INSTITUTE FOR SOCIAL RESEARCH • SURVEY RESEARCH CENTER
MICHIGAN RETIREMENT RESEARCH CENTER
UNIVERSITY OF MICHIGAN

Working Paper
WP 2016-336

The Retirement and Social Security Benefit Claiming of U.S. Military Retirees

David Knapp, Beth Asch, Jim Hosek, and Michael Mattock

MRRC

Project #: UM15-Q1

The Retirement and Social Security Benefit Claiming of U.S. Military Retirees

David Knapp
RAND Corporation

Beth Asch
RAND Corporation

Jim Hosek
RAND Corporation

Michael G. Mattock
RAND Corporation

November 2015

Michigan Retirement Research Center
University of Michigan
P.O. Box 1248
Ann Arbor, MI 48104
www.mrrc.isr.umich.edu
(734) 615-0422

Acknowledgements

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement Research Consortium through the University of Michigan Retirement Research Center (5 RRC08098401-07). The opinions and conclusions expressed are solely those of the author(s) and do not represent the opinions or policy of SSA or any agency of the Federal Government. Neither the United States Government or any agency thereof, or any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.

Regents of the University of Michigan
Michael J. Behm, Grand Blanc; Mark J. Bernstein, Ann Arbor; Laurence B. Deitch, Bloomfield Hills; Shauna Ryder Diggs, Grosse Pointe; Denise Ilitch, Bingham Farms; Andrea Fischer Newman, Ann Arbor; Andrew C. Richner, Grosse Pointe Park; Katherine E. White, Ann Arbor; Mark S. Schlissel, *ex officio*

The Retirement and Social Security Benefit Claiming of U.S. Military Retirees

Abstract

After serving 20 years in the active component of the U.S. military, service members can retire from the military, as young as age 38, and begin collecting a monthly pension benefit for the remainder of their life. In this paper, we ask: do active duty military retirees exit the labor force earlier or later because of their access to military retirement benefits? Do they alter their Social Security claiming decisions? We theorize that access to a consistent source of income may encourage earlier retirement through a standard income effect, but the military pension may also increase a retiree's post-military job search, allowing for a greater wage and improved job satisfaction due to a better employer-employee match. Access to a steady source of pension income may also reduce short-term liquidity constraints, encouraging military retirees to delay claiming their Social Security benefit in order to benefit from delayed retirement. We estimate the impact of military retiree pension income on retirement empirically using the 1992 Health and Retirement Study cohort. We identify the military pension effect in a difference-in-difference model by exploiting a surprise change in military-retiree benefits in 2001 that extended Tricare health benefits to Medicare eligible military retirees and their spouses through the end of their lives. TFL eliminated the need to purchase Medigap coverage, thereby eliminating a cost that could cut into disposable income from their military annuity. A key limitation of the analysis is that the HRS includes relatively few military retirees.

Citation

Knapp, David, Beth Asch, Jim Hosek, and Michael Mattock. 2015. "The Retirement and Social Security Benefit Claiming of U.S. Military Retirees." Ann Arbor, MI. University of Michigan Retirement Research Center (MRRC) Working Paper, WP 2015-336.
http://www.mrrc.isr.umich.edu/publications/papers/pdf/wp336.pdf

1. Introduction

The current military retirement system has remained largely unchanged since the end of World War II, through historical periods marked by various military campaigns, ups and downs of the economy, and the transition from a draft to an all-volunteer force. The retirement system is a defined benefit plan that vests active-component members in an immediate annuity, regardless of age, roughly equal to half their basic pay at 20 years of service and growing to 75 percent for those with 30 years.[1] In 2012, there were 1,472,087 nondisabled military retirees, including 32,564 new retirees, with a combined 2012 fiscal year obligation of more than $42 billion in retirement benefits, not including the cost of medical benefits for these retirees (*Statistical Report on the Military Retirement System*, 2013).

Because of the high cost and the desire for more equity and for greater force management flexibility, the Department of Defense and the Congress are actively considering major reforms (Henning, 2011), and the National Defense Authorization Act of 2016, passed by both houses of Congress, included major military retirement system reform. Most of the recommended reforms to the system, including the reform included in the congressional legislation have argued for moving some of the deferred compensation to current compensation and for including an earlier-vested defined contribution plan. Some of the reform recommendations involve reducing the defined benefit annuity, including during the second career phase. For example a Department of Defense internal working group released a white paper in May 2014 outlining two concepts for military retirement reform. Both concepts would reduce the defined benefit annuity, with one imposing a larger reduction to the annuity during the "second career" phase extending from the start of military retirement to the end of work life.

---

[1] For members of the Reserve Components, the system vests after 20 years of service in an annuity that typically begins payout at age 60.

An extensive literature exists on the impact of military service on post-military outcomes including education, work, health, earnings, and disability (Angrist, 1990; Angrist & Chen, 2011; Angrist, Chen, & Frandsen, 2010; Autor & Duggan, 2008; Heaton, Loughran, & Miller, 2012). Far less work exists on the impact of military service on veterans' exit from the labor force and benefit claiming (including Social Security, Medicare, and private pensions) in old age. This paper explores the effects of military service on retirement from the labor force, as well as benefit claiming decisions of a specific subset of veterans, veterans who retired from the active component. Military retirees are comprised of veterans who have at least 20 years of active service and retire from the military, and are not discharged from the service dishonorably. Active duty military retirees have access to a pension that begins immediately and they have access to Tricare (the military healthcare system). We do not consider retirees from the reserve components because they are not eligible for an immediate annuity. We ask: Do active duty military retirees exit the labor force earlier or later because of these benefits? Do they alter their claiming decisions because they already have access to an annuity flow as well as ongoing access to health care?

Military retirees are a segment of the broader population who claim Social Security benefits and, of course, exit from the labor force. Examining how military retirees differ from the nonretired veteran and nonveteran populations will help us understand how post-service outcomes interact with a military retiree's benefits accrued during the service. They are a potentially distinct segment of the population, though given past studies that find a small effect of military service on post-service earnings, the retirement and claiming behavior of veterans might be generalizable to the population of nonveterans with similar personal and job characteristics. To identify the impact of military retiree pension income, we exploit a surprise change in military-retiree benefits in 2001. Prior to October 2001, military retirees eligible for Medicare at age 65 lost access to Tricare. As part of the National Defense Reauthorization Act of 2001, Congress created “Tricare for Life” (or TFL) by extending Tricare to Medicare eligible military retirees and their spouses through the end of their lives. TFL eliminated the need to purchase Medigap coverage, thereby eliminating a cost that could cut into disposable income from their military annuity. The average annual cost of a private Medicare supplemental plan (Medigap) was $1,524 per person in 2001 (ASPE Report, 2011), and we discuss below the implied change in the disposable military pension income as a result of TFL.

2. A One-period Model of Retirement

In this section, we introduce a one-period model of retirement. The model provides a logical framework for understanding how the existence of a military benefit may change the balance of work and retirement for the remainder of a military retiree’s life. This decision is based on one’s preference for consumption and leisure today, versus consumption tomorrow. Instead of splitting an individual’s choices into two periods (e.g., work and retirement), we instead opt for allowing the individual’s decision between work and leisure to occur on a bounded continuum (e.g. the lower bound of time is the date the military retiree exits military service, and the upper bound of time is an assumed known death date). This allows the individual’s decision-making to be more granular, reflecting the fact that the decision to leave the labor force is, in fact, a continuous one. In addition, we also consider the expanded role of searching for a better job after the military retiree exits military service. We theorize that the military retiree’s immediate annuity provides additional liquidity such that he or she can find a better job match. In doing so, the military retiree may take longer to find a job than they would in the absence of the military pension. A “better” job, however, may come with greater pecuniary and nonpecuniary benefits that may lead to either an increase or decrease in working life (relative to the case of no military benefit). We explore these ideas in the following model.

2.1 A one-period model with only work and retirement

Suppose an individual lives for one period. The individual receives utility $u(c_w)$ while working and utility $u(c_r)$ while retired. All consumption is immediate, i.e., all utility derived from current consumption is realized in the current period. Consumption while working is defined by an exogenous wage, w, and military pension, mb. Consumption while retired is based on government pension, ssb, and the military pension, mb. We ignore private pensions in this analysis. We assume the individual consumes only goods and his preferences exhibit diminishing marginal utility: $u'(c) > 0, u''(c) < 0$. Also, a worker's government pension depends on his work history, δ, but increases at a decreasing rate: $ssb'(\delta) > 0, ssb''(\delta) \leq 0$. Finally, there is a disutility to working, $\psi(\delta)$, that is increasing and concave: $\psi'(\delta) > 0, \psi''(\delta) > 0$. The worker's problem is to choose the fraction of the period, δ that will maximize the period's utility:

$$\max_{\delta} \quad \delta u\,(\,w + mb\,) + (\,1 - \,\delta\,)u\,(ssb(\delta) + mb) - \,\psi(\delta) \qquad \textbf{(1)}$$

Simply put, the individual chooses the δ such that

$$u\,(w + mb) + (1 - \delta)u'(ssb(\delta) + mb) \cdot ssb'(\delta) = u(ssb(\delta) + mb) + \psi'(\delta) \qquad \textbf{(2)}$$

For simplicity, we assume the wage, w, is constant, though later we allow the wage to increase with time devoted to search.[2] The optimization in (2) implies

[2] One explanation for this assumption is that the wage we are modeling is for individuals entering the civilian labor market after having a substantial earnings history in the military context. As such, most of the growth in earnings that is typical of an early career work are not expected at first hire. A typical life-cycle earnings profile calculated from the American Community Survey or Current Population Survey will rise sharply over the first two decades of employment before generally flattening around 45 and falling after 55. Therefore by assuming wage is not conditional on delta, we are assuming entry into employment at mid career (say age 45).

