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HEALTH, INCOME, AND RETIREMENT: EVIDENCE FROM NINETEENTH CENTURY AMERICA

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ABSTRACT

I investigate the factors that fostered rising retirement rates prior to social security and private-sector pensions by estimating the income effect of a large government transfer, the first major pension program in the United States, covering Union Army veterans of the American Civil War. The pension, because of the program's rules, had only an income effect and these rules create a natural experiment to identify the effects of pensions and health on labor supply.

Pensions exerted a large impact on retirement rates. The elasticity of non-participation with respect to pension income was at least 0.66, exceeding even the most conservative estimates of that elasticity with respect to social security payments. Union Army pensions were a much larger fraction of retirement income than social security payments today and this accounts for some of the difference in estimated elasticities. My findings suggest that secular increases in income can explain a substantial part of the rise in retirement rates, although the elasticity of labor force non-participation with respect to transfer income may have fallen over time, perhaps because of the increasing attractiveness of leisure.

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1 Retirement since the Turn of the Century

Increasing numbers of men have permanently abandoned the labor force at ever younger ages during the twentieth century. In 1900 about 80% of men 65 years of age or older were in the labor force and in 1930 labor force participation rates were 60%. But, by 1980 the figure was less than 25% (Moen 1987).[1] Among men aged 55-64 and 45-64 labor force participation rates were 86% and 90% at the turn of the century, but had fallen to 71% and 82%, respectively by 1980 (Durand 1948; Series D 29-41 in U.S. Bureau of the Census 1975: 132; U.S. Bureau of the Census 1983b).[2]

Many changes can account for the downward trend in labor force participation rates. After the Second World War, the expansion of pension plans spurred by the tax incentives granted by the Revenue Act of 1942 contibuted to rising retirement rates (Burkhauser 1979; Kotlikoff and Wise 1987; Stock and Wise 1990). States began to establish old age pensions in 1933. The Social Security old age insurance and old age assistance programs were instituted in 1935 and grew steadily after 1950. In 1956, Social Security Disability Insurance was established for older, permanently disabled workers. By 1965, all workers, regardless of age, and their dependents were eligible for Social Security disability benefits.[3]

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[1] In 1940, the definition of the labor force changed. Prior to 1940, only the occupation at which an individual spent most of his time was recorded. It is not possible to distinguish between full-time, part-time, and seasonal workers, and workers with more than one occupation. The current concept of the labor force centers on determining and describing an individual's activity during a specific week. Moen (1987) estimated his series under the pre-1940 definition. Ransom and Sutch (1986a) present alternative estimates dating the beginning of the decline to 1940. However, their estimates are based upon the argument that men who reported 6 or more months of unemployment in 1900 were retired. Margo (1993) finds that the long-term unemployed had different characteristics from the retired and hence cannot be classified as retired.

[2] Labor force participation rates prior to 1940 are made compatible with later rates through the use of a "correction factor."

[3] There is a large literature on Social Security retirement and disability benefits. Some examples are Diamond and Hausman (1984), Hausman and Wise (1985), Parsons (1980a, 1980b,1982), Leonard (1979), Burkhauser and Quinn (1983), Gordon and Blinder (1980), Haveman and Wolfe (1984a,1984b), Haveman,

An explanation for the decline in labor supply observed in the 1970s has been the fall in market opportunities for the less skilled and less educated (Juhn 1992). Explanations for the decline prior to the establishment of Social Security have focused on the shift of production from the home to the factory and from agriculture to manufacturing (Smelser 1959; Moen 1987); institutional changes in the employment of labor (such as the switch from piece rates to time rates) that worsened the employment prospects of older workers (Achenbaum 1978); and changes in societal and individual attitudes toward work at older ages, manifested by the imposition of mandatory retirement (Graebner 1980; Achenbaum 1978). Finally, a possible reason for the decline in labor force participation observed from the turn of the century to the present is an increased demand for leisure arising from higher incomes, and from the growth of mass entertainment and mass tourism.

The majority of papers examining the decline in male force participation rates have used cross-sectional data since the late 1960s, but the applicability of cross-sectional estimates to periods outside the sample range is questionable. The earliest data used have been from the late 1960s. The increase in male retirement rates dates from 1900 and 70% of the decline occurred prior to 1960. During the time periods covered by panel data, changes in program work rules and benefits have been marginal. In addition, retirement rates are already high in the periods covered by panel data, therefore only huge benefit increases could have enticed those remaining in the labor force to have withdrawn. A lack of micro-level data has hampered previous work on retirement prior to 1960.

This paper uses a new data set to investigate the determinants of work levels in 1900 among a group of white Union Army veterans receiving Union Army pensions. The Civil War pension program stipulated no work disincentives, and pensions did not

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Wolfe, and Warlick (1988), Bound (1989), Bound and Waidman (1992), and Haveman, Jong, and Wolfe (1991). Reviews of the literature are Danziger and Haveman (1979) and Quinn and Burkhauser (1990).

depend upon past wages. Therefore, Union Army pensions can be used to estimate a pure income effect on labor supply. The Civil War pension program is thus a unique natural experiment.An advantage to using Union Army pensions to estimate an income effect is that unlike property income, pensions are clearly exogenous.The generosity of Union Army pensions were determined by the pensioner's health. Because the amount received depended on whether the veteran could trace his disability to the war, I can disentangle the effects of pensions from that of health on labor supply. My findings therefore reveal the effect of income growth on retirement, and so bear on income effects arising from the Social Security retirement and disability programs. Because health information is available, the findings can be used to examine the effects of disability on labor supply in the absence of work disincentives. Futhermore, the availability of occupational information makes it possible to use the regression results to examine the effect of farm occupation and hence the effect of a decline in the farm sector on aggregate retirement rates.

The Union Army records allow us to learn about the experience of the old at a time when aging was first becoming a public issue. The first public commission on aging was established in 1909 in Massachusetts and the first major survey of the economic conditions of the aged was carried out in 1910 in Massachusetts (Fischer 1977).[4] Also, because a large percentage of the elderly population received a Union Army pension, the records allow us to examine the impact on retirement patterns of the first major pension program in the United States prior to the availability of private pensions and of Social Security.

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[4]In 1909 the twenty-fourth annual report of the Commissioner of Labor was a two volume description of workmen's insurance and compensation in Europe and contained large sections on old age insurance (U.S. Bureau of Labor 1911). Cross-sectional data from 1900 also tells us something about the effect of the Union Army pension program on a cohort of men. In fact, Moen (1987) attributes the sharp decline in labor force participation rates between 1900 and 1910 to an increase in the number of Union Army veterans who were 65 years of age or more.

2 Civil War Pensions and Union Army Records

The scope of the pension program in 1900, run for the benefit of Union veterans and their dependent children and widows, was enormous. Benefits consumed almost 30% of the federal budget (Vinovskis 1990) and veterans lobbied vociferously for high tariffs to continue feeding the federal surplus (Glasson 1918a: 218-219). Among all white males, 35% of those aged 55-59 were on the pension rolls, 21% of those aged 65-69, 14% of those aged 65-69, and 9% of those 70 or older. The annual value of the average veteran pension was $135, or 53% of the annual income of farm laborers, 36% of the income of other laborers, 20% of the income of carpenters, blacksmiths, and salesmen, and 12% of the annual income of landlords and merchants.[5]

The pension program had, by 1900, both a disability and an-old age component. Application was through a pension attorney whose fee was set by law. The dollar amount received depended upon the degree of disability, determined by the applicant's capacity to perform manual labor as judged by three examining surgeons employed by the Pension Bureau and following guidelines established by the Bureau. The value of the pension award did not depend upon the wealth of the individual, his ability to earn a living other than by manual means, or his participation in the labor force.[6] Nor did receipt of a pension depend upon whether the disability could be traced to wartime service, but an applicant who could relate his disability to military service received substantially more for the same disability

[5]Imputations for annual incomes are given in Table A.1 in Preston and Haines (1991: 212-220). For older men, the pension represented an even greater proportion of earnings because of the sharp decline in the age-earnings profile.

