major depression	0.056 (0.230)	0.145 (0.352)	0.040 (0.196)	0.100 (0.301)
Posttraumatic stress disorder	0.222 (0.416)	0.526 (0.500)	0.190 (0.393)	0.465 (0.500)
Number of chronic health conditions	2.205 (1.329)	2.630 (1.496)	2.083 (1.249)	2.468 (1.424)
Military experience				
Theater veteran	0.718 (0.450)	1.000 (0.000)	0.738 (0.440)	1.000 (0.000)
Length of service				
Less than 1 year	0.011 (0.105)	0.008 (0.092)	0.007 (0.085)	0.007 (0.082)
One to 3 years	0.746 (0.435)	0.770 (0.422)	0.763 (0.426)	0.786 (0.411)
Four to 20 years	0.144 (0.351)	0.162 (0.369)	0.139 (0.346)	0.157 (0.365)
Twenty years or more	0.099 (0.299)	0.060 (0.237)	0.091 (0.288)	0.050 (0.219)
Exposed to high levels of war-zone stress	0.248 (0.432)	1.000 (0.000)	0.240 (0.427)	1.000 (0.000)
Demographic variables				
Minority	0.512 (0.500)	0.563 (0.497)	0.501 (0.500)	0.548 (0.498)
Age	41.879 (6.313)	40.540 (4.165)	41.349 (5.277)	40.358 (3.826)
Currently married	0.739 (0.439)	0.688 (0.464)	0.763 (0.425)	0.732 (0.443)
Years of schooling	13.390 (2.457)	13.182 (2.360)	13.527 (2.401)	13.234 (2.349)
Non-labor income	7666.769 (9850.598)	8 469.193 (10 638.228)	7 971.055 (9945.916)	9 280.936 (10 997.450)
Region of residence				
Northeast	0.156 (0.363)	0.173 (0.379)	0.160 (0.366)	0.177 (0.383)
Midwest	0.183 (0.387)	0.179 (0.384)	0.183 (0.387)	0.194 (0.396)
Southeast	0.373 (0.484)	0.341 (0.475)	0.362 (0.481)	0.311 (0.464)
Mountain and Pacific	0.265 (0.442)	0.290 (0.454)	0.273 (0.446)	0.304 (0.461)
Puerto Rico	0.023 (0.150)	0.017 (0.129)	0.022 (0.146)	0.013 (0.115)
Job characteristics[b]				
Data	—	—	2.855 (1.868)	3.177 (1.954)
People	—	—	5.593 (2.442)	5.786 (2.330)
Things	—	—	4.457 (2.694)	4.602 (2.615)
Sample size	1417	352	1247	299

[a] The mental health variables indicate the presence (1) or absence (0) of a lifetime diagnosis.
[b] The job characteristics are coded on a scale of 0 to 6, 7, or 8, with zero denoting the most complex tasks. The variable Data ranges from synthesizing (0) to comparing data (6); the variable Things ranges from setting up (0) to handling (7) things (equipment, machines, tools, etc); the variable People ranges from mentoring (0) to taking instructions (8).

by other family members.* In addition to this and other demographic variables which tend to differentiate high-wage from low-wage workers (education, age, ethnicity, and marital status), the wage and hours worked analyses also include variables that reflect job characteristics. Following a coding scheme developed by the *Dictionary of Occupational Titles*,[20] we classified occupations according to the complexity with which the worker must deal with data, people, and things, with the lowest score denoting the highest level of complexity.

Model Specification

The earnings equation is an augmented version of the human capital earnings function.[21] The dependent variable is the natural log of the hourly wage. Potential lifetime work experience is measured by age, education by years of schooling. To the extent that workers are matched to jobs according to both measured and unmeasured productivity, the job trait variables are intended to control for differences in skills that remain after controlling for education and potential experience. These variables are potentially important control variables since the survey year (1986) coincided with a period during which labor demand shifted markedly toward workers with more technically oriented skills.[22] We also include regional dummies to control for differences in labor market conditions across geographic areas. Finally, in keeping with the literature, we allow for a potential difference in the returns to military versus civilian work experience by including a series of dummy variables for length of military service.

The hours worked and employment probability equations are modeled as labor supply decisions. They include variables that may influence a person's potential market wage: age, ethnicity, marital status, education, health, military experience, and region of residence. Labor supply decisions may also be influenced by non-labor sources of income.