$$
\begin{aligned}
u'(w+mb)\partial w - u'(ssb(\delta)+mb)\cdot ssb'(\delta)\partial\delta \quad &= \quad u^{l}(ssb(\delta)+mb)ssb'(\delta)\partial\delta + \psi''(\delta)\partial\delta \\
+(1-\delta)u'(ssb(\delta)+mb)\cdot ssb''(\delta)\partial\delta & \\
+(1-\delta)u''(ssb(\delta)+mb)\cdot(ssb'(\delta))\partial\delta &
\end{aligned}
$$

$$
\begin{aligned}
u'(w+mb)\partial w \quad &= \quad u'(ssb(\delta)+mb)\cdot ssb'(\delta)\partial\delta \\
&\quad -(1-\delta)u'(ssb(\delta)+mb)\cdot ssb''(\delta)\partial\delta \\
&\quad -(1-\delta)u''(ssb(\delta)+mb)\cdot\left(ssb'(\delta)\right)^2\partial\delta
\end{aligned}
$$

$$
\frac{\partial\delta}{\partial w} \quad = \quad \frac{u'(w+mb)}{\begin{pmatrix} u'(ssb(\delta)+mb)\cdot ssb'(\delta) \\ -(1-\delta)u'(ssb(\delta)+mb)\cdot ssb''(\delta) \\ -(1-\delta)u''(ssb(\delta)+mb)\cdot ssb'(\delta))^2 \\ +u'(ssb(\delta)+mb\cdot ssb'(\delta)+\psi''(\delta) \end{pmatrix}} \quad \textbf{(3)}
$$

$$
\frac{\partial\delta}{\partial w} \quad > \quad 0
$$

This is the familiar result that an increase in the wage leads an individual to work more. There is no income effect here from a wage increase because we assume the agent does not have non-wage income as a result of savings. Consequently, there is no backward bending labor supply curve. As we'll see next, the income effect in the model occurs through the effect of the military retirement benefit on work. As $\delta \to 1, \frac{\partial\delta}{\partial w} \to 0$, implying that the individual will never actually work the entire period (i.e. $\delta \neq 1$).

Applying the model to understand the role of military benefits, equation (2) implies that the effect of the military benefit on the length of work, δ, can be described by:

$$
\begin{aligned}
&u'(w+mb)\partial mb && = \quad u'(ssb(\delta)+mb)\partial mb + u'(ssb(\delta)\partial\delta + \psi''(\delta)\partial\delta \\
&-u'(ssb(\delta)+mb)\cdot ssb'(\delta)\partial\delta && \quad\ +(1-\delta)u'(ssb(\delta)+mb)\cdot ssb''(\delta)\partial\delta \\
&+(1-\delta)u''(ssb(\delta)+mb)\cdot\left(ssb'(\delta)\right)^2\partial\delta &&
\end{aligned}
$$

$$\frac{\partial\delta}{\partial mb} = \frac{u'(w+mb)-u'(ssb(\delta)+mb)+(1-\delta)u''(ssb(\delta)+mb)ssb'(\delta)}{\begin{pmatrix} u'(ssb(\delta)+mb)\cdot ssb'(\delta)-(1-\delta)u'(ssb(\delta)+mb)\cdot ssb''(\delta) \\ -(1-\delta)u''(ssb(\delta)+mb)\cdot\left(ssb'(\delta)\right)^2+u'(ssb(\delta)+mb)ssb'(\delta)+\psi''(\delta)\end{pmatrix}}$$

$$\Rightarrow \frac{\partial\delta}{\partial mb} < 0 \qquad (\mathbf{4})$$

The last line follows because of diminishing marginal utility and an additional assumption that government pension benefits will never exceed the value of working, i.e. $ssb(\delta) < w$. Result (4) suggests that work will decrease as the military pension increases. This is the standard income effect on labor supply. A higher military retirement benefit increases nonwage income, and assuming leisure is a normal good, work will decrease.

2.2 A revision incorporating returns to search

We revise the model to incorporate the role of having benefits during job search. We incorporate search because military retirement benefits can self-finance search for a longer period, inducing individuals to search longer and leading to a better-matched job and longer work duration. A better-matched job could take the form of higher pay or greater nonpecuniary happiness while working. We model it here as higher pay (similar to (Card, Chetty, & Weber, 2007). Of course, like unemployment benefits in the Card et al. (2007), the presence of military retirement benefits can also have a moral hazard effect that leads to less search intensity in the sense that military retirement benefit smooths consumption between the search state and the working state, thereby reducing the incentive to search. Consequently, the effects of retirement benefits on search intensity can operate in opposing ways, as we show next.

Let the individual choose the length of job search, s, where the length of job search influences the wage while working, $w(s)$. The wage is increasing but diminishing in the length of search: $w'(s) > 0, w''(s) \leq 0$. The individual spends s percent of the period searching for work, δ working, and $(1-s-\delta)$ retired. While searching, the individual consumes only his military benefit. His resulting problem is:

$$\max_{s,\delta}\; s\cdot u(mb)+\delta u(w(s)+mb)+(1-s-\delta)u(ssb(\delta)+mb)-\psi(s+\delta) \qquad \textbf{(5)}$$

The resulting first order conditions would become:

$$\partial s: \quad u(mb)+\delta u'(w(s)+mb)w'(s) \;=\; u(ssb(\delta)+mb)+\psi'(s+\delta) \qquad \textbf{(6)}$$

$$\partial\delta: \; u(w(s)+mb)+(1-s-\delta)u'(ssb(\delta)+mb\cdot ssb'(\delta)=\; u(ssb(\delta)+mb)+\psi'(s+\delta) \qquad \textbf{(7)}$$

At an interior solution, where $s\in(0,1), \delta\in(0,1)$, and $(1-s-\delta)\in(0,1)$, then equations (6) and (7) are satisfied. It is clear from (6) and (7) that:

$$u(mb)+\delta u'(w(s)+mb)w'(s)=u(w(s)+mb)+(1-s-\delta)u'(ssb(\delta)+mb)\cdot ssb'(\delta) \qquad \textbf{(8)}$$

We can totally differentiate (8), rearrange, and get an expression for how the optimized length of work is affected by the military retirement benefit:

$$\frac{\partial\delta}{\partial mb} \;=\; \frac{\alpha_1}{\alpha_2} \qquad \textbf{(9)}$$

where,

$$\begin{aligned}\alpha_1 \;&=\; u'(w(s)+mb)-u'(mb)\\ &\quad +[(1-s-\delta)u''(ssb(\delta)+mb)ssb'(\delta)-\delta u''(w(s)+mb)w'(s)]\\ \alpha_2 \;&=\; u'(w(s)+mb)w'(s)+u'(ssb(\delta)+mb)ssb'(\delta)\\ &\quad -(1-s-\delta)u'(ssb(\delta)+mb)ssb''(\delta)\\ &\quad -(1-s-\delta)u''(ssb(\delta)+mb)\big(ssb'(\delta)\big)^2\end{aligned}$$

The denominator α_2 is positive. The numerator, α_1, includes two terms that have different signs. The first, $u'(w(s)+mb)-u'(mb)+[(1-s-\delta)u''(ssb(\delta)+mb)ssb'(\delta)$, is similar to the numerator in (4) above that captures the negative income effect of military retirement benefits on work. But, there is the addition of a positive term, $-\delta u''(w(s)+mb)w'(s)$, that accounts for the role of search. Additional search increases wages, and thereby increases the optimum amount of work. Thus, the effect of retirement benefits on work is now ambiguous.

We can also totally differentiate and rearrange (8) to get an expression for how the optimized amount of search is affected by the military retirement benefit:

$$\frac{\partial s}{\partial mb} = \frac{\alpha_3}{\alpha_4} \tag{10}$$

where

$$\begin{aligned} \alpha_3 &= u'(w(s)+mb) - u'(mb) \\ &\quad + [(1-s-\delta)u''(ssb(\delta)+mb)ssb'(\delta) - \delta u''(w(s)+mb)w'(s)] \end{aligned}$$

$$\begin{aligned} \alpha_4 &= \delta u''(w(s)+mb)w'(s)^2 + \delta u''(w(s)+mb)w''(s) \\ &\quad - u'(w(s)+mb)w'(s) + u'(ssb(\delta)+mb)ssb'(\delta) \end{aligned}$$

As in (9), the numerator in (10) has two opposing effects; military retirement benefit creates an income effect. The benefit smooths consumption between the search state and the working state, thereby reducing the incentive to search. But, the military retirement benefit also subsidizes search, increasing the incentive to search because increased search results in a higher wage while working. The denominator in (10) is ambiguous but is positive if $w''(s) > w'(s)^2$ and $w'(s) < ssb'(\delta)$.

It is clear that the signs of (9) and (10) are ambiguous and depend on the shape of the utility function and degree of risk aversion, the returns from work, and the government retirement benefit formula and how it depends on employment length. We can get more insight into these expressions by considering a more graphical interpretation of the theory that involves reorganizing (6) and (7), so that they can be stated as

$$MU_s = MU_r \tag{11}$$

$$MU_\delta = MU_r \tag{12}$$

where

$$MU_s = \delta u'(w(s) + mb)w'(s)$$

which is the gain in utility (coming from additional wages during work), and further

$$MU_\delta = [u(w(s) + mb - u(mb)] + (1 - s - \delta)u'(ssb(\delta) + mb) \cdot ssb'(\delta)$$

which is the gain in utility during the work period from additional work (normalized by no work – hence the subtraction of $u(mb)$) and the marginal gain of government pension benefits during retirement from additional work. Finally,

$$MU_r = [u(ssb(\delta) + mb) - u(mb)] + \psi'(s + \delta)$$

which is the gain in utility during the retirement period from additional work (normalized by no work—hence the subtraction of $u(mb)$) and the "disutility not incurred" from additional non-retirement.