[6]Demographic and occupational characteristics did not predict pension amount. Neither did the lawyer through whom the veteran applied. For 80 men qualitative information is available that allows me to identify the poor, middle class, and the wealthy. There was no relation between income category and pension amount. Similarly, the ratings of the surgeons did not did not depend upon the lawyer or upon income category. These findings suggest that fraud is not biasing my results.

than his counterpart who could not. Men who could not claim a disability of service origin received from $6 to $12 per month, while men who could claim a war-related disability received a pension ranging from $6 to $100 per month.[7] In 1900, 58% of all veterans were receiving a pension for a disability that was not related to wartime service (U.S. Bureau of Pensions 1900). Therefore individuals of the same health status received different pension amounts.

Even though old age was not recognized by statute law as sufficient cause to qualify for a pension until 1907, the Pension Bureau instructed the examining surgeons in 1890 to grant a minimum pension to all men who were at least 65 years of age, unless they were unusually vigorous. Men aged at least 75 years were entitled to an even larger pension. After 1900, the Bureau's old age provisions grew still more generous.[8] But, if the applicant could claim a specific disability, then he might be entitled to a pension larger than that granted for age alone. Therefore, controlling for both health and age, I can identify the effect of pension income on labor supply.

Union Army records are being collected as part of a project to study early indicators of later work levels, disease, and death.[9] Information on the enlisted men, but not the officers, in a random sample of 331 Union Army infantry companies has been gathered

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[7]In 1900, the pensioner who could trace his disability to the war was entitled to $30 for incapacity to perform any manual labor, $24 for a disability equivalent to the loss of a hand or foot, $17 for the loss of one eye, and $6 to $10 for a single hernia. His counterpart who could not trace his disability to the war received $12, $10, $6, and $6 for each respective ailment. Veterans who could trace their disabilities to the war received, by Congressional decree, up to $100 for loss of both hands, feet, or eyes. However, a veteran blinded in an industrial accident received at most $12.00. (Men with multiple ailments did not receive a pension amount equal to the sum of the amount that would be received by men with a single disability. Instead, they received an amount that reflected their total disability.)

[8]A detailed account of pension laws in provided in Costa (1993).

[9]The project is sponsored by the National Institute of Aging, the National Science Foundation, the National Bureau of Economic Research, the Center for Population Economics at the University of Chicago, and Brigham Young University.

from their regimental records. Thus far the men in 20 of these companies have been linked to the 1850, 1860, 1900, and 1910 censuses, military service records, army medical records, pension records, and the successive medical reports of the examining surgeons of the Pension Bureau.[10] Out of 1036 men at risk to be found in the 1900 census, 712 men were found and out of 597 men at risk to be found in the 1910 census, 361 men were found. Among the information that the 1900 and 1910 censuses provide is occupation. Virtually all men found in the 1900 and 1910 censuses were on the pension rolls by 1900.[11] An examining surgeons' report is available for 88% of these men and these provide many health variables. Wages, incomes, and wealth are not explicitly reported, but there is information that makes it possible to estimate the income categories into which pension applicants belonged.[12]

Searches in the 1900 and 1910 censuses were limited to men found in the pension records because address information is required for linkage and this information is available only from the pension records and because the pension records provide death dates and hence avoid searches for men not at risk of being found. An analysis of the selection biases arising from linkage failure indicates that the only significant factor in explaining linkage failure is if the recruit was a deserter and hence ineligible for a pension (Fogel 1991; Fogel *et*

[10]The 20 companies were not chosen randomly from the sample of 331 companies and are a geographically biased sample. However, when I examined a random sample of 4,554 white, non-institutionalized men drawn from the 1900 census (Preston and Higgs 1983), a subsample chosen to have the same geographic distribution as the 20 company sample resembled men in the rest of the country in terms of home ownership, marital status, literacy, occupational distribution, foreign-birth, and age.

[11]Men who were rejected would have a pension record. Men not yet on the rolls would frequently provide retrospective information. Pension applications included not only the original application, but also applications for increases, which could be filed at any time. Not all claims for pensions or for pension increases were accepted. Out of an average of 12 complaints filed, about 2 were rejected. Causes of rejection are known for 195 out of 557 rejections. Twenty-four percent of all men for whom causes of rejection are known were rejected because their disabilities were judged to be unrelated to the war.

[12]Although not yet available, information is being collected which makes it possible to classify pension applicants as poor, of average means, and well off. Occupation can also be used to estimate expected income.

al. 1991). Futhermore, the sample appears to be representative of the Northern population in terms of mortality and wealth.[13]

The analysis presented in this paper is based on the sample of 696 men found in the 1900 census whose ages ranged from 50 to 81.[14] Men were classified as 1) farmers, 2) professionals or proprietors, 3) artisans, and 4) semi-skilled or unskilled laborers, including farm laborers, on the basis of their 1900 occupation, if in the labor force, or, if retired, on the basis of their previous occupation as given in the pension records.[15]

A man is considered to be retired in this analysis if the census enumerator specifically stated that he was "retired" or had "no occupation," or if he left the occupational field empty.[16] The labor force experience of Union Army veterans can be compared with the labor force experience of the general population by contrasting retirement rates among the men in the veteran sample with retirement rates among men aged 50-81 in a random sample drawn from the public use sample of the 1900 Census (Preston and Higgs 1980). Table 1 compares retirement rates by age groups among men in the veteran sample with

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[13]Life tables were constructed for the men found in the 1900 Census and compared with mortality schedules constructed for states that kept death registration records. The two life tables are similar.Also, the distribution of causes of death of veterans who died circa 1910 and were in the pension records is not significantly different from the distribution of causes of death reported by the death registration states. Recruits' households were neither disproportionately rich nor poor in 1860 (Fogel 1991; Fogel *et al.* 1991) and using height as a proxy for wealth, I find that wealth does not predict war survivorship.

[14]Sixteen institutionalized men were deleted from the sample.

[15]The census enumerators were asked to record an individual's primary occupation. In the few cases where two occupations were given, the first occupation was taken. Neither past nor current occupation is known for 51 men in the sample.

[16]The percentage of men with a blank occupational field rises with age. I use "retired" and "out of the labor force" interchangeably. Ransom and Sutch (1986a) argue that men who were unemployed for six months or more were retired. However, Margo (1993) finds that these long-term unemployed did not have the same characteristics as the retired. In my sample, the estimation of a multinomial logit indicated that the long-term unemployed were also statistically distinguishable from the retired, and hence I do not use Ransom and Sutch's definition of retired. However, when I used their definition the basic findings still hold, although pensions and health exert a slightly smaller impact on the probability of retirement. The elasticity of labor force non-participation with respect to pension income was 0.32 when I used Ransom and Sutch's definition instead of 0.43 when I did not.

Table 1:

COMPARISON OF RETIREMENT RATES AMONG VETERANS AND A RANDOM SAMPLE OF WHITE MEN

age	veteran sample %	random sample[a] un-adjusted %	random sample[a] age-adjusted[c] %	restricted random sample[b] un-adjusted %	restricted random sample[b] age-adjusted %
50-59	8.4	3.6	4.1	4.4	5.1
60-69	15.2	8.5	7.7	9.7	8.9
70-81	42.0	28.8	26.7	31.3	29.7
50-64	10.0	4.7	4.9	5.2	5.4
65-81	29.7	24.4	23.1	25.5	24.3

[a]The random sample was drawn from the public use sample of the 1900 Census (Preston and Higgs 1980) and consists of 4,554 white, non-institutionalized men.

[b]The random sample was restricted to men who were either born in a Union state or who if foreign-born immigrated prior to the Civil War. The random sample contains both veterans and non-veterans.