The mental health variables included in all three equations indicate the presence or absence of lifetime diagnoses. Preliminary estimation investigated the possibility of interaction effects among the four disorders. Six of the interaction terms included in our regressions involved two-way interactions of each disorder with the other. We also interacted substance abuse with education. This latter decision was guided by the findings of Mullahy and Sindelar, who showed that alcoholism had its most depressing effects on the earnings of relatively less-educated men.[6] In the hours worked and work probability equations none of the interaction effects was statistically significant, either jointly or individually. In the log-wage equation all but one, substance abuse interacted with depression, was statistically insignificant, both individually and jointly. Consequently, the log-wage equation reported here includes only this interaction effect.

Since observations on wages and hours worked were restricted to employed persons, we investigated the potential for sample selection bias using conventional methods: Heckman's two-step procedure and full information maximum likelihood. We found little practical difference between the ordinary regression coefficients and the coefficient estimates corrected for sample selection bias. Furthermore, in the sample selection models, the estimated correlations between the error in the work probability equation and the errors in the log-wage and hours worked equations were statistically insignificant.

However, in Monte Carlo simulations, Leung and Yu have shown that when there is high collinearity among the regressors, the OLS procedure outperforms the sample selection procedure in several important respects, even when the sample selection model is the true model.[23] Summary measures of multicollinearity indicate a high degree in our data.* Hence, we have decided to take a conservative approach in estimation and interpretation. We focus our paper on the OLS results and apply our findings for hours worked and the hourly wage only to veterans who work, not necessarily to the general population of veterans. The employment probability equation is estimated on the full sample using probit.

We also examined the issue of the exogeneity of several of the regressors in our earnings and hours worked equations. Basic econometric intuition suggests that the OLS estimates, however large or small, may reflect a bias resulting from a possible simultaneous relationship. From a human capital perspective, expectations of high wages may induce greater personal efforts to maintain mental health. From a psychological perspective adverse economic circumstances may lead to the development of psychiatric disorders.[25] Moreover, studies have shown a strong correlation between mental health and, respectively, marital stability and educational attainment[5,7,26]—correlations so strong that one might reasonably suspect that unobservable personal characteristics may be driving the results rather than the measured covariates themselves. If this were so, then causal inferences drawn from OLS estimates would be suspect.

To resolve this issue, we carried out a Hausman test of the joint exogeneity of years of schooling, marital status, and the four mental health indicators. The instruments included variables for the educational attainment of each of the respondent's parents and variables which reflect the respondent's childhood environment and genetic predisposition toward psychiatric illness—whether the respondent was an only child, whether the respondent lived with

* The ideal measure of non-labor income would also include the respondent's own non-labor sources of income (interest income, rental income, transfer payments, etc). Unfortunately, we are unable to derive the amount from these sources.

* We used two diagnostic procedures for detecting collinearity. One, auxiliary regressions of the inverse Mills ratio on the regressors in the hours worked and log-wage equations, yielded an R^2 of 0.88 in both equations. These values are much higher than the R^2s in the hours worked and log-wage equations, 0.06 and 0.08, respectively. The other, the condition number for the moment matrix of the regressors, was approximately 1827 for both the hours worked and log-wage equations. Both numbers are far in excess of 30, the value that is considered the threshold for serious collinearity problems.[24]

both parents until age 16, and indicators for the extent of mental illness, substance abuse, and criminal behavior in the respondent's parents during his childhood. The chi-square statistics were 3.868 (p-value = 0.695) and 4.470 (p-value = 0.613) for the hourly wage and hours worked equations, respectively. Hence we are unable to reject the null hypothesis of joint exogeneity.

Since the hourly wage equation is specified in a log-linear form, the coefficient on a continuous regressor, such as years of schooling, age, and non-labor income, can be interpreted as the rate of return to an additional unit of that regressor. To interpret the effect of a dummy variable, D, on the hourly wage we compute $e^{\gamma} - 1$, the proportionate difference in the hourly wage for a person for whom $D = 1$ versus a person for whom $D = 0$, where γ is the coefficient of D in the log-wage equation. To derive the impact on the hourly wage of a dummy variable, D_1, whose effect interacts with another dummy variable, D_2, we compute $e^{\gamma+\beta\overline{D}_2} - 1$, the proportionate difference in the hourly wage for a person for whom $D_1 = 1$ versus a person for whom $D_1 = 0$ evaluated at the mean value of D_2, weighted by β, the coefficient on the interaction term in the log-wage equation.