We can gain a great deal of intuition about how search and work interact by making a simplifying assumption, namely that $\overline{r} = s + \delta$ is fixed. This will permit us to examine how decisions are made between searching and working, holding the total time in retirement constant. It follows from (11) that

$$MU_s = (\overline{r} - s)u'(w(s) + mb)w'(s)$$

$$\frac{\partial MU_s}{\partial s} = -u'(w(s) + mb)w'(s) + \delta u''(w(s) + mb)\big(w'(s)\big)^2 + \delta u'(w(s) + mb)w''(s)$$

$$\frac{\partial MU_s}{\partial s} < 0$$

and from (12):

$$MU_\delta = [u(w(s) + mb)] + (1 - s - (\overline{r} - s))u'(ssb(\overline{r} - s) + mb) \cdot ssb'(\overline{r} - s)$$

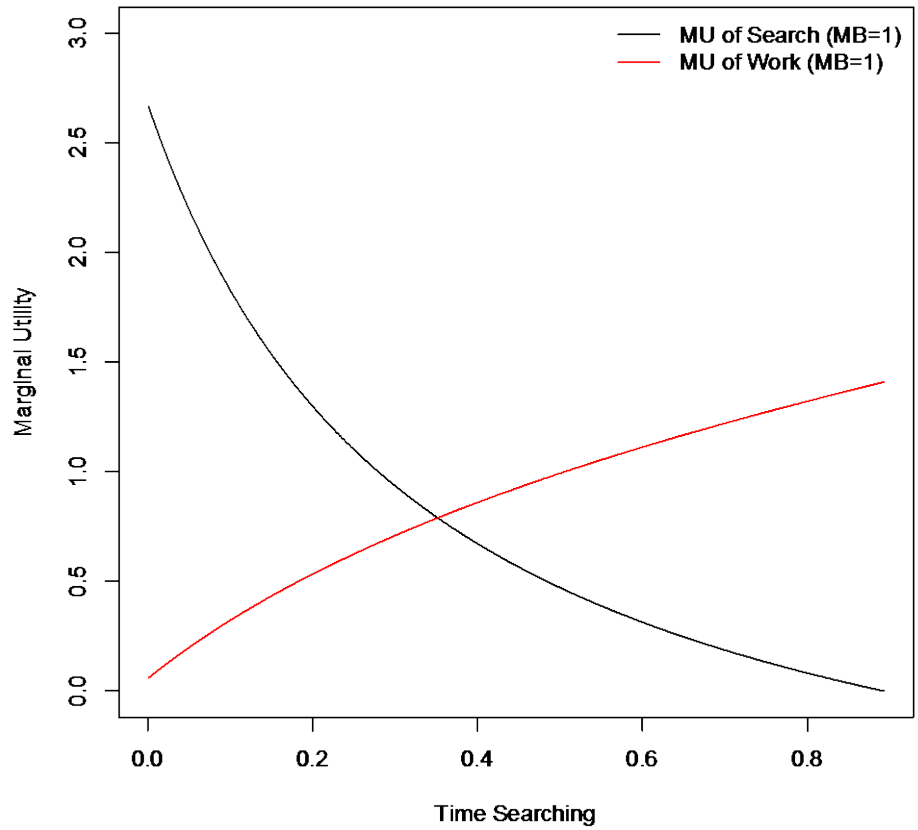
$$\frac{\partial MU_\delta}{\partial s} = u'(w(s)+mb)w'(s) - (1-\bar{r})u''(ssb(\bar{r}-s)+mb)\cdot\left(ssb'(\bar{r}-s)\right)^2$$

$$-(1-\bar{r})u'(ssb(\bar{r}-s)+mb)\cdot ssb''(\bar{r}-s)$$

$$\frac{\partial MU_\delta}{\partial s} > 0$$

Figure 1 presents this graphically assuming $u(c)$ is logarithmic in consumption (i.e. $u(c) = \ln(c)$).

Figure 1: Tradeoff between s and δ for a given r



In Figure 1, the individual chooses to expend more time searching if $MU_s > MU_\delta$, and likewise less time searching if $MU_s < MU_\delta$. Note that the x-axis adds up to $1-\bar{r} = s+\delta$. Extending this analysis to allow the MU_s and MU_δ to shift due to a change in military benefit, the math, for a given $\overline{r}$, indicates that both curves decrease in response:

$$MU_s = (\overline{r} - s)u'(w(s) + mb)w'(s)$$

$$\frac{\partial MU_s}{\partial mb} = (\overline{r} - s)u''(w(s) + mb)w'(s)$$

$$\frac{\partial MU_s}{\partial mb} < 0$$

and

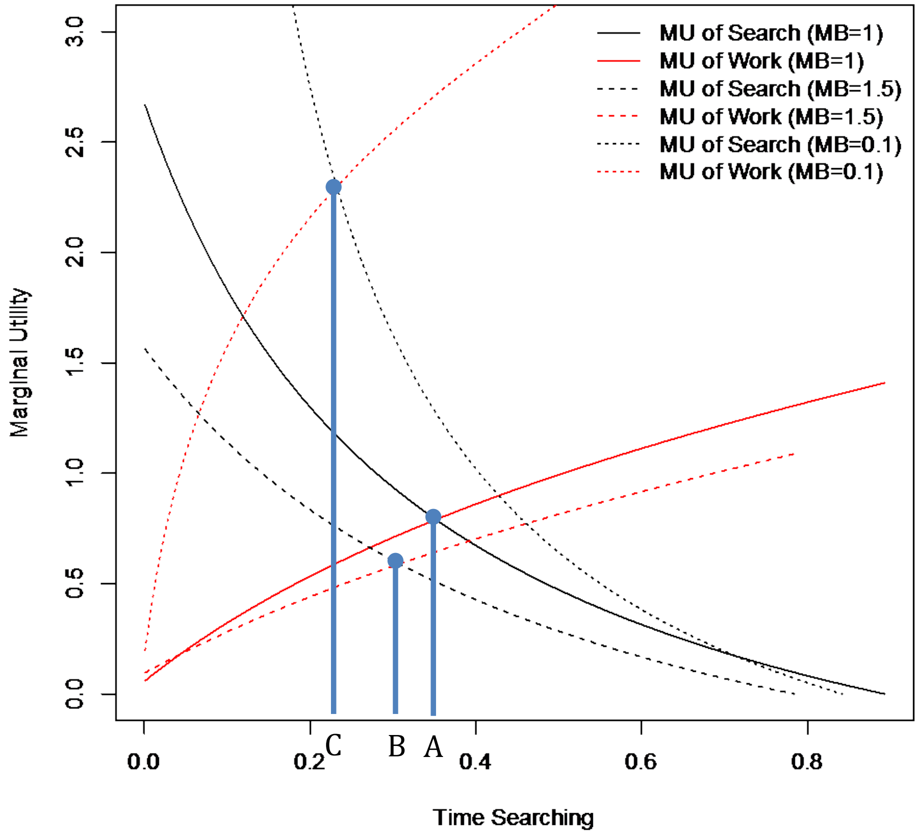
$$MU_\delta = [u(w(s) + mb) - u(mb)] + (1 - \overline{r})u'(ssb(\overline{r} - s) + mb) \cdot ssb'(\overline{r} - s)$$

$$\frac{\partial MU_\delta}{\partial mb} = [u'(w(s) + mb) - u'(mb)] - (1 - \overline{r})u''(ssb(\overline{r} - s) + mb)$$

$$\frac{\partial MU_\delta}{\partial mb} < 0$$

Similar to the introductory economics result that a decrease in demand and an increase in supply leads to an ambiguous change in quantity transacted, so too does an increase in the military bonus lead to an ambiguous change in search time and therefore work time. For example, in Figure 2, point A corresponds to the original time spent searching. Following an increase in military benefits, the new optimal search length is B. For a decrease in military benefits, the optimal search length is C. Allowing $1 - r = s + \delta$ to float and re-optimizing can lead to both higher and lower values of a military benefit leading to less search, which is what we observe in Figure 2.

Figure 2: Tradeoff between s and δ for the optimal level of r for a given level of military benefits



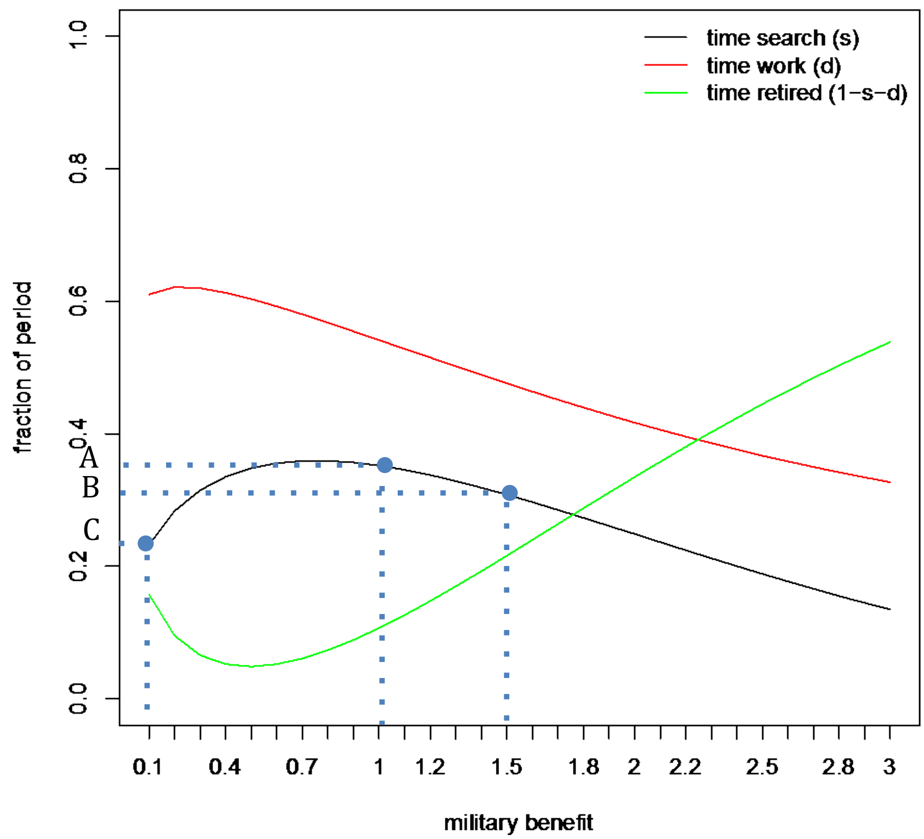
In Figure 2, we chose to depict time searching on the x-axis because it is more responsive to the military benefit when utility is logarithmic in consumption (i.e. $u(c) = \ln(c)$).

In Figure 3, we report the results from numerically solving equation (5) for alternative levels of military benefit. We confirm the intuition provided above: the military benefit provides an opportunity to search that leads to greater work. As the military benefit increases, the optimal level of search rises because more search increases wages. However, the optimal amount of search declines because the military benefit also smooths consumption between the search and working state, so there is less incentive to find work. Similarly for work, we only observe a positive association between work and military benefit at very low levels of the military benefit.