[c]Reweighted to have the same age distribution as the veteran sample.

the random sample. Retirement rates for veterans are higher at all ages.

Table 1 suggests that retirement rates may have been higher for veterans at all ages because of Union Army pensions. But, if morbidity rates were greater for veterans then health, not pensions, may be the culprit. Although health information for non-veterans is not available, the impact of pensions apart from health can be determined by comparing retirement rates of healthy veterans with those in ill-health.

3 Pensions, Health, and Retirement

Because the pension amount that a veteran received depended upon his success in proving his disability was related to wartime service, it is possible to identify an income effect from pensions because many veterans who were in ill health did not receive a large pension. Among those whose health status is known, 57% could not claim that their disabilities were of service origin.[17] The characteristics of men who could trace their disability to the war, men who could not, and the entire veteran population are given in Table 2.

The ratings of the examining surgeons were used to construct health variables. The surgeons rated each specific disability and I added the ratings to construct dummies.[18] The Pension Bureau specified how a disability, such as anchylosis of the wrist, should be rated. The examining surgeons then had to decide, for example, if the veteran's heart condition was equivalent to anchylosis of the wrist in performing manual labor. If it was, then it received the same rating. Almost all men in the sample for whom either the complaint, the reason for the ruling, or surgeons' ratings are known could claim some kind of disability.

Table 2 reveals that the Civil War pension program was not exactly the perfect natural experiment. Men with war-related disabilities, and therefore men eligible for a large pension, were not randomly chosen. Compared with men whose disabilities were not service related, men who claimed a disability of service related origin were more likely to be farmers and less likely to be professionals and proprietors. They were more likely

[17] In the entire veteran population, 58% of all men were collecting a pension that was not of service origin (U.S. Bureau of Pensions 1900).

[18] As previously mentioned, the surgeons' ratings did not depend upon characteristics that were unrelated to health, suggesting that using the ratings of the examining surgeons as a health measure will not bias my results.

Table 2:

CHARACTERISTICS OF MEN WHO COULD AND COULD NOT TRACE THEIR DISABILITIES TO THE WAR

	whole population	traceable to war	not traceable to war	significance[a]
Labor Supply				
% retired	14.8	19.5	12.8	2%
% unemployed 6 months or more	9.6	8.4	11.2	5%
Past or Current Occupation				
% farmers	39.7	46.4	36.6	1%
% professionals or proprietors	19.5	14.9	21.3	4%
% artisans	13.4	11.9	12.8	72%
% laborers	20.1	18.0	22.4	18%
% unknown	7.3	8.8	6.8	36%
Demographics				
mean age in 1900	60.8	61.2	60.8	18%
% head household	93.1	95.4	91.8	8%
% married	85.3	89.3	83.3	4%
% with at least one working 18 year-old son	69.7	70.5	69.1	71%
% foreign-born	10.9	7.7	13.4	2%
% who cannot read or write	4.5	5.0	4.6	84%
Military History				
% discharged for disability	24.6	31.4	19.4	0.1%
% POWs	5.6	7.7	4.1	6%
% volunteers	95.7	97.3	93.7	4%
% who became officers	3.0	2.3	3.6	37%
Program Participation				
mean monthly pension payment ($)	12.9	17.6	9.5	0.01%
mean age entry on rolls		40.3	48.6	3%

Continued on Next Page

[a]For means, the significance level at which a t test showed that the means for men who could trace their disability to the war and men who could not were different. For percentages, the significance level at which a χ^2 test showed that the means for men who could trace their disabilities to the war and men who could not were different.

Table 2:

CHARACTERISTICS OF MEN WHO COULD AND COULD NOT TRACE THEIR DISABILITIES TO THE WAR, CONTINUED

	whole population	traceable to war	not traceable to war	significance[a]
Health				
mean height at enlistment[b]	68.8	69.0	68.7	32%
% rated mildly disabled[c]	25.3	14.2	30.6	0.00%
% rated fairly disabled	33.9	28.7	37.2	3%
% rated very disabled	22.6	39.1	13.1	0.00%
% without rating	18.2	18.0	19.1	72%
mean BMI[d] at ages 50-64	23.0	22.9	23.2	42%
% alleging				
rheumatism	47.0	36.4	58.5	0.00%
other musculoskeletal disorder	30.3	31.4	32.8	72%
circulatory disorder	38.4	36.8	41.3	26%
injury or gunshot wound	31.2	33.7	29.5	26%
diarrhea	21.7	23.8	21.0	42%
other gastro-intestinal disorder	7.2	3.8	8.2	3%
respiratory disorder	17.4	10.0	22.4	0.00%
sight or eye disorder	10.8	9.6	12.3	29%
hearing or ear disorder	9.9	11.1	10.1	69%
hernia	9.1	6.1	11.5	2%
genito-urinary disorder	8.2	3.1	12.3	0.00%
nervous disorder	5.7	5.0	6.3	49%
infectious disease	4.7	5.4	3.8	36%
symptoms and ill-defined conditions	17.7	8.8	25.7	0.00%
Number of Observations	696	199	291	

[a] For means, the significance level at which a t test showed that the means for men who could trace their disability to the war and men who could not were different. For percentages, the significance level at which a χ^2 test showed that the means for men who could trace their disabilities to the war and men who could not were different.

[b] I restricted the sample to men aged 23-49. There were 112 men who could trace their disability to the war and 170 who could not.

[c] The examining surgeons rated the veterans.

[d] Body mass index, or weight in kilograms divided by height in meters squared. BMI is a measure of current nutritional status.

to have been discharged for disability, to have been prisoners of war, and to have been volunteers. Interestingly, there is no significant difference in the percentage claiming injury or gunshot wounds, but men without service related disabilities were more likely to claim rheumatism, gastro-intestinal disorders other than diarrhea, respiratory disorders, hernias, and symptoms and ill-defined conditions that could not be classified. Men who could trace their disabilities to the war entered the rolls earlier and were rated by the surgeons to be in worse health.[19]

Even though men who could trace their disability to the war were in worse health, on average, than those who could not, an income effect from pensions can still be identified provided I can control for the limiting health factor that won men their pension. Among all men whose pension is known, whose disabilities resulted from their wartime service, and who were rated as being very disabled, for example, 84% were receiving more than $12 per month and 17% $12 or less per month. Among men whose disabilities did not result from wartime service, all men were collecting $12 a month or less. When men on the rolls under either cause are examined, 56% of the very disabled were receiving pensions of over $12 and 42% pensions of $12 or less (Table 3).[20]

Attachment to the labor force was lower among men who were receiving higher pensions and among men who were in worse health (Table 4). Because receipiency of a large pension and disability were correlated, Table 5 shows retirement rates by health category and by pension amount. Retirement rates were higher by pension amount among

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[19]They were also less likely to live out their expected life span. The findings did not change when I used a logit to examine the differences between men with service-related disabilities and men without service-related disabilities.

[20]Though collinearity between pensions and health ratings is not a problem, the health ratings might still be inadequate measures of health, and a higher pension will capture some of the effects of health. Detailed medical reports are not yet available for these men. However, detailed medical reports will be collected as part of this project, and hence better controls will be possible.

Table 3:

HEALTH AND PENSIONS

	all veterans			war-related			not war-related		
	rated disabled, mildly	fairly	very	rated disabled, mildly	fairly	very	rated disabled, mildly	fairly	very
% receiving									
$\leq$ \$12/month	93.1	81.4	42.9	66.7	52.3	16.5	100.0	100.0	100.0
$>$ \$12/month	6.9	18.6	57.1	33.3	47.7	83.5	0.0	0.0	0.0
Observations	115	182	133	24	63	85	82	101	42

Table 4:

RETIREMENT RATES AMONG VETERANS LESS THAN 70 YEARS OF AGE

	% retired	sample size	χ^2	Prob
receiving $\leq$ \$12/month	8.4	502		
receiving $>$ \$12/month	23.9	113	22.3	0.00
rated mildly or fairly disabled[a]	8.2	379		
rated very disabled	13.1	122	2.6	0.10
died later than expected[b]	10.0	280		
died sooner than expected	12.6	269	1.0	0.33
$20 \leq$ BMI[c] < 28	8.6	395		
BMI < 20 or BMI ≥ 28	17.7	130	8.3	0.00

[a] The examining surgeon rated the veterans.