Results

The first column of Table 2 reports results from the probit estimation of the employment probability equation. All four types of psychiatric disorder have statistically significant negative effects on the probability of employment. The findings for substance abuse and dependence conform to the results from numerous other studies of the employment rates of adult men.[5,6,7,9] The finding that depression has an even larger negative effect on the likelihood of working is consistent with Ettner, Frank, and Kessler, whose analysis of the NCS predicts that out of 13 specific psychiatric

Table 2. Estimates of hourly wages, hours worked and the probability of employment

Variables	Employment probability	Hours worked per week	Log of hourly wage
Health status[a]			
Anxiety disorder	−0.415* (0.129)	1.229 (0.918)	0.267* (0.087)
Substance abuse/dependence	−0.233** (0.106)	0.189 (0.614)	−0.083 (0.059)
Major depression	−0.390** (0.184)	−2.158 (1.581)	−0.970* (0.265)
Substance abuse × depression	—	—	0.943* (0.308)
Posttraumatic stress disorder	−0.498* (0.132)	−0.356 (0.871)	−0.171** (0.082)
Number of chronic health conditions	−0.165* (0.037)	−0.515** (0.247)	−0.004 (−0.023)
Military experience			
Theater veteran	0.600* (0.125)	0.589 (0.714)	0.050 (0.067)
Length of service			
One to 3 years	0.484 (0.446)	0.350 (3.416)	0.489 (0.323)
Four to 20 years	0.363 (0.458)	0.428 (3.501)	0.415 (0.331)
Twenty years or more	0.461 (0.476)	−0.313 (3.673)	0.109 (0.347)
Exposed to high levels of war-zone stress	−0.045 (0.139)	0.926 (0.775)	0.019 (0.073)
Demographic variables			
Minority	−0.316* (0.106)	2.391 (5.918)	−0.049 (−0.858)
Age (÷ 10)	2.574* (0.749)	−1.633 (0.603)	1.050*** (0.559)
Age squared (÷ 100)	−0.324* (0.078)	−1.312 (0.655)	−0.105*** (0.062)
Currently married	0.468* (0.108)	1.516** (0.699)	0.098 (0.065)
Years of schooling	0.068* (0.021)	0.081 (0.131)	0.048* (0.012)
Non-labor income (÷ 1000)	0.000 (0.000)	−0.000*** (0.000)	—
Region of residence			
Northeast	0.226 (0.323)	2.404 (2.126)	0.588* (0.201)
Midwest	0.054 (0.315)	3.356 (2.121)	0.612* (0.200)
Southeast	0.080 (0.300)	3.684 (2.046)	0.496** (0.193)
Mountain and Pacific	0.304 (0.308)	2.765 (2.062)	0.614* (0.195)
Job characteristics[b]			
Data	—	0.086 (0.194)	−0.026 (0.018)
People	—	−0.746* (0.161)	0.002 (0.015)
Things	—	0.024 (0.121)	−0.045* (0.011)
Intercept	−5.034* (1.851)	40.272* (13.937)	−1.627 (1.316)
Sample Size	1417	1247	1247
Log-likelihood	−394.149		
R squared		0.060	0.081

Note: The reference group is white veterans without a history of any psychiatric disorder, who served outside Southeast Asia, who were exposed to low levels of war-related stress, and who served for less than one year. They lived in Puerto Rico and were not married at the time of the survey.
[a,b] See notes to Table 1. * p-value < 0.01; ** 0.01 ≤ p-value < 0.05; *** 0.05 ≤ p-value < 0.10.

diseases major depression has the largest negative effect on male employment rates.[9] Anderson and Mitchell, however, find that depression is the only disorder that has no effect on the labor force participation rates of the working-age males included in the ECA.[11]

It is difficult to place the result for anxiety disorders within the literature since most studies of specific disease effects have focused on depression and alcohol and drug abuse.[5,6,27–31] Ettner, Frank, and Kessler, who control for five different types of anxiety disorder simultaneously, find that none individually affects male employment rates.[9] In bivariate comparisons, however, Eaton *et al*. and Blazer *et al*. find much higher rates of panic and generalized anxiety disorders among welfare recipients and others that are financially dependent on the government—persons who have the most difficulty holding a job.[32,33]

In column 2 we see that none of the psychiatric disorders has a statistically significant effect on the usual number of hours worked per week. With the exception of dysthymia, Ettner *et al*. obtain the same result for the men surveyed in the National Comorbidity Survey. Berndt *et al*. French and Zarkin, and Greenberg *et al*. have shown, however, that persons with anxiety disorders and other emotional problems tend to have higher rates of absenteeism.[34–36] Together these results suggest that survey questions about usual hours worked fail to elicit enough information about the respondent's work habits to reveal the full effects of psychiatric illnesses on labor supply.