Given the specification shown in Figure 3, the main effect of the military benefit with respect to the amount of time worked is the negative income effect.

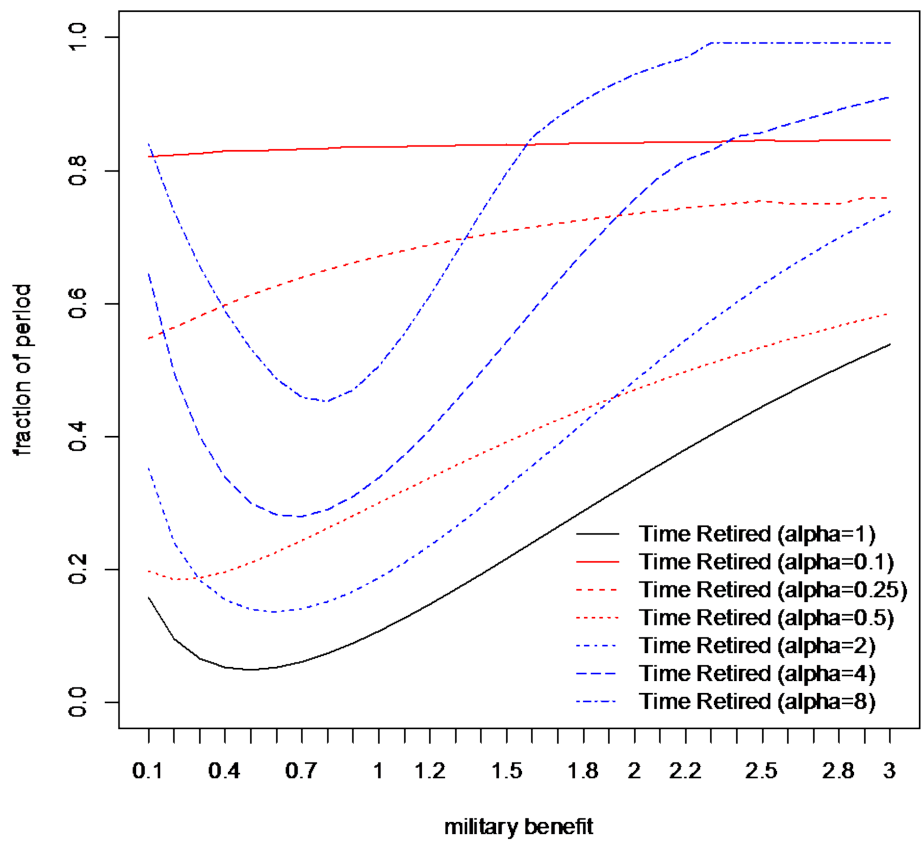
It is also interesting to note that in Figure 3, when the military benefit equals 1, the flow utility from additional government pension benefits is equal in magnitude to the flow utility from additional military benefit, i.e, ssb=mb. At this point, the returns from additional military benefits actually yield less time spent searching and working and more time in retirement.

Figure 3: Optimal time spent searching, working, and in retirement for varying levels of military benefit



We explore further how time in retirement (and conversely, combined time spent in search and in work) is related to the military retirement benefit in Figure 4. The above graphical results depend on the assumed returns from work, government retirement benefits, disutility of work, and the form of the utility. In Figure 4 we allow the utility to take on the more flexible CRRA form (i.e. $u(c) = \frac{c^{1-\alpha}-1}{1-\alpha}$, where $u(c) = \ln(c)$ if $\alpha = 1$ and plot the length of time spend in retirement. The figure shows that the level of risk aversion affects the relationship between military retirement benefits and time spent in retirement, and in particular, affects the range of benefits over which time spent in retirement decreases (rather than increases). We see that the military benefit encourages more combined searching for a better wage and work for more risk averse individuals (as $\alpha \uparrow$). At low levels of risk aversion ($\alpha \rightarrow 0$), additional military benefit leads to less work.

Figure 4: Optimal time in retirement for varying levels of military benefit and differing levels of risk aversion



The theoretical results reported here suggest that, relative to a world where the military benefit is zero, the existence of the military benefit can provide the opportunity for the military retiree to find a better job, thereby reducing time in retirement. At high benefit levels, however, the wealth effect of having more income overall can have a total diminishing effect on time spent working and an increasing effect on time in retirement. Our theory makes clear that the relationship between military retirement benefits and retirement is an empirical issue. We investigate this relationship empirically using the Health and Retirement Study (HRS), as described next.

3. Data

We use the 1992 cohort of the HRS. Members of this cohort or their spouses were between the ages of 51 and 61 in 1992. Consequently, the median age of this cohort will be 65 in 2001, the year of the expansion of Tricare for Life. The HRS has detailed information on individual work histories, the start and end of military service in the active component, their pension incentives, and retirement choices.[3]

Of particular interest to modeling retirement and claiming behavior is that the HRS has linked 82 percent of the original cohort to their Social Security earning histories, allowing a more detailed retrospective look into each individual's employment and pay history, as well as near exact calculation of their Social Security benefit. Moreover, if an individual reported having a defined benefit pension in 1992, the HRS, with the respondent's permission, reached out to the pension plan's managing organization and collected a detailed summary plan description. Based on this summary plan description, the HRS created a pension calculator that uses an individual's reported wages and work history to calculate the expected discounted present value of each

[3] We identify whether an individual is a veteran or a military retiree off of the question: "During what years were you in active service? (answer: from and to)". As a result, we are only capturing military retirees from the active component. It is possible that there are military retirees from the reserve component included in the veteran subgroup and not included in the military retiree subgroup. As mentioned earlier, since reserve military retirees are not eligible for an immediate annuity, they are not the focus of this research, however, eligibility for a reserve military retiree pension (since it occurs at age 60, but can be earlier based on years in the active component,) could be a source of useful variation for future studies.

individual defined benefit pension plan. Approximately 62.5 percent of the male population in the original HRS sample that reported having a DB pension had a summary plan description collected.

Table 1 reports the details of the sample selection. Approximately 43.6 percent of male HRS population served in the military, rising to 54 percent after we match based on Social Security earnings histories. Haider and Solon (2000) found that nonworking and nonwhite individuals were less likely to have their Social Security earnings matched, which may partially explain the large increase in the percentage of the sample having served. Following this initial cut, the proportion of the sample that served in the U.S. military and the proportion with 20 or more years of service is relatively constant at around 52.8-54.3 percent and 3.6-3.9 percent of the sample, respectively.

We select our sample conditional on working at age 55. Following Coile and Gruber (2007), we consider an individual working in the years before the first HRS interview based on whether or not they have nonzero earnings. An individual is considered to have retired before the first HRS interview if they have nonzero earnings in one year, followed by zero earnings the next.[4] During the HRS interview years, an individual's retirement date is based on the individual's self-reported retirement date, assuming it occurs at or after the first interview. The effect of these assumptions is to examine retirement from an individual's career job. As such, we also exclude individuals who are still in or who retired from the military in 1992 or later.

[4] We also consider individuals who have positive DB pension value during this time period as working. This has the effect of incorporating individuals who may be in non-Social Security covered occupations, such as the federal civil service, public teachers, etc.

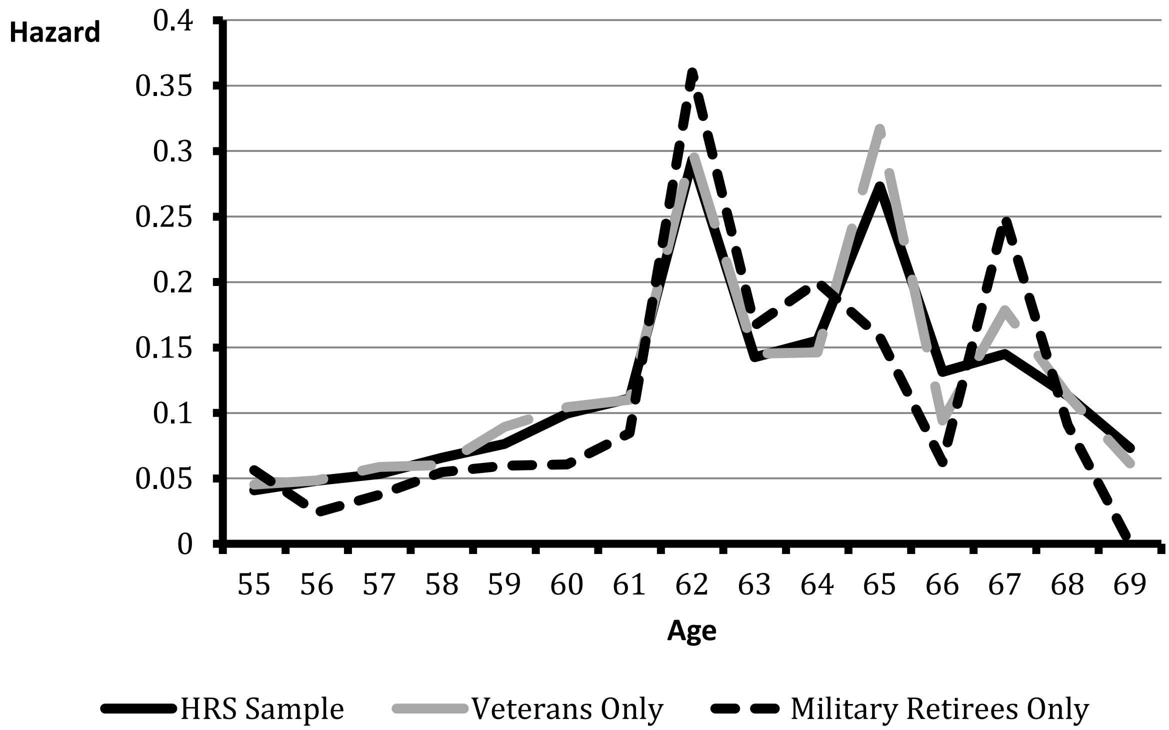
Table 1: Sample Selection

	Sample Size	Fraction Veteran	Fraction Military Retiree
Original Cohort	12,562	20.6%	1.4%
Restrictions			
Males Only	5,868	43.6%	3.0%
Matched Social Security	4,737	54.0%	3.7%
Non-missing DB pensions	4,252	54.3%	3.8%
Working at 55	2,850	52.8%	3.7%
Not in military in 1992	2,846	52.8%	3.6%
Person-Year Observations	21,716		
With nonzero weight	2,271	53.5%	3.9%
Person-Year Observations	17,050		

Figure 5 reveals the retirement hazard of the sample with nonzero sample weights.[5] The empirical hazards for the HRS and veteran (nonretiree) samples exhibit noticeable retirement spikes at age 62 and 65, coinciding with early and normal old-age Social Security benefit claiming ages, as well as the Medicare eligibility age.[6] Compared to the reported hazard of Coile and Gruber (2007), our hazard at every year is generally greater, with our hazard of exiting at age 62 at approximate 30 percent compared to their 20 percent.[7] For the military retiree sample, we observe an even larger spike at age 62 than the other two samples, as well as spikes in the retirement hazard at ages 64 and 67. The small spike in the retirement hazard at age 64 is associated with a large fraction of the remaining working military retirees that have defined

[5] A figure including individuals with a sample weight of zero has similar attributes.
[6] This is not surprising given that more than 50 percent of the HRS sample is also veterans.
[7] Coile and Gruber (2007) have a smaller sample size owing to the fact that they use an older data match between SSA and HRS, as well as the fact that they only see people through 2000, whereas we are using observations through 2012.