[b] Expected life span is from a life table for 1900.

[c] Body mass index, or weight in kilograms divided by height in meters squared.

Table 5:

RETIREMENT RATES BY DISABILITY AMONG VETERANS LESS THAN 70 YEARS OF AGE

	% retired	sample size	χ^2	Prob
rated mildly disabled[a]				
receiving $\leq$ \$12/month	5.0	100		
receiving $>$ \$12/month	25.0	8	4.9	0.03
rated fairly disabled				
receiving $\leq$ \$12/month	10.7	131		
receiving $>$ \$12/month	20.0	30	1.9	0.16
rated very disabled				
receiving $\leq$ \$12/month	14.0	43		
receiving $>$ \$12/month	17.0	59	0.2	0.68

[a]The examining surgeons rated the veterans.

the mildly, fairly, and ver disabled, but not significantly so. But, because men with war-related disabilities were employed in different occupations and differed in terms of marital and head of household status, I control control for other characteristics using a logit. The controlling variables are derived from the 1900 Census, which provides information on occupation and labor force participation, the pension and military service records, and the reports of the examining surgeons. The variables, together with definitions, means, and standard deviations, are listed in Table 6.[21]

Because receipt of a pension was not contingent on labor force participation, the only difference between the retirement and the participation option is the income received when working. Although no direct wage or income data are available in the census or

[21]Only three or four men in the sample were not receiving pensions. These men were classified together with men who were on the rolls, but for whom a dollar amount is unavailable. (The results remain unchanged regardless of how these men are categorized.)

Table 6:

DEFINITIONS OF VARIABLES

Variable	Mean	Std. Dev.	Definition
			Dependent Variable
RTRD1900	0.15	0.36	dummy=1 if retired in 1900
			Pension Amounts
PEN8	0.25	0.43	dummy=1 if monthly pension $\leq$ \$8
PEN8-12	0.31	0.46	dummy=1 if \$8 $<$ monthly pension $\leq$ \$12
PEN12-17	0.11	0.31	dummy=1 if \$12 $<$ monthly pension $\leq$ \$17
PEN17	0.09	0.29	dummy=1 if monthly pension $>$ \$17
PENDMISS	0.37	0.48	dummy=1 if no pension information
PENAMT	12.94	7.84	monthly pension amount
			Health
DISCHARGE	0.25	0.43	dummy=1 if discharged from the service for disability
HLTHGOOD	0.25	0.43	dummy=1 if rated mildly disabled
HLTHFAIR	0.34	0.47	dummy=1 if rated fairly disabled
HLTHPOOR	0.23	0.42	dummy=1 if rated very disabled
HLTHMISS	0.18	0.39	dummy=1 if no health information
FARMER	0.40	0.49	dummy=1 if retired or current farmer
PP	0.20	0.40	dummy=1 if retired or current professional or proprietor
ARTISAN	0.13	0.34	dummy=1 if retired or current artisan
LABORER	0.20	0.40	dummy=1 if retired or current laborer
MISSOCCU	0.07	0.26	dummy=1 if retired and past occupation unknown

Continued on next page.

Table 6:

DEFINITIONS OF VARIABLES: CONTINUED

Variable	Mean	Std. Dev.	Definition
			Home Ownership
FARMFREE	0.23	0.42	dummy=1 if a farm and the farm is not mortaged
HOUSFREE	0.24	0.43	dummy=1 if owns a house and the house is not mortaged
MORTPROP[a]	0.20	0.40	dummy=1 if owns mortaged property
NOPROP[b]	0.34	0.47	dummy=1 if owns no property
			Household and Demographic Characteristics
SERVANT	0.02	0.15	dummy=1 if hires a servant
BOARDER	0.05	0.22	dummy=1 if takes in a boarder
DEPEND4	0.15	0.36	dummy=1 head of household and 4 or more dependents in house
MARRIED	0.85	0.35	dummy=1 if currently married
AGE55	0.51	0.50	dummy=1 if aged 50-59 in 1900
AGE65	0.37	0.48	dummy=1 if aged 60-69 in 1900
AGE75	0.12	0.32	dummy=1 if aged 70-79 in 1900
			Education
ILLIT	0.04	0.21	dummy=1 if either could not read or could not write
			Region Residence
EAST	0.21	0.41	dummy=1 if resided in the east
MIDWEST	0.72	0.45	dummy=1 if resided in the midwest
REGOTHER	0.07	0.26	dummy=1 if resided in another region
			Characteristics Residence
URBANCO	0.41	0.49	dummy=1 if city of 10,000 or more in county of residence
STUNEMP	3.62	0.15	mean duration of unemployment in months for manufacturing workers by state

[a]Seventeen percent of non-farmers and 61% of farmers owned mortaged property.

[b]Forty-four percent of non-farmers and 19% of non-farmers owned no property.

pension records, I use past occupation as a proxy for the opportunity cost of not working. If ill-health lowers earnings, then the opportunity cost of retirement, and therefore the impact of pensions, will be overestimated.

In the subsequent regressions, my health proxies are physical condition as measured by the ratings of the examining surgeons and whether the veteran was discharged for disability from the service.[22]

Several proxies for earnings and wealth are available. High state unemployment levels may reflect not only a "discouraged worker" effect, but also low wages.[23] Illiteracy and foreign birth may indicate lower than average earnings.[24] Marital status may also reflect earnings if employers favor married men or if married men are more skilled. In 1900, married males in manufacturing earned 17% more than unmarried males, controlling for the observable characteristics of workers and their jobs (Goldin 1990: 102).[25] Among home owners in cities, letting rooms to boarders may be symptomatic of economic difficulties (Modell and Harevan 1973), but does increase family income. The hire of a servant is an indicator of affluence. Homeownership meant that the person had wealth, because a substantial down payment, generally equal to half of the value of the purchased property, was required (Haines and Goodman 1991).[26]

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[22]The use of other health proxies is also investigated.

[23]Margo (1993) finds that the long-term unemployed soon retired. The statewide unemployment numbers are from Table A.13 in Keyssar (1986: 340-341).

[24]The foreign-born may have been less skilled than the native-born.

[25]See Korenman and Neumark (1991) for an analysis of recent data.

[26]However, because property was one of primary modes of saving, men who had retired might already have liquidated their property. There is some evidence that upon retirement men sold their farms, though often the sale was to their children (Barron 1984). Other assets were insurance policies (Ransom and Sutch 1987) and savings accounts. Alter, Goldin, and Rotella (1992) find that in the middle of the nineteenth century most savings accounts were used to hold funds on route to acquiring physical property. Dependence upon children became increasingly uncommon after 1820 (Ransom and Sutch 1986b). Also, prior to the Second World War, both government and private pensions were rare. Only 12 private pension plans

In the specifications presented in Table 7, the dependent variable is a dummy equal to one if the veteran was retired, and zero otherwise. The effect on the probability of retirement of a unit change in one of the independent variables is given by the partial derivative of the probability function L with respect to the independent variable x.[27] Thus, when pension amount is included as a continuous variable, a \$10 increase in monthly pension income raises the retirement probability by 0.054.[28] Table 8 shows how the mean probability of retirement changes for different pension amounts.[29] The probability of retirement rises linearly with pension amount. In fact, when I entered pension amount linearly into the specification and included dummies for pension amount, the coefficients on the dummies were not significantly different from zero.[30]

Elasticities of labor force non-participation with respect to pension income can be calculated from mean derivatives and mean retirement probabilities. At the pension mean of \$12.9 the elasticity is 0.43 ($= (0.0054)\frac{12.9}{0.1643}$). Evaluated one-half standard deviation below the pension mean and one-half standard deviation above, the elasticities are 0.30 ($= (0.0048)\frac{9.0}{0.1442}$) and 0.53 ($= (0.0060)\frac{16.8}{0.1864}$), respectively. Hence, the larger the pension

existed in 1900. These plans small and could be withdrawn at the discretion of the company. The federal government had no regular retirement or pension system for its employees until 1920 (Fischer 1977; Haber 1983).