Turning to the last column of Table 2 we find that depression and posttraumatic stress disorder have statistically significant negative effects on male hourly wages. Veterans suffering from PTSD are predicted to have 16% lower hourly wages than nonsufferers. Substance abuse and depression have a strong positive interaction effect. Evaluated at the means, the coefficients imply that a man suffering from major depression has a 45% lower hourly wage than that of a nonsufferer ($t = -2.14$). Substance abusers are predicted to earn 4.4% lower pay rates than those of other workers, although that effect is statistically insignificant ($t = -0.78$). The statistically insignificant coefficient for substance abuse/dependence comes as no surprise. Evidence on the wage effects of substance use has been inconclusive, varying not only in practical significance but also in sign. In studies based on the New Haven site of the ECA, Mullahy and Sindelar find that alcohol abuse/dependence significantly lowers the income of full-time male workers.[6,7] French and Zarkin find a nonlinear relationship between alcohol consumption and wages where heavy drinkers and those who abstain earn lower annual earnings than do moderate drinkers.[37] Register and Williams, Gill and Michaels, and Kaestner find that drug use is associated with higher wages among young adults.[30,31,38]

We did not expect to find a positive association between anxiety disorders and hourly wages. Blazer *et al*. find a strong negative association between occupational status and a diagnosis of generalized anxiety disorders, the most common type of anxiety disorder in our sample. That is, highly educated, high-wage workers have much lower prevalence rates.[33] In its *Diagnostic and Statistical Manual of Mental Disorders*, the American Psychiatric Association writes that impairment in occupational functioning is typically mild for generalized anxiety disorders and for most panic disorders but can be quite severe for persons with obsessive–compulsive disorder.[39] No study has found that persons with anxiety disorders are more productive on the job.

In both the employment and wage equations the coefficients on the standard demographic control variables have the expected signs. Each additional year of schooling raises hourly earnings by 4.8%. Hourly earnings initially rise with age but eventually the payoff to experience drops and after age 50 it becomes negative. This is a familiar pattern in almost all cross-sectional age–earnings profiles. Minorities earn 4.8% less than whites with identical backgrounds, married men earn 10% more than do other men, although these effects are not statistically significant. It is interesting to note that veterans placed in jobs that require skill in the use of machinery are amply rewarded. Those in jobs requiring the highest skill level earn 37% more than do veterans at the lowest skill level. Variables that are associated with high market earnings potential also raise the probability of working. There are large regional variations in wage rates but not in employment probabilities. Length of military service appears to have no effect on the likelihood of working or on hourly wages. Only physical health, marital status, sources of other income, and degree of personal interactions on the job have statistically significant effects on usual hours worked, all in the expected direction.

Studies of the difficulty Vietnam-era veterans faced in adjusting to civilian life emphasize the importance of actual exposure to combat experiences instead of service in Southeast Asia *per se*.[12] Some of our findings confirm this view. Veterans who served in Southeast Asia, 'theater' veterans, were actually more likely to be employed but having served in the war theater did not give rise to either a wage premium or penalty. A diagnosis of combat-related PTSD, however, significantly reduced both the likelihood of working and the hourly rate of pay.

Although exposure to war-zone stressors is a significant risk factor for posttraumatic stress disorder, not all veterans exposed to high levels of war-zone stress met the full criteria for this disease. To assess the potentially independent effects of extensive exposure on success in the civilian labor market we added a binary variable to our specification, which equals one if exposure to war-related stress was high, zero if not. As shown in Table 2, this variable was not statistically significant. Hence, although one-fourth of the veterans in our sample were exposed to high levels of war-zone stress, among them only those veterans who also met diagnostic criteria for psychiatric disorders were at a serious disadvantage in the civilian labor market.

Assessing the Practical Significance of the Results

To compare the effects of health to some important non-health factors it is helpful to consider the effects of

Table 3. The effects of two standard deviations and category changes in selected explanatory variables on the probability of employment and the hourly wage rate

Variable	Difference in employment probabilities	Percentage difference in the hourly wage rate
Minority versus white	−0.045*	4.76
Currently married versus not currently married	0.078*	10.27
Lifetime diagnosis of at least one substance abuse disorder versus none	−0.034**	−4.41
Lifetime diagnosis of at least one anxiety disorder versus none	−0.071*	30.54*
Lifetime diagnosis of major depression versus none	−0.070***	−45.23*
Lifetime diagnosis of posttraumatic stress disorder versus none	−0.086*	−15.75**
Number of chronic medical conditions one s.d. above the mean versus one s.d. below the mean	−0.063*	−0.97
Age one s.d. above the mean versus one s.d below the mean	−0.025	21.32**
Years of schooling one s.d above the mean versus one s.d. below the mean	0.048*	25.88*