Figure 5: Retirement Hazard Function



benefit pensions leaving at this age. Notably, there is a large difference in the retiree vs. non-retiree hazard at age 65. The later retirement spike for military retirees could be related to the possibility that military retirement benefits induces greater search and more satisfying jobs with longer careers, as discussed in our theory.

A key adaptation in the above sample is that we have corrected the Social Security benefits for credits provided to those serving in the military. Service members began contributing to Social Security in 1957, and service members until 2001 were eligible to receive to $1,200 per year for their service. This value was not adjusted over this interval, so in real terms, the value of the additional credits was declining. Because service members did not contribute to Social Security before 1957, special service credits were given up to $1,920 per year ($160 per month of service). These credits enter as additional income when the Social Security Administration calculates an individual's average indexed monthly earnings (AIME). Table 2 reports the effect of including these additional benefits on the present value of individual's own Social Security benefit. The difference is substantial for military retirees, amounting to an additional 10 percent of expected lifetime benefits.

Table 3 compares descriptive statistics for our sample of males for nonveterans, veterans with less than 20 years of service, and veterans with 20 or more years of service. Military retirees from the HRS cohort are generally closer in background to veterans from the HRS cohort than nonveterans of the same cohort (in terms of education and demographics), but significant differences arise across all three groups. Military retirees, on average, are more educated, more likely to be married and nonwhite, and never apply for disability benefits relative to veterans. Military retirees generally have lower Social Security and DB pension wealth than veterans from the HRS cohort, but greater than nonveterans. In table 3, we also present potential earnings after 1992. Since SSA earnings information is only available for periods prior to the respondent giving the HRS permission, the effect is that earnings histories for many individuals are only available for prior to 1992. As a result, we project earnings using a weighted sampling of nonzero earnings in the five years preceding 1992.[8] Table 3, therefore, reports the potential earnings of those turning 55 at or after 1992, and the observed SSA earnings for those turning 55 before 1992. We will refer to them as potential earnings for ease of exposition. Given their greater education, it is odd that military retirees have a similar potential earnings and AIME to nonveterans, and have a lower potential earnings and AIME relative to veterans. Part of the lower potential earnings may be due to the relatively low tenure of military retirees in their second career, or the possibility that retirees choose jobs with greater nonpecuniary benefits due to their supplemental income

[8] This method was chosen to ease comparability with other estimates from the HRS, and is detailed in Kapinos, Brown, Nolte, Stolyarova, and Weir (2010).

from the military retiree pension. The lower AIME relative to veterans is due in part to the lower relative military pay during the retiree's service period. Our sample of military retirees largely served between 1951-1981. In the early years of the all-volunteer force, military pay was on par with civilian pay. However, in the late 1970s, military pay was below civilian pay (Nelson, 1986; Warner & Asch, 2001)

As part of our analysis, we include as control variables computations of Social Security and Pension Wealth (i.e. expected discounted present value) and forward-looking incentive measures, such as peak-value.[9] Ideally, we would estimate a structural model of individual decision-making after 55. A structural model would specify how an individual's choice of working today would impact future leisure via the individual's preference (utility) structure. It would also capture specific incentives built into the structure of an individual's Social Security and pension benefits conditional on that individual's work history. While such models are possible (see for example Knapp (2014)), they are more computationally demanding because the unique structure of an individual's pension incentives requires solving the model separately for each household, or the sample and research question needs to reflect a common pension scheme (e.g. Asch, Hosek, Mattock, and Panis (2008)'s work on the U.S. military; or Knapp, Brown, Hosek, Mattock, and Asch (2015)'s work on Chicago teachers' retirement incentives). A less computationally demanding alternative is to compute a forward-looking measure that captures the potential growth in pension wealth from continuing work. Coile and Gruber (2007) propose peak-value—which is the difference between the maximum possible value of pension wealth and the pension wealth if one retired today – as a possible forward-looking metric. We use peak-value in our main specification as a forward-looking measure of pension benefits.

[9] A more detailed account of alternative incentive measures that we considered, as well as how the wealth variables we calculated, is included in appendix A.

Referring to table 3, we observe that military retirees have a lower mean peak value for Social Security but a greater mean peak value for their defined benefit pensions than either non-veterans or veterans who are not also military retirees. On the one hand, this implies that Social Security is providing an incentive to claim Social Security benefits earlier. But on the other hand, it implies that the DB pension is providing a stronger incentive to continue working in order to get a larger defined benefit (conditional on having a DB pension). The greater incentive to keep working in the DB job is likely due to the late start due to the military retiree's military career.

Table 2: Comparison of Social Security Benefits' Present Value (1992 dollars) Before and After Accounting for Service Credits

	Before Credits	After Credit	Perc. Change
Veterans (non-Mil. Retirees)	$95,057	$96,734	1.8
Military Retirees	$86,041	$94,614	10.0

Table 3: Descriptive Statistics

	Non-Veterans	Veterans, non-Military Retirees	Military Retirees
Social Security Wealth ($100k)	0.861	0.956	0.940
Pension Wealth ($100k)	0.362	0.474	0.431
SS Peak Value ($100k)	0.096	0.082	0.067
DB Peak Value ($100k)	0.102	0.110	0.202
Earnings at 55 (1992 dollars)	28905	32076	29711
AIME	2311	2417	2305
<12 years of school	36.1%	17.1%	12.4%
12 years of school	29.7%	36.4%	24.7%
13-15 years of school	11.7%	22.3%	29.2%
16 years of school	8.5%	11.5%	16.9%
17+ years of school	13.9%	12.7%	16.9%
Non-White	22.0%	9.7%	16.9%
Married in 1992	86.6%	87.9%	92.1%
Ever apply for Disability (SSI/SSDI)	15.6%	12.8%	6.7%
Persons (N)	1056	1126	89
Person-Year Observations	8001	8334	682

Note: All descriptive statistics are at age 55, unless otherwise noted.

4. Empirical Specification

We use changes to military retirement benefits to identify the responsiveness of the work decision to additional annuity income. When Tricare was extended in 2001, many military retirees no longer needed to purchase supplemental Medicare plans. Indeed, between the 2000 and 2002 HRS interview waves, the number of males covered by Tricare increased by 96 percent for the 1992 entry cohort. The average annual cost of a private Medicare supplemental plan (Medigap) was $1,524 per person in 2001 (ASPE Report, 2011).

The extension of Tricare was unanticipated, so we estimate a difference-in-difference model of how the shock to income (via reduced deductible expenses for those older than 65 or reduced expected deductible expenses for those younger than 65) altered the military retiree's labor supply decision. Consider the following model, where R_{it} equals 1 if individual i exits the labor force at age *t*:

$$R_{it} = \beta_0 Military_{it} + \beta_1 TricareForLife_{it} + \beta_2 Military_{it} \times TricareForLife_{it} + \beta_3 X_{it} + \beta_4 A_t + \varepsilon_{it}$$

(13)

and where $Military_{it}$ is a categorical variable that can take a value of nonveteran, nonmilitary retiree veteran, and military retiree (baseline is assumed to be nonmilitary retiree veterans); $TricareForLife_{it}$ is a dummy variable capturing whether or not an individual is older than 65 and the year is after 2001, which is meant to reflect Tricare for Life eligibility. The coefficient on Tricare for Life is for the baseline group, nonmilitary retiree veterans. Because the Tricare for Life policy covered military retirees but did not cover other veterans and nonveterans, our hypotheses is $\beta_2 = 0$ for nonveterans, and β_2 for military retirees is statistically different than zero and positive Other covariates include X_{it}, a vector of control variables including the individual's expected discounted present values of pension benefits (Social Security and private DB pension wealth), the forward-looking measures of pension wealth, a control for lifetime income (an individual's AIME), and a control for potential earnings (predicted earnings based upon the pre-1992 Social Security earnings history), and other demographics and controls for spouse earnings and age differences; A_t is an age dummy; and ε_{it} is an iid error term. The difference-in-difference estimates could be interpreted as the effect of increasing retirement benefits, through the Tricare expansion, to military retirees.

The model presented in (1) is estimated as a probit model given the binary nature of the retirement outcome at ages 55 to 69. Observations are only included from age 55 until retirement. Retirement corresponds to the year an individual leaves the labor force. If an individual re-enters, they are not included in the analysis. The results are presented in Table 4. Model 1 in table 4 corresponds to a simple weighted specification of retirement on military service and demographic controls, while model (2) includes controls for Social Security and defined benefit pensions. Our omitted group is veterans from the HRS cohort who are married in 1992 and have 12 years of education.

In the first model, we find that military retirees, conditional on working at age 55, are less likely to retire, but the difference is not statistically significant. Individuals with more education are less likely to retire, especially individuals with 17 or more years of education (e.g. professional and master degrees). Even after controlling for education, nonveterans are less likely to retire. Nonveterans have lower Social Security and pension wealth, meaning that continued work may be due to necessity, e.g., liquidity constraints.[10] Of the age dummies, ages 62 and 65 have the largest positive associations with retirement, corresponding to the early and normal retirement ages. Individuals who ever apply for disability are also more likely to retire. These demographic associations persist across our different models, although some become more or less important.