[27] $L = \frac{\exp(x'\beta)}{(1+\exp(x'\beta))}$.

[28] The values of $\frac{\partial L}{\partial x}$ were calculated as $\beta\frac{1}{n}\sum L(x)(1 - L(x))$, where β is the logit coefficient and n is the number of observations. Alternative ways in which the derivative and hence the elasticity can be calculated are examined in the next section.

[29] The mean probability of retirement is $\frac{1}{n}\sum L(x)$. Everyone is evaluated at the given pension amount.

[30] When I included pension amount as a polynomial of order 3 or 4, the retirement probabilities were similar, but none of the terms of the polynomial were significant. Note that only men who could trace their disabilities to the war were collecting pension amounts greater than \$12 but less than or equal to \$17 and \$17 or more. Six percent of all men collecting pensions of \$17 or more per month were in good health and 15% were in fair health. I later address the issue whether correlation with health is biasing the coefficient on pension amount.

Table 7:

LOGIT OF DETERMINANTS OF PROBABILITY RETIREMENT, WITH RETIREMENT STATUS AS THE DEPENDENT VARIABLE

	(1) 696 observations likelihood ratio = 285.92		(2) 526 observations likelihood ratio = 228.93	
Variable[a]	Parameter Est[b]	$\frac{\partial L}{\partial x}$ [c]	Parameter Est.	$\frac{\partial L}{\partial x}$ [d]
INTERCEPT	−16.19‡	-1.0362	−18.13‡	-1.3232
PEN8-12	1.08†	0.0670	.	.
PEN12-17	1.10*	0.0705	.	.
PEN17[d]	2.38‡	0.1522	.	.
PENDMISS	0.39	0.0251	.	.
PENAMT	.	.	0.07‡	0.0054
HLTHFAIR	1.11†	0.0714	1.10*	0.0799
HLTHPOOR[e]	1.35†	0.0864	1.53‡	0.1116
HLTHMISS	0.54	0.0349	0.44	0.0319
PP	−1.94‡	-0.1242	−1.71‡	-0.1247
ARTISAN	−1.65‡	-0.1059	−1.07*	-0.0780
LABORER	−1.16‡	-0.0742	−0.94*	-0.0689
MISSOCCU	3.19‡	0.2045	3.12‡	0.2280
FARMFREE	−2.76‡	-0.1767	−2.97‡	-0.2168
HOUSFREE	0.64*	0.0407	0.44	0.0319
MORTPROP	−1.29‡	-0.0824	−1.18†	-0.0866
AGE65	0.78‡	0.0500	0.92†	0.0673
AGE75	1.67‡	0.1067	1.79‡	0.1306
MIDWEST	1.09†	0.0699	0.82	0.0597
REGOTHER	-0.42	-0.0268	-0.88	-0.0640
DISCHARGE	−1.21‡	-0.0775	−1.44‡	-0.1052
SERVANT	-1.11	-0.0712	-1.72	-0.1253
BOARDER	-1.13	-0.0726	-0.89	-0.0652
DEPEND4	−1.57†	-0.1008	−1.63†	-0.1191
MARRIED	-0.49	-0.0311	-0.21	-0.0152
FOREIGN	-0.52	-0.0334	-0.62	-0.0453
ILLIT	0.55	0.0350	0.65	0.0467
URBANCO	0.92‡	0.0586	0.80‡	0.0581
STUNEMP	3.39‡	0.2173	3.92ddagger	0.2858

[a] The omitted dummies are PEN8, HLTHGOOD, FARMER, NOPROP, AGE55, and EAST.

[b] The symbols $*$, †, and ‡ indicate that the coefficient is significantly different from 0 at at least the 10%, 5%, and 1% level, respectively.

[c] $\frac{\partial L}{\partial x} = \beta \frac{1}{n} \sum L(1-L)$ and is in probability units.

[d] PEN8-12, PEN12-17, and PEN17 are jointly significantly different from PEN8 at the 0.00% level. The likelihood ratio is 17.80.

[e] HLTHFAIR and HLTHPOOR are jointly significantly different from HLTHGOOD at the 3% level. The likelihood ratio is 7.36 in the first specification and 7.28 in the second.

Table 8:

RETIREMENT PROBABILITY AS A FUNCTION OF PENSION AMOUNT

	mean retirement probability[a]
PEN8=1	0.1011
PEN8-12=1	0.1619
PEN12-17=1	0.1635
PEN17=1	0.2810
PENAMT is	
6	0.1304
9.0	0.1442
12	0.1593
12.9	0.1643
15	0.1758
16.8	0.1864
24	0.2342
50	0.4753

[a] $\frac{1}{n}\sum L(x)$. In the continuous case, values of PENAMT were chosen to include the mean value (12.9), the values half a standard deviation below and half a standard devation about the mean (9.0, 16.8), as well as several other common values.

Table 9:

ESTIMATED EFFECT ON RETIREMENT RATES OF A PENSION ELIMINATION

	veteran sample		random sample[a]		restricted random sample[b]	
	old[c]	new[d]	un-adjusted	age-adjusted[e]	un-adjusted	age-adjusted
age	%	%	%	%	%	%
50-59	8.4	5.6	3.6	4.1	4.4	5.1
60-69	15.2	11.2	8.5	7.7	9.7	8.9
70-81	42.0	30.5	28.8	26.7	31.3	29.7

[a]The random sample was drawn from the public use sample of the 1900 Census (Preston and Higgs 1980).

[b]The random sample was restricted to men who were either born in a Union state or who, if foreign-born, immigrated prior to the Civil War. The random sample contains both veterans and non-veterans.

[c]Retirement rates in the veteran sample.

[d]Retirement rates in the veteran sample when pensions are eliminated. The coefficients from the second specification in Table 7 were used. This column should be compared with age-adjusted retirement rates in the restricted veteran sample.

[e]Reweighted to have the same age distribution as the veteran sample. The age-adjusted column should be compared with retirement rates in the veteran sample, when pensions are eliminated.

income the larger the elasticity.[31]

Simulating the impact of the elimination of pensions on retirement rates suggests that pensions explain most of the difference in retirement rates among veterans and the general population (see Table 9). Virtually the entire difference between the veteran sample and the random sample disappears.

[31]To investigate if the impact of pension income depends upon earnings, I used income imputations for non-farmers from Preston and Haines (1991: 212-22) that are averages for occupational categories. (I do not yet have income imputations for farmers.) The elasticity of labor force non-participation with respect to pension income did not vary with average occupational yearly income.

Estimation of the coefficient on pension amount may be affected by several biases. For example, because men who could trace their disabilities to the war were more likely to be farmers, differences in retirement rates among farmers and non-farmers may be influencing the coefficient on pension income. If only farmers who are in the labor force own a farm, then because farm ownership is controlled for, the impact of farm occupation on the probability of retirement may be overstated and therefore the impact of pension income overestimated. When I do not control for property ownership, farmers are no longer more likely to be retired than non-farmers. The probability of retirement among farmers and non-farmers is not significantly different.[32] The elasticity of labor force non-participation with respect to pension income falls slightly to 0.38 ($= 0.0049\frac{12.94}{0.1648}$).