Notes: The predicted probability of employment for an individual with characteristics X is computed according to $\Phi(X\hat{\beta})$ where Φ denotes the cumulative distribution function of the standard normal density and $\hat{\beta}$ the probit estimates reported in Table 2. The predicted proportionate difference in the hourly wage is computed as $e^{\beta} - 1$. The effect of a given change in a variable is computed setting the values of all others to their sample means. Standard errors are computed according to the delta method.
* p-value $\leq .01$. ** $.01 \leq p$-value $\leq .05$. *** $.05 \leq p$-value $\leq .10$.

comparable changes in the explanatory variables. Such comparisons are reported in Table 3. To explain the entries in this table consider the effect of a two standard deviation change in years of schooling, reported in the last row. Setting all other variables equal to their sample means, the difference between the probability of employment for a veteran with years of schooling one standard deviation above the mean versus a veteran with years of schooling one standard deviation below the mean is 4.8 percentage points. The entry in the next column indicates that the veteran with the higher years of schooling will earn 26 percent more per hour. The entries for dummy variables report the difference in employment probabilities and hourly wages when the category switches from 1 to 0. For example, evaluated at the sample means of all other variables, the probability that a veteran, who is currently married, will be employed is 7.8 percentage points higher than the likelihood of employment for other veterans. His hourly wage is 10 percent higher.

By these measures the most important determinants of the probability of employment are marital status and health, particularly the presence or absence of PTSD, anxiety disorder and major depression. The effect of PTSD is almost twice the magnitude of the effect of a two-standard-deviation change in years of schooling. The importance of health, however, is not confined to mental health status. The effect of physical health is nearly one-third larger than the effect of schooling.

These measures also imply that psychiatric health is of great importance in determining hourly wages. Working veterans suffering from major depression, on average, earn 45 percent less per hour than do veterans who do not suffer from this disease. This is nearly double the effect of a two standard deviation change in education. Posttraumatic stress disorder lowers hourly earnings, on average, by 16 percent, an amount that is 60 and 75 percent of the effects of education and experience, respectively.

Summary and Conclusions

In the 1980s, the US Congress passed legislation mandating the National Vietnam Veterans Readjustment Study. The primary objective of the study was to assess the prevalence of post-war psychological problems, with a particular focus on posttraumatic stress disorder (PTSD), and to determine the extent to which these problems interfered with readjustment to civilian life. Analyses of the data collected in this study have contributed much to our understanding of the factors, both pre-war and war related, that lead to the development of PTSD symptoms in adults.[40–42] Other studies have highlighted the relationship between PTSD and quality-of-life outcomes such as overall well-being, physical health, and homelessness.[43–45] This paper contributes to this literature with a systematic look at the long-term effects of psychiatric distress on the civilian labor market experiences of male Vietnam-era veterans.

We find that combat-related PTSD significantly lowers the likelihood of working and, for those veterans who are working, the hourly wage rate. By our measure, PTSD is, in fact, the most important determinant of the probability of employment. On average, a veteran with a lifetime diagnosis of PTSD is 8.6 percentage points less likely to be currently working than is a veteran who did not meet

diagnostic criteria for this disease. This effect is nearly double the difference between the likelihood of working for a veteran with 16 years of schooling versus one with 11 years. Among those who are employed, veterans with PTSD earn, on average, 16 percent less per hour.

We also find that other psychological diseases, in particular anxiety disorders and major depression, have nearly as large an effect on employment rates as does PTSD. Their effects are more important than the influence of non-health characteristics that are thought to signal high earnings potential in the civilian labor market (education and age/experience). Psychiatric health also affects on-the-job productivity as measured by the hourly wage rate. A working veteran who has suffered a major depressive episode incurs a substantial earnings loss, a 45 percent reduction in his hourly rate of pay.

Psychiatric health may assume added importance in the labor supply decisions of veterans as opposed to the general population because of the availability of VA disability compensation. However, Rosenheck, Frisman, and Sindelar have shown that the work disincentive effects of VA disability benefits are modest.[46] Hence our estimated effects of mental illness on labor supply and earnings most likely reflect its debilitating effects on work effort. The size of our estimates implies potentially large benefits from providing veterans with effective treatments for these diseases.

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