[10] This idea is further supported by nonveterans being insignificantly different from veterans once we control for Social Security and pension wealth in model 2.

Table 4: Regression Results
Coefficient Estimates, Standard Errors in Parentheses

VARIABLES	(1)	(2)	(3)	(4)
Tricare For Life (=1 if Age 65+, Yr 2001+)		-0.209**	-0.395***	-0.391***
		(0.105)	(0.141)	(0.142)
Non-Veteran	-0.0684**	-0.0333	-0.275**	-0.162
	(0.0312)	(0.0333)	(0.134)	(0.151)
Military Retiree	-0.0564	-0.0773	-1.227***	-1.185**
	(0.0790)	(0.0848)	(0.448)	(0.518)
Non-Veteran X Tricare For Life		0.0287	0.288*	0.274
		(0.109)	(0.169)	(0.170)
Military Retiree X Tricare For Life		0.340	1.402***	1.375***
		(0.284)	(0.522)	(0.500)
SS Wealth		0.382***	1.034***	1.045***
		(0.0846)	(0.304)	(0.303)
DB Pension Wealth		0.0957***	0.245***	0.245***
		(0.0154)	(0.0758)	(0.0763)
SS Incentive Measure (Pk Value)		-2.205***	9.592***	9.905***
		(0.552)	(3.724)	(3.759)
DB Incentive Measure (Pk Value)		-0.271**	0.364	0.415
		(0.115)	(1.204)	(1.211)
Potential Earnings		-7.45e-07	-1.77e-09	1.73e-07
		(1.22e-06)	(2.86e-06)	(2.96e-06)
AIME		-1.36e-05	-0.000103	-0.000110
		(2.61e-05)	(7.98e-05)	(8.16e-05)
Loves to Work				0.184
				(0.119)
Loves to Work X Non Vet				-0.295*
				(0.169)
Loves to Work X Mil. Ret.				-0.0817
				(0.458)

<12 years of education	-0.00565	0.0315	-0.0444	-0.0577
	(0.0398)	(0.0406)	(0.119)	(0.118)
13-15 years of education	-0.0797*	-0.0722	-0.0318	-0.0410
	(0.0433)	(0.0440)	(0.124)	(0.124)
16 years of education	-0.0843	-0.0931*	-0.158	-0.170
	(0.0526)	(0.0545)	(0.127)	(0.128)
17+ years of education	-0.0818*	-0.0946*	-0.183	-0.193
	(0.0475)	(0.0520)	(0.122)	(0.122)
Non-White	-0.0306	0.0303	0.146	0.161
	(0.0448)	(0.0471)	(0.132)	(0.133)
Divorced	0.0363	-0.0586	0.0628	0.0148
	(0.0555)	(0.0732)	(0.237)	(0.237)
Widowed	0.216	0.0868	0.577	0.591
	(0.145)	(0.154)	(0.417)	(0.415)
Single Always	-0.0115	-0.0607	0.271	0.308
	(0.0957)	(0.109)	(0.289)	(0.291)
Age 56	0.0783	0.0539		
	(0.0713)	(0.0730)		
Age 57	0.176**	0.120		
	(0.0714)	(0.0732)		
Age 58	0.304***	0.226***		
	(0.0704)	(0.0730)		
Age 59	0.353***	0.248***		
	(0.0705)	(0.0742)		
Age 60	0.542***	0.434***		
	(0.0693)	(0.0752)		
Age 61	0.587***	0.462***		
	(0.0703)	(0.0773)		
Age 62	1.247***	1.111***		
	(0.0656)	(0.0752)		
Age 63	0.783***	0.631***		
	(0.0785)	(0.0883)		
Age 64	0.801***	0.633***		

	(0.0818)	(0.0946)		
Age 65	1.217***	1.119***	0.331*	0.310*
	(0.0798)	(0.104)	(0.180)	(0.180)
Age 66	0.732***	0.641***	0.00211	-0.0127
	(0.101)	(0.128)	(0.171)	(0.173)
Age 67	0.782***	0.716***	0.182	0.168
	(0.106)	(0.139)	(0.164)	(0.164)
Age 68	0.590***	0.552***	0.0866	0.0769
	(0.119)	(0.152)	(0.171)	(0.170)
Age 69	0.393***	0.366**		
	(0.143)	(0.172)		
Ever Applied for SSI/SSDI	0.473***	0.490***	-0.381*	-0.377
	(0.0455)	(0.0460)	(0.229)	(0.230)
Potential Spouse Earnings		-1.57e-06	3.37e-06	2.90e-06
		(1.92e-06)	(4.16e-06)	(4.17e-06)
Spouse AIME		4.63e-05	-8.35e-07	9.98e-06
		(3.17e-05)	(7.13e-05)	(7.15e-05)
Missing Spouse Earnings (for married)		0.124**	-0.301*	-0.300
		(0.0568)	(0.182)	(0.183)
Age Difference with Spouse		-0.00920**	0.00467	0.00346
(Husband's minus spouse's age)		(0.00379)	(0.0101)	(0.00996)
Constant	-1.770***	-1.978***	-1.396***	-1.436***
	(0.0568)	(0.0984)	(0.256)	(0.260)
Observations	17,050	17,017	1,778	1,778
Pseudo R^2	0.0815	0.0963	0.0881	0.0904

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 5 suggests that military retirees might be more likely to retire at certain ages. To explore if model 1's parameters might vary by age, we re-estimated model 1 conditioning on key ages, such as ages 62 and 67 (results available from authors). While military retirees were found to be more likely than veterans to retire at these ages, the results were still not statistically significant. This could be due to (1) unmodeled factors, such as selection on unobserved factors, explaining retirement,[11] or (2) small sample size for military retirees impacting the precision of the model's parameter estimates.

In model 2 in table 4, we included our difference-in-difference covariates, Social Security and pension wealth and incentive controls, as well as spouse controls. In this model, we find that individuals reaching age 65 after 2001 (Tricare for Life variable) are more likely to delay retirement, matching the general U.S. trend toward a longer working life and the estimate is statistically significant. Military retirees are less likely to retire than veterans at any age (conditional on working at age 55), but the difference is not significant. Our difference-in-difference coefficient, the interaction between reaching age 65 after 2001 (i.e. eligibility for TFL) and being a military retiree, is positive, implying that TFL eligible individuals are more likely to retire. A test of the difference-in-difference estimator, which is the coefficient on reaching age 65 after 2001 (i.e. eligibility for TFL) and being a military retiree is not significantly different from zero (i.e. $\beta_2 = 0$ cannot be rejected).

Model 2's estimates for DB pensions and Social Security wealth and incentives are statistically significant and in the correct direction. Greater pension or Social Security wealth is associated with a greater likelihood of retirement. Greater pension or Social Security incentive

11 Our analysis does not control for why some military personnel choose to leave the military before qualifying for retirement benefits. That is, there could be unobserved characteristics, such as taste for military service, that contributes to different retirement behavior between veterans (nonmilitary retirees) and military retirees.

from additional work (i.e. peak value in our specifications) is associated with a lower likelihood of retirement. The coefficient on Social Security's peak value measure (point estimate of -2.205) suggests that an $8,800 increase in the benefit of delaying claiming until the peak of one's Social Security present value (i.e. one standard deviation change) reduces the probability of retiring by 2 percentage points.

Our estimates from model 2 were greater in magnitude for Social Security benefits compared to Coile and Gruber (2007); our marginal effects from a one standard deviation change in peak value are -0.0208 and -0.0082 (Social Security and DB pension, respectively) compared to -0.009 and -0.0104. We also find greater responses to retirement wealth measures: 0.0178 and 0.0167 (Social Security and DB pension, respectively) compared to 0.0116 and 0.0105 in Coile and Gruber (2007).[12] The fact that we find a greater response is expected: Coile and Gruber's sample was in the midst of their retirement decision-making. Assuming the male was born between 1931-41, this would place them between 59-70 in 2000. By 2010 (our data) these households would be 69-80, having nearly fully completed the retirement ages under study. A more complete history would include more individuals whose retirement decision is based on delaying claiming their SSA or pension benefit until it reaches peak value.

Additionally, based on model 2, we find that husband and wife measures of potential and lifetime earnings (represented by AIME) are not significantly associated with retirement. Husbands who are older than their wives are significantly less likely to retire: a three-year age difference is associated with a husband being .45 percentage points less likely to retire.

Model 2 is similar to other reduced form models used in the literature on retirement decision-making. A problem with model 2 is that it assumes that the responses to retirement

[12] These can be interpreted as a one-standard deviation in Social Security Wealth (e.g. an increase of $28,800) being associated with a 1.78 percentage point greater likelihood of retirement at any given age.

incentives and wealth do not change with age. For example, the coefficient on the categorical variable for military retirees is the average effect across all age groups. This results in two issues. First, the difference-in-difference coefficient (β_2) mixes the effect of TFL on retirees currently eligible to receive it with the effect of TFL on retirees at younger ages who expect to receive it. This in effect means that the age dummy controls may be misspecified and should differentiate between individuals who can expect to receive TFL versus those who cannot expect to receive it. We eliminate this possible misspecification in model 3, which is restricted to individuals in the TFL age range. A second issue with model 2 is that it includes 55-59 year olds, which for the HRS sample (born between 1931 and 1941) are almost all at years before the introduction of TFL in 2001 (e.g. an individual born in 1941 will be 59 in 2000, so will not have known about TFL at 59, and cannot then even respond in anticipation of receiving this benefit at 65). Considering these issues and the fact that TFL can only directly affect individuals who are age 65 and older, we present model 3.