Another possible source of bias is sample selection bias. If pensions affected survivorship, then the men surviving to 1900 will be a selected sample, and the coefficient on pensions will be biased.[33] I tested whether pension amount affects life expectancy using a proportional hazards model where the dependent variable was the number of years lived after 1900. Controlling for health, pension amount did not affect the probability of mortality. However, if duration of pension receipiency, not pension amount, matters for length of life, then the coefficient on pensions will be biased. But controlling for health, date of entry is not a significant predictor of mortality.

The coefficient on pension amount may be biased upwards if I inadequately controlled for health status or if I omitted a variable that is correlated with a war-related disability. I examined the relation between the residuals from the logit and pension amount to test if there was additional information in the residuals, but there was no correlation

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[32]This finding suggests that the decline in male labor force participation rates cannot be attributed to the shift from agriculture to manufacturing. This finding is discussed in Costa (1993).

[33]The bias could go either way.

between the residuals and pension amount. If there is no additional health information in pension amount, then the residuals from a prediction of pension amount on individual characteristics such as health, whether the disability was traceable to the war, and age, should not predict subsequent mortality. They do not. Furthermore, instrumental variable estimation suggests that the coefficient on pension amount is a conservative estimate.

Because the estimated impact of health is likely to be sensitive to the health proxy that is used, I tested the use of indices based upon different weighting schemes of the surgeons' ratings for individual diseases. In 2,793 logits, the elasticity of labor force non-participation with respect to pension income, when pension income was included as a continuous variable, ranged from 0.41 to 0.60. I also investigated the use of alternative health variables, such as BMI (Body Mass Index) and BMI squared.[34] [35] When BMI and BMI squared are used as health proxies, the elasticity of labor force non-participation with respect to pension income is 0.49 ($= (.0057)\frac{12.94}{0.1510}$). The BMI which maximizes the probability of labor force participation is 24.9 and this BMI also minimizes mortality risk. The elasticity of labor force participation with respect to pension income was not sensitive to BMI.

As a final test of whether the large estimated impact of pensions arises from a biased coefficient on pension amount, I examined a random sample of native-born men drawn from the 1910 Census (Preston and Higgs 1989). One of the questions asked in the

[34]BMI is weight in kilograms divided by the square of height in meters. Men with BMIs below 20 or 22 and BMIs of 28 or more face a higher mortality risk than men with BMIs in the medium range (Waaler 1984; Hoffmans, Cromhout, and Coulander 1989).

[35]Subsequent mortality as measured by deviations from a life table for 1900 (U.S. Bureau of the Census 1981), was not a significant predictor of labor force participation. Pensions exerted the largest impact on retirement when dummies for specific disorders were used as health proxies. Specific disabilities were not even individually significant predictors of labor participation rates. The problem with using dummies for specific disorders is that the severity of the condition may matter.

1910 Census was whether the respondent was a veteran, and, if so, whether a Union or Confederate veteran. I divided the sample into a "Northern-born" sample, consisting of men born in a Union state and into a "Southern-born" sample, composed of men born in a Confederate state. In 1910 Union pensioners were collecting an average pension of $171.90 per year and about 90% of all Union veterans were collecting a pension. Although some Confederate states provided pensions, the average pension amount was $47.24 per year and fewer than 30% of all Confederate veterans were collecting a pension.[36] Assuming that disability levels were the same across both types of veterans, the difference in labor force participation rates among northern-born non-veterans and Union veterans should be much greater than the difference in labor force participation rates among southern-born non-veterans and Confederate veterans.[37]

Table 10 presents the results of this test. In the "Northern" sample, Union veterans were significantly more likely to be retired than non-veterans, but there was no significant difference in the retirement status of non-veterans and Confederate veterans in the "Southern" sample. There were some Union veterans in the "Southern" sample and they were significantly more likely to be retired than non-veterans. There was also a small number of Confederate veterans in the "Northern" sample. In this sample Confederate veterans did not differ significantly from either Union veterans or non-veterans, but the standard error of the coefficient on Confederate veteran is very large.[38]

[36]Glasson (1918a; 1918b) gives the number of Civil War veterans on the pension rolls in 1910. Because of undernumeration of veterans in the 1910 census, the total number of Union Army veterans is estimated from a life table and is from Series Y 957-970 in U.S. Bureau of the Census (1975: 1145). Assuming that undernumeration of veterans did not vary among Union and Confederate veterans, the number of Confederate veterans can be calculated from the 1910 public use sample.

[37]Although disability levels for Confederate veterans are unavailable, young men in the South were almost three times as likely to die during the Civil War as young Northen men (Vinovksis 1990), suggesting that disability rates were probably higher in the South.

[38]The standard error was 0.39. The standard errors on age were less than half that amount.

Table 10:

LOGIT PREDICTING PROBABILITY RETIREMENT FOR NORTHERN-BORN AND SOUTHERN-BORN AGED 65-89 IN 1910, WITH RETIREMENT STATUS AS THE DEPENDENT VARIABLE (FROM PUBLIC USE RANDOM SAMPLE)

	Northern-born 3237 observations likelihood ratio = 802.70			Southern-born 903 observations likelihood ratio = 345.93		
Variable[a]	Mean	Parameter Est.[b]	$\frac{\partial L}{\partial x}$ [c]	Mean	Parameter Est.	$\frac{\partial L}{\partial x}$ [c]
dummy=1 if retired	0.40	.	.	0.33	.	.
intercept	.	0.24	0.044	.	0.10	0.015
dummy=1 if	.	.	.	.	.	.
not a veteran	0.73	.	.	0.50	.	.
union veteran	0.25	0.34‡	0.064	0.07	1.79‡	0.258
confederate veteran	0.02	0.39	0.025	0.43	0.19	0.027
married	0.72	-0.13	-0.025	0.76	−0.42*	-0.061
illiterate	0.04	0.21	0.039	0.14	-0.16	-0.024
has servant	0.08	−0.34†	-0.064	0.05	-0.49	-0.070
takes in boarder	0.13	−0.52‡	-0.098	0.11	−1.23‡	-0.178
lives on farm	0.36	−1.53‡	-0.287	0.59	−2.04‡	-0.294
head household	0.78	−1.30‡	-0.242	0.79	−2.20‡	-0.317
lives in east	0.39	.	.	0.01	.	.
lives in midwest	0.42	0.41‡	0.076	0.12	1.12	0.161
lives in west	0.07	0.03	0.005	0.03	0.74	0.107
lives in south	0.12	-0.10	-0.018	0.84	1.24	0.179
age 65-69	0.43	.	.	0.48	.	.
age 70-79	0.46	0.98‡	0.183	0.41	1.37‡	0.197
age 80-89	0.11	2.19‡	0.408	0.11	2.06‡	0.297
number dependents	1.86	0.08‡	0.015	2.31	0.04	0.005
county population/10,000,000	0.17	−0.35†	-0.065	0.05	0.02	0.003

[a]The sample consists of white, non-institutionalized, native-born men aged 65-89 drawn from the 1910 Census (Preston and Higgs 1989). The omitted dummies are residence in the east and age 65-69.

[b]The symbols *, †, and ‡ indicate that the coefficient is significantly different from 0 at at least the 10%, 5% and 1% level, respectively.

[c] $\frac{\partial L}{\partial x} = \frac{1}{n}\sum L(1-L)$ and is in probability units.

4 Calculating Elasticities

Although it is not necessary to calculate elasticities to estimate the impact of the Union Army pension program on labor force participation rates, elasticities are a convenient tool. Because researchers calculate elasticities in many different ways, great care must be exercised in estimating them. In the previous section the elasticity of labor non-participation with respect to pension income was calculated by evaluating the derivative and the probability of retirement at every sample point and then taking the mean. Many researchers estimate the elasticity by evaluating the derivative and the probability of retirement at the mean values of the variables. As discussed below, this method leads to an even larger elasticity of labor force non-participation with respect to pension income.