Model 3 is a more restrictive model that limits the age range to 65-69; these are the ages directly impacted by TFL. In model 3, the difference-in-difference estimator, which is the coefficient on reaching age 65 after 2001 (i.e. eligibility for TFL) and being a military retiree is positive and significantly different from zero at the 1 percent level. That is, a higher military retirement benefit increases the likelihood of retiring among those ages 65-69, conditional on still working full time at age 64. To provide a marginal effect, we made individual-level predictions of the marginal effect assuming that everyone was a military retiree, then averaged the marginal effects across individuals to get an overall average marginal effect. In this scenario, the average response of a Tricare eligible military retiree is a 15.2 percentage point greater likelihood of retirement.[13] This higher likelihood of retirement for military retirees runs strongly counter to the marginal effect from model 3 for only Tricare for Life (β_1): Individuals reaching 65 or older after 2001 and who are still working at age 64 are 5.3 percentage points *less* likely to retire.

Model 3 supports the hypothesis that military retirement benefits affect the attachment of military retirees to their second-career job. To the degree that TFL saves a retiree the expense of Medigap insurance, then a retiree's implied responsiveness to an expansion of the military retiree benefit can be computed. In 2001, 26 percent of Medicare qualifying individuals had a Medigap plan, with an average monthly premium of \$127. In 2012, the average monthly military retiree pension was \$2,180, or \$1,681 in 2001 dollars. The implied elasticity, given that 34 percent of military retirees in our sample are still working at 65, would then be $\frac{\%\Delta Retirement}{\%\Delta Military\ Pension} = \frac{15.2/_{34}}{(127/_{1681})} = 5.92$. This suggests the retirement behavior of military retirees ages 65 and older is highly sensitive to the size of the military retirement benefit. Our elasticity would be even greater if one controlled for the percentage participating in Medigap plans in 2001.

[13] We examined alternative methods of calculating the marginal effect. Marginal effects can be sensitive to the composition of the sample being used if exogenous variables are strongly correlated, e.g. military retirees are more likely to have greater education, and greater education is correlated with higher retirement wealth. One alternative was to restrict the calculation of the marginal effect to specific education groups: 12-15 years of schooling and 16 or more years of schooling. In this case, the marginal effects were greater for the less educated group: 16.1 percentage points versus 14.3 percentage points. In other alternative specifications, we imposed the average retirement wealth, retirement incentives, potential earnings, AIME, and spousal covariates among individuals with between 12-15 years of schooling and 16 or more years of schooling separately, in addition to imposing that the individuals were military retirees. The result was a larger response, with the largest response coming from the 12-15 years of schooling group. Specifically, we find that the model predicts a marginal effect for an individual who is a married, white, military retiree with 12-15 years of schooling and has average earnings and wealth covariates for this education group. Such an individual will have a 25.4 percentage point greater likelihood of retirement due to TFL eligibility. The response for individuals with 16 or more years of education is 24.1 percentage points. These results suggest that the response could be larger if our comparison group more closely reflected the characteristics of military retirees.

At age 65 and older, most individuals will have reached the peak of the present value of their defined benefit and Social Security pensions. Model 3 suggests that military retirees exhibit greater responsiveness to these retirement wealth incentives. Oddly, the retirement incentive measures are now positive, implying a greater peak value is associated with a greater likelihood of retirement. The marginal effect of a single standard deviation in Social Security's peak value is now 0.034 or, put another way a $1,550 increase in the benefit of delaying claiming until the peak of one's Social Security present value increases the probability of retiring by 3.4 percentage points. At these ages, peak value is likely to reflect the change in the present value of Social Security benefits from continuing work for one more year. It is possible that individuals with large peak values at ages 65 and older have low Social Security wealth to begin with, and as such it does not provide a substantial incentive to continue working. However, due to the odd directionality of this finding, it merits further examination in the future, as the peak value measure may be associated with some other factors influencing retirement at these ages.[14] In model 3, we continue to find that greater retirement wealth, whether through Social Security or defined benefit pensions, is associated with a greater likelihood of retirement.

In section 2, we theorized in our one-period model that search could result in a "better" job and therefore a lower likelihood of retirement. A better job could mean greater monetary reward or a compensating differential. In an effort to control for the potential of the compensating differential's impact on our estimate, we included as a covariate an indicator for whether or not someone was particularly attached to his work. The question, asked in the first HRS interview, was "Some people think of their work as important mainly because of the money. Others think of the money as less important than the work itself. What about you?" We

[14] Individuals in model 3 have negative DB pension and Social Security Wealth peak values at these ages, meaning that continued delay reduced lifetime benefits. While the Social Security peak value point estimates are large, the marginal effects are small for a one standard deviation change in peak value.

labeled an individual as loving to work if he answered "Work itself the most important thing." The addition of this covariate and an interaction with military status is presented in model 4 in table 4.[15]

The comparison group in model 4 is those individuals who did not answer that "Work itself the most important thing." The omitted group was chosen based on the largest sample size. We find that "loving to work" is associated with an insignificantly greater likelihood of retirement, and in a nod to our theory that military benefits may improve a military retiree's second career job match, an insignificantly lower likelihood of retirement among military retirees.

Overall, the results in models 3-4 indicate that military retirement benefits affect the decisions of military retirees to retire from the labor force. Our theory from section 2 suggested that the direction of that effect is ambiguous *a priori*. We find that military retirees, who have access to additional pension income while working are less likely to retire, conditional on working at age 55, compared to veterans. This difference is not statistically significant when looking at the retirement decisions of men age 55-69, however, it is statistically significant when we focus on a sample that would be impacted by the expansion of Tricare for Life – men age 65-69. Our difference-in-difference estimates that exploit the unanticipated expansion of Tricare for Life in 2001 to military retirees that are eligible for and receiving Medicare, are positive and statistically significant. These results suggest that the likelihood of retirement increases when military benefits are expanded via lower healthcare costs. We calculate an elasticity of retirement

[15] We recognize that this question is an imperfect measure of the nonpecuniary return from a job. We also tested alternative questions, and the results were similarly insignificant. We chose to present this question because it was asked in the first interview wave, whereas other measures were asked in later waves leading to greater nonresponse.

for ages 65-69 of at least 5.92, implying Medicare eligible military retirees' labor supply is highly responsive to expansion of their military pension.

Caution should be taken not to over-interpret these estimates. Specifically, our findings are limited to military retirees from the HRS cohort (generally born between 1931 to 1941) that are Medicare eligible when the benefit expansion occurs. Moreover, due to the small sample size of military retirees in the HRS, we believe further research is needed, possibly using Social Security and VA administrative data.

The results for models 1-4 also indicate that the structure and level of other sources of retirement benefits have significant and intuitive influences on retirement decisions. Specifically, greater wealth leads to a greater likelihood of retirement, and having greater returns to Social Security or pension benefits deters retirement.

5. Social Security Benefit Claiming

In the previous section, we found that the defined benefit military pension that is paid to military retirees throughout their second career increases the likelihood of retirement from the labor force and identify the effect by using the changes that occurred as a result of the Tricare for Life legislation for Medicare eligible military retirees after 2001. Social Security benefit claiming has also received significant attention in recent years, with authors (Coile, Diamond, Gruber, & Jousten, 2002; Sass, Sun, & Webb, 2013; Shoven & Slavov, 2012, 2013) emphasizing the returns to delayed claiming. An individual can increase their Social Security benefit by up to 75 percent by delaying claiming from age 62 to age 70. However, in our HRS sample, the majority will begin collecting their Social Security benefit before their 63rd birthday. Authors have argued that Social Security claiming may be due to a mixture of liquidity constraints and low desire to continue in the workforce. However, military retirees should not have liquidity constraints before claiming Social Security, since they have access to their military pension. As such, we would theorize that at all ages, they should have an incentive to delay claiming.

Benefit claiming is often combined with the retirement decision. This is due in part to the existence of the Social Security earnings test. Between age 62 (i.e. early retirement age) and normal retirement age (age 65 for the majority of our sample), Social Security benefits are reduced $1 for every $2 earning if income from work exceeds a specified threshold ($10,680 in 2001). This can provide a sharp incentive not to work if the Social Security benefit has already been claimed.[16] Prior to 2000, an earnings test existed for ages between the normal retirement age and age 70. This earnings test had a greater earnings threshold.

We consider cases of benefit claiming when the labor force decision is separate from the retirement decision. Similar to Hurd et. al (2004), we estimate two models that reflect two cases: (1) Men who have retired before age 62, and (2) men who have not retired by age 65 and for whom the earnings test does not apply (e.g., at and after year 2000). In both of these cases, we capture individuals who should not be affected by the earnings test, meaning that their choice of when to claim their Social Security benefit is up to the individual.

The models represent two different, but related, questions. The first model asks: Do military retirees retiring before age 62 delay claiming their Social Security benefits? The second model asks: Are military retirees who are still working after 64 likely to delay claiming their Social Security benefit due to a reduced need for health insurance after 2001?

We use the same sample and a similar specification to the models discussed in section 4, with the only key variations being: (1) We will estimate the models on the subsample that stops

[16] If an earner's own Social Security benefits are reduced before normal retirement age due to the earnings test, he or she will receive an increase in benefits at normal retirement age meant to compensate for the reduction due to the earnings test.

work before age 62 or at ages 65 and older; (2) the outcome variable will be an indicator of claiming the Social Security benefit at age 62 for model 1 and age 65 for model 2; (3) the age dummies in model 1 will reflect the age the individual actually retires; (4) due to limited observations under the age of 62 after 2001, model 1 will not include covariates capturing the introduction of TFL; and (5) we drop all individuals who first claim their Social Security benefit before age 62. The reason for this last condition is that these individuals were either eligible for Social Security disability or survivor benefits. The model is not designed to capture these decisions. We use individual's self-reported age at first Social Security claim to determine their claiming age. The covariates we included are those in models 2 from section 4. Table 5 presents the results. If the military pension results in a delay in the claiming of Social Security benefits, we would expect a negative coefficient estimate on the variables related to being a military retiree and expansion of the military pension.

In model 1, we find that being a military retiree is positively associated with claiming at age 62, but the estimate is not statistically significant. Greater Social Security wealth is associated with claiming at age 62, while greater potential earnings are associated with deferred claiming. Similar to Hurd et al., we find that people with 16 or more years of education are more likely to delay claiming. Individuals who ever applied for SSI or SSDI, conditional on working at age 55, are significantly less likely to claim at age 62. It is possible that the condition that led to them applying for disability also affected their ability to save; making delayed claiming a better decision. However, we find this unlikely. It is possible that these individuals initially stopped work to file for benefits, but then returned to the labor force after they were not successful (had they been successful, they would have been omitted from our sample). Since we do not track returns in this analysis, we would not capture their return to work.

In model 2, we find that military retirees working after 64 are less likely to claim at 65, but the association is not statistically significant. Military retirees retiring after age 64 and after 2001 are also more likely to delay claiming their benefit consistent with our theory, but the effect is not statistically significant. The sign of other coefficients are generally as expected (e.g. more education is associated with delayed claiming), but the parameter estimates are weak.

Our findings are consistent with the theory presented in section 2, but most of the parameter estimates are not statistically significant. Potential earnings are a major driver in both cases. For claiming at 65, an additional $10,000 in potential income is associated with 3.14 percentage point lower likelihood of claiming. This may reflect the option of these individuals to return to the labor market, something they may eventually take advantage of.

Table 5: Claiming Results

VARIABLES	(1) Claim at 62	(2) Claim at 65
Indicator for After 2001 (Tricare for Life)		0.446
		(0.276)
Non-Veteran	0.00126	-0.329*
	(0.128)	(0.198)
Military Retiree	0.405	-0.556
	(0.370)	(0.500)
Non-Veteran X Tricare For Life		0.346
		(0.306)
Military Retiree X Tricare For Life		-0.118
		(0.836)
SS Wealth	1.009***	0.265
	(0.366)	(0.530)
DB Pension Wealth	0.0695	0.106
	(0.0477)	(0.0834)
Potential Earnings	-1.34e-05***	-9.98e-06*
	(4.28e-06)	(5.43e-06)
AIME	0.000152	0.000193
	(0.000106)	(0.000151)
<12 years of education	0.0226	0.167

	(0.187)	(0.225)
13-15 years of education	-0.281	0.247
	(0.175)	(0.232)
16 years of education	-0.635***	-0.0916
	(0.193)	(0.232)
17+ years of education	-0.335*	-0.310
	(0.185)	(0.217)
Non-White	-0.187	-0.0164
	(0.181)	(0.232)
Divorced	-0.0183	0.177
	(0.257)	(0.396)
Widowed	1.491***	-
	(0.436)	
Single Always	-0.0654	0.342
	(0.348)	(0.427)
Age 56	-0.141	
	(0.243)	
Age 57	0.359	
	(0.247)	
Age 58	0.409	
	(0.252)	
Age 59	0.150	
	(0.236)	
Age 60	0.572**	
	(0.238)	
Age 61	0.740***	
	(0.244)	
Ever Applied for SSI/SSDI	-0.515***	-0.147
	(0.196)	(0.589)
Potential Spouse Earnings	2.94e-06	-5.09e-06
	(8.61e-06)	(8.17e-06)
Spouse AIME	-2.06e-05	-3.89e-05
	(0.000132)	(0.000147)
Missing Spouse Earnings (for married)	-0.164	-0.271
	(0.192)	(0.275)
Age Difference with Spouse (Husband's minus spouse's age)	0.00453	0.0247
	(0.0167)	(0.0205)
Constant	-0.449	0.130
	(0.315)	(0.429)
Observations	652	393
r2_p	0.158	0.0940

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Summary and Conclusions

While past studies have considered the post-service outcomes on military veterans, there is little research on the effects of military service on labor force exit and the claiming of Social Security benefits. This paper focuses on a subset of veterans, namely military retirees. This subgroup is particularly interesting because their access to military pension income might affect their retirement and claiming behavior. Furthermore, Congress has recently enacted major reform legislation to alter the military retirement benefit, and these reforms might alter this group's retirement and Social Security claiming behavior.

We developed a simple theory of how military pensions might affect retirement timing. On the one hand, military pensions increase the incentive to retire as a result of the standard income effect, but pensions may also increase search, raise wages, and induce delayed retirement. Thus, the effect of military pensions is ambiguous *a priori*. We use the HRS 1992 cohort data to examine empirically which effect dominates. To identify the effect of military pension income, we exploit an unanticipated expansion of the military health benefit known as Tricare for Life to Medicare-eligible military retirees after 2001 to estimate difference-in-difference models of retirement and of Social Security claiming. TFL eliminated the need to purchase Medigap coverage, thereby effectively increasing military pension income.

We find evidence consistent with the income effect being the dominant effect. Specifically, we find that a higher military retirement benefit increases the likelihood of retiring from the labor force among Medicare-eligible military retirees, conditional on still working full time at age 64. The difference-in-difference estimate is statistically significant and large, implying an elasticity of responsiveness of retirement after age 65 to an expansion of the military retiree benefit of over 5.9. Our point estimates also suggest that expansion of the military pension results in delayed claiming of Social Security benefits, though our estimates are not statistically significant.

Caution should be taken in over-interpreting our results. Our findings are limited to older military retirees who are near the end of their work life. Given that the military retirement system vests active duty members in an immediate annuity after 20 years of service, military retirees may be as young as 38 years old if they enlisted in the military at age 18. Thus, our findings are for only a subset of the broader military retiree population. Furthermore, the sample size of military retirees in the HRS is quite small. For that reason, we believe further research is needed.

One fruitful way to extend our research is to use administrative data on military retirees together with Social Security earnings data. Aside from a larger sample, administrative data could provide information on military retirees who are younger and still working as part of their second civilian career.

In addition to exploring retirement and claiming behavior of military retirees, an innovation of our study is that we accounted for credits provided to those who served in the military when we compute the present value of Social Security benefits, an important control variable in our analysis. These credits enter as additional income when the Social Security Administration calculates an individual's average indexed monthly earnings (AIME), and we estimate that they provide an additional 10 percent of expected lifetime benefits. It is unclear whether military veterans applying for Social Security benefits are aware of these credits and how the availability and awareness of these credits affect claiming behavior. This is another potential area for future research.

References

Angrist, J. D. (1990). Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records. *American Economic Association, 80*(3), 313-336.

Angrist, J. D., & Chen, S. H. (2011). Schooling and the Vietnam-Era GI BIll: Evidence from the Draft Lottery. *American Economic Journal: Applied Economics, 3*(2), 96-118.

Angrist, J. D., Chen, S. H., & Frandsen, B. R. (2010). Did Vietnam veterans get sicker in the 1990s? The complicated effects of military service on self-reported health. *Journal of Public Economics, 94*, 824-837.

Asch, B. J., Hosek, J., Mattock, M., & Panis, C. (2008). Assessing Compensation Reform: Research in Support of the 10th Quadrennial Review of Military Compensation (Vol. MG-764-OSD). Santa Monica, CA: RAND Corporation.

ASPE Report. (2011). Variation and Trends in Medigap Premiums: U.S. Department of Health and Human Services Assistant Secretary for Planning and Evaluation Office of Health Policy.

Autor, D. H., & Duggan, M. (2008). The Effect of Transfer Income on Labor Force Participation and Enrollment in Federal Benefits Programs: Evidence from the Veterans Disability Compensation Program (pp. 67): Social Security Administration.

Card, D., Chetty, R., & Weber, A. (2007). Cash-On-Hand And Competing Models Of Intertemporal Behavior: New Evidence From The Labor Market. *The Quarterly Journal of Economics, 122*(4), 1511-1560.

Coile, C., Diamond, P., Gruber, J., & Jousten, A. (2002). Delays in Claiming Social Security Benefits. *Journal of Public Economics, 84*, 357-385.

Coile, C., & Gruber, J. (2007). Future Social Security Entitlements And The Retirement Decision. *The Review of Economics and Statistics, 89*(2), 234-246.

Haider, S., & Solon, G. (2000). Nonrandom Selection in the HRS Social Security Earnings Sample *Labor and Population Program* (pp. 16). Santa Monica, CA: RAND Corporation.

Heaton, P., Loughran, D. S., & Miller, A. R. (2012). Compensating Wounded Warriors: An Analysis of Injury, Labor Market Earnings, and Disability Compensation Among Veterans of the Iraq and Afghanistan Wars (pp. 111). Santa Monica, CA: RAND Corporation.

Henning, C. A. (2011). *Military Retirement Reform: A Review of Proposals and Options for Congress*. Washington D.C.: Retrieved from http://www.fas.org/sgp/crs/misc/R42087.pdf.

Hurd, M. D., Smith, J. P., & Zissimopoulos, J. M. (2004). The Effects of Subjective Survival on Retirement and Social Security Claiming. *Journal of Applied Econometrics, 19*, 761-775.

Kapinos, K., Brown, C., Nolte, M., Stolyarova, H., & Weir, D. (2010). *Prospective Social Security Wealth Measures of Pre - retirees Public Release: Data Description and Usage*. Survey Research Center. Ann Arbor.

Knapp, D. (2014). *The Effect of Social Security Auxiliary Spouse and Survivor's Benefits on the Household Retirement Decision*. Paper presented at the 16th Annual Joint Meeting of the Retirement Research Consortium, Washington, DC. http://crr.bc.edu/wp-content/uploads/2014/06/Panel-3_3-Knapp.pdf

Knapp, D., Brown, K., Hosek, J., Mattock, M. G., & Asch, B. J. (2015). Retirement Benefits and Teacher Retention: A Structural Modeling Approach (Vol. PR-2131-EDU). Santa Monica, CA: RAND Education.

Nelson, G. (Ed.). (1986). *The Supply and Quality of First-Term Enlistees Under the All-Volunteer Force*. Washingon, D.C.: Pergamon-Brassey's.

Sass, S. A., Sun, W., & Webb, A. (2013). Social Security claiming decision of married men and widow poverty. *Economics Letters, 119*, 20-23.

Shoven, J. B., & Slavov, S. N. (2012). The Decision to Delay Social Security Benefits: Theory and Evidence *NBER Working Paper Series* (pp. 50). Cambridge, MA: National Bureau of Economic Research.

Shoven, J. B., & Slavov, S. N. (2013). Recent Changes in the Gains From Delaying Social Security *NBER Working Paper Series* (pp. 37). Cambridge, MA: National Bureau of Economic Research.

Statistical Report on the Military Retirement System. (2013). Alexandria, VA: Office of the Actuary.

Warner, J. T., & Asch, B. (2001). The Record and Prospects of the All-Volunteer Military in the United States. *Journal of Economic Perspectives, 15*(2), 169-192.