Because logits and probits are non-linear functions, the value of the derivative and of the probability of retirement depends upon the value of the variables at which they are calculated. Evaluated at the mean, the derivative is $\beta L(\bar{x})(1 - L(\bar{x}))$ and the probability of retirement is $L(\bar{x})$. Using the second specification in Table 7 and estimating the derivative and retirement probability at the mean yields an elasticity of 0.77 ($= 0.003\frac{12.94}{0.050}$). But individuals vary widely in their retirement probabilities. Estimating the derivative and the probability of retirement at every point in the sample and then taking the mean ($\beta\frac{1}{n}\sum L(x)(1 - L(x))$ and $\frac{1}{n}\sum L(x)$, respectively) is an average over all types of individuals and weights heterogeneous men more heavily. Recall that the calculation of mean derivatives and mean probabilities yields an elasticity of 0.43, a considerably smaller value. However, if heterogeneous men are outliers, then it may be preferable to estimate the derivative and probability of retirement at the variable means.

The two methods yield different estimates because the sample contains men with a probability of retirement far greater than either the median or the mean. The mean probability of retirement is 0.1721, but the variance is 0.2698. The most important factor is the unavailability of occupational information for some of the men who were out of the labor force in 1900. These men had a predicted probability of retirement of 0.87. They constitute only 7% of the sample and thus their influence on the means of the dependent variables is small. However, because their probability of retirement is large, they exert a large impact on the mean probability of retirement.

Occupational class was predicted for these men. The sample was initially restricted to men who were in the labor force and their probability of switching occupation between enlistment and 1900 predicted on the basis of their individual characteristics. Men with missing occupational information more likely to remain in the same occupational than to change were assigned to their enlistment occupational category. Men likely to have switched were assigned to the 1900 occupational category that they were most likely to have entered. Imputing occupations in this manner, the elasticity estimated by calculating the derivative and the probability of retirement at the sample means barely changes, but the elasticity estimated from the mean derivative and the mean probability of retirement rises to 0.66 ($= 0.0061\frac{12.9}{0.1197}$), suggesting that the previous estimate of the elasticity (0.43) should be revised upwards.[39] [40]

The elasticity of labor force non-participation with respect to pension income varies by group (see Table 11). Men who were old, were in poor health, and lived in urban areas were least responsive to pension income.[41] When non-farm occupations are

[39]Note that in using men in the labor force to predict occupations of men not in the labor force sample selection problems may arise. However, the elasticity was not very sensitive to the occupational imputations that were made.

[40]Factors such as age, health, and state unemployment account for the remainder of the difference in elasticities.

[41]If the cost of living was lower in rural counties, then pensions would represent a much larger sum of money. But, controlling for state cost of living using state price and earnings indices, suggests that cost of

Table 11:

ELASTICITY OF LABOR FORCE NON-PARTICIPATION WITH RESPECT TO PENSION INCOME FOR VARIOUS GROUPS

variables set at[a]	elasticity[b]	elasticity[c]
percent with good health=100	0.46	0.80
percent with fair health=100	0.44	0.74
percent with poor health=100	0.43	0.72
percent aged 50-59=100	0.50	0.78
percent aged 60-69=100	0.48	0.74
percent aged 70-81=100	0.44	0.69
percent farmers=100	0.58	0.75
percent professional or proprietor	0.72	0.79
percent artisan	0.69	0.79
percent laborer	0.77	0.78
percent in urban county=100	0.44	0.74
percent in urban county=0	0.46	0.78

[a]The second specification in Table 7 is used.

[b]The derivative and probability were calculated at every point of the sample, assuming a pension amount of $12.94.

[c]The derivative and probabilities were calculated at the sample means.

examined, responsiveness is greater among men in lower paying occupations. Farmers were least responsive.

The findings imply that increases in Union Army pensions mainly reduced the labor force participation rates of younger men, of men in good health, and of men who were in a poorer occupational class. (Union pensions also reduced the labor force participation rates of men in rural counties, but the orders of magnitude are smaller.) Therefore, as veterans aged, the impact of the pension program on labor force participation rates should have been mitigated.

Recent studies find smaller elasticities of non-participation with respect to Social Security retirement and disability payments and with respect to assets than I find with respect to Union Army pensions. There are of course exceptions. Parsons (1980a) finds an elasticity of non-participation in response to disability payments of 0.63, but he did not distinguish between the effect of benefits on labor supply and the effect of low wages. Leonard (1979) finds an elasticity of non-participation of 0.35 and of 0.44 when he restricts his sample to those who claim to know of the Social Security Disability program. But work by Bound (1985) suggests that Leonard's results yield an elasticity of 0.16 because less than half of the men who were rejected for disabilty payments were working. Haveman and Wolfe (1984a;1984b) find elasticities of non-participation of 0.002 to 0.003, but Leonard (1986) points out that their simulations imply an elasticity of 0.58. The respective elasticities of labor force participation with respect to pension income are -0.03 (Parsons), -0.0003 to -0.0005 (Haveman and Wolfe), -0.052 (Leonard), and -0.024 (Bound). (I find an elasticity of labor force participation of -0.08.) Note that the calculated elasticity differs according to the health proxy that is used. Parsons employed subsequent morbidity, Leonard a list of

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living within a state is an insignificant predictor of labor force participation.

chronic conditions, and Haveman and Wolfe self-reported health. Bound (1991) points out that when subsequent mortality is used the impact of pensions will be overestimated and when self-reported health is used the impact of pensions will be underestimated. Work by Bound and Waidmann (1992) on trends is self-reported disability from 1950 to 1987 suggests that the elasticity of labor force non-participation with respect to disability payments is not that large. They can explain at most one quarter to one third of the fall in labor force participation rates among men 55-64 by increases in disability payments.

Discussions of the impact of Social Security retirement benefits on labor force participation rates have not focused on the elasticities. However, some of the simulations that have been presented can be expressed in elasticity form. Hurd and Boskin (1984) estimate that an extra $10,000 in Social Security wealth would lower participation by 0.078 among men 60-64, implying an elasticity of labor force non-participation of 0.71. They attribute all of the change in retirement rates between 1968 and 1973 to increases in Social Security. Other researchers find a smaller impact of Social Security retirement benefits on labor force participation rates. Hausman and Wise (1985) estimate that an extra $10,000 in Social Security at ages 62-64 leads to a 1.7% increase in the probability of retirement and at ages 65 or older to a 3.8% to 4.0% increase. They estimate that increases in Social Security benefits from 1969 to 1973 could account for at most one third of the decrease in labor force participation rates among men aged 60-64 and less for men 65 years of age or older. Although Hausman and Wise (1985) gave no information on the magnitude of benefit increases in the period covered by their simulations, their results suggest that an upper bound for the elasticity is 0.23.[42] Krueger and Pischke (1992) use time series data to examine cohorts whose Social Security wealth was reduced because of

[42]Estimated from various issues of *Social Security Bulletin* for benefits.

the 1977 amendments to the Social Security Act and find that Social Security wealth had a statistically insignificant impact on the retirement rate.[43]

Most studies have found a small effect of assets, perhaps because assets are not necessarily exogenous. Hurd and Boskin (1984) find that although workers in the highest asset quartile retire more frequently, variation in retirement probability with assets is small. Hausman and Wise (1985) find that on average an extra $10,000 in liquid assets leads to only a 0.16% increase in the probability of retirement. Diamond and Hausman (1984) find on average an extra $1,000 in wealth reduces time until retirement by 6%, but an extra $1,000 in Social Security wealth reduces time until retirement by about 15%.

There are several reasons why the elasticity of labor force non-participation with respect to Union Army pensions may have been larger than the elasticity of non-participation with respect to Social Security payments or assets found by Bound (1989), Hausman and Wise (1985), and Krueger and Pischke (1992). Among these are 1) because estimates of elasticities are sensitive to the point at which they are calculated none of the elasticities are comparable; 2) elasticities vary by groups and the relative size of groups has changed; 3) Union Army pension represented a relatively larger sum than either Social Security retirement or disability benefits; 4) Union Army pensions were the only available retirement program; and 5) the elasticity of labor force non-participation has changed over time, perhaps because of cultural factors.

Researchers have calculated elasticities in various ways. Elasticities estimated from simulated retirement probabilities, such as those of Hurd and Boskin (1984) and of Hausman and Wise's (1985), were calculated from the mean derivative and the mean probability of retirement. Leonard's (1979) and Parson's (1980a) elasticities were estimated

[43]It should be noted that the amendments also reduced the relative wealth advantage of delaying retirement.

by evaluating the derivative at the mean and using the mean retirement rate in the sample.

Regardless of how the elasticity is calculated, the elasticity of labor force non-participation with respect to Union Army pensions is greater than that with respect to current income transfers. Comparisons by veteran status and by pension receipiency showed that the impact of Union Army pensions on labor force participation rates was substantial. The evidence on the impact of Social Security retirement and disability payments is mixed.

Differences in the elasticity in the Union Army sample and in recent data can perhaps be accounted for by changes in characteristics, such as age, occupation, and health. Precise estimates of the effect of changing characteristics are not possible because of differences in specification and because variable means are rarely given in the retirement literature.

Although a decrease in average health might therefore have lowered the elasicity of labor force non-participation with respect to transfer income, the available evidence indicates that health has improved over time. Body Mass Index has increased. The prevalence of rheumatism, heart disease, hernias, varicose veinsm and respiratory conditions were higher among Union Army veterans than among men today. Congenital anamolies in the young were more prevalent in 1860 than today (Fogel, Costa, Kim 1993).

The Union Army sample consists of men 50-81 years of age. Hausman and Wise (1985) estimated probabilities of retirement for men 60-64 years of age. The impact of Social Security disability payments on labor force participation is estimated for men aged 45-61. Therefore, if a recent age distribution were imposed on the Union Army sample, the elasticity of labor force non-participation with respect to pension income should rise.

The elasticity barely changes when a current occupational distribution is imposed on the Union Army sample.[44] When the derivative and probability are calculated at the means, the elasticity of labor force non-participation with respect to pension income becomes 0.73 ($= 0.003\frac{12.94}{0.053}$). When the elasticity of pension income is calculated at every point, the elasticity is 0.62.

5 Relative Size of Pensions

Union Army pensions may have had a larger effect on labor force participation rates than either Social Security or disability benefits because Union Army pensions represented a relatively larger sum of money than either Social Security retirement or disability payments. In 1900, for men 60 years of age or older, the average Union pension as a percentage of average annual earnings was 15% higher than the average Social Security payment in 1980.[45] As a percentage of per capita GNP, the average Union Army pension was 55% of per capita GNP in 1900, while the average Social Security retirement payment was 35% of per capita GNP in 1990 and the average Social Security disability payment 37%.[46] In 1900, a pension of $7 per month represented 35% of monthly per capita GNP. Evaluating the derivative and the probability of retirement at a pension of $7, the elasticity of labor force non-participation is 0.41 ($= 0.0030\frac{7}{0.0509}$). Calculating the mean derivative and mean probability of retirement and imputing occupations, the elasticity of labor force non-participation with

[44] Present and past occupations of all men aged 45-54 in 1969 in the National Longitudinal Survey of Older Men (Center for Human Resource Research 1983) were classified.

[45] Estimated from Table A.1 in Preston and Haines (1991: 212-220), U.S. Bureau of the Census (1983b), and Table 703 in U.S. Bureau of the Census (1991).

[46] Calculated from Series F 1-5 in U.S. Bureau of the Census (1975: 224), Table 2 in U.S. Department of Health and Human Services (1991: 17), and Table 703 in U.S. Bureau of the Census (1991: 434).

respect to income is 0.36 ($= .0034\frac{7}{0.0667}$).[47]

Union Army pensions represented not only a large fraction of average earnings and of GNP, but also of retirement income. There were no other retirement programs at the turn of the century. Pension programs were rare and the inability of workers to save for old age because of low wages was a great concern (e.g. Squier 1912).

Not only are pension plans now widespread, but there are many social programs in addition to Social Security. The impact of any one program is therefore mitigated. Haveman and Wolfe (1984a; 1984b) account for other forms of assistance and of income, by estimating total income both in and out of the labor force and find that Social Security Disability Income has only a small effect on labor force participation rates. Bound (1985) finds that because a large fraction of rejected Social Security Disability applicants receive some kind of public assistance they can be out of the labor force. In a sample of Social Security Disability receipients, Social Security Disability payments represented 75% of all transfer payments.[48] Therefore, the elasticity of labor force non-participation with respect to Union Army pension income should be compared to the elasticity of labor force non-participation with respect to total transfer income, not with respect to one program alone. IF total transfer income is $12.9 per month, a program equivalent in magnitude to Social Security Disability would pay $9.7 per month. If private pensions are included in total transfer income, then disability payments represent $8.6 per month. Ignoring program interactions, imputing occupations, and estimating elasticities from the mean derivative

[47]Although the average Social Security retirement benefit is smaller than the average Union Army benefit in relative terms, in real terms the average Social Security retirement benefit is much larger. In 1990, the average monthly Social Security retirement benefit was about $38 in 1900 dollars. However, if retirees seek to maintain a socially defined standard of living, then because the standard of living has risen over time, relative pension amount is the relevant quantity.

[48]The sample is drawn from the 1969 National Longitudinal Survey of Mature Men (Center for Human Resource Research).

and mean retirement probabilities yields elasticities of $0.58(=0.0040\frac{9.7}{0.0668})$ and $0.52(=0.0032\frac{8.6}{0.0511})$, still higher than estimated elasticities with respect to Social Security disability and retirement benefits.

Savings, wages of family members, and income from part-time work are now greater than in 1900. Therefore, a monthly transfer is likely to have a smaller effect at high than at low levels of retirement income. Although incomes are not known in the Union Army sample, the following calculation illustrates the importance of size of retirement income. Among Social Security disability receipients, disability payments represent approximately 41% of all income. Thus, if \$12.9 per month is total income, Social Security disability payments are \$5.3 per month. Evaluating derivatives at every point and imputing occupational class, the elasticity of labor force non-participation with respect to pension income is 0.33.

6 Changes in Elasticity

The effect of pension income upon labor force participation was substantial. Pensions could explain most of the difference in retirement rates between veterans and the general population. Imputing occupations to men whose occupation was unknown yielded an elasticity of labor force non-participation with respect to pension income of 0.66. Compared with most elasticities of labor force non-participation with respect to Social Security payments derived from modern data, an elasticity of 0.66 is large. Although the range of computed elasticities of labor force non-participation with respect to Social Security payments varies widely, an elasticity close to 0.20 is a conservative estimate. The analysis showed that the high elasticity of labor force non-participation with respect to pension income was not caused by bias problems. Differences in elasticities derived from the Union Army sample and from recent data can partially be explained by differences in payments relative to GNP and by differences in payments as a fraction of total retirement income. In fact, adjusting for these differences, the elasticity of labor force non-participation falls up to 0.33 points to an elasticity of 0.33.

Because Union Army pensions led to only an income effect, estimates of the impact of Union Army pensions on retirement rates can be used to calculate the effect of a secular increase in income on the secular decline in male labor force participation rates, under the assumption that the elasticity of labor force non-participation with respect to pension income has remained constant since 1900. The retirement rate for men 65 years of age or older was 34.6% in 1900, 42.0% in 1930, 53.0% in 1950, and 75.3% in 1980 (Moen 1987: 29). An increase in income, holding wages constant, of 53.5% between 1900 and 1930, 65.0% between 1930 and 1950, and 150.5% between 1950 and 1980 could explain all of the increase in retirement rates. Per capita fixed reproducible tangible wealth rose by 33% between 1900 and 1930, 57% between 1930 and 1950, and 79% between 1950 and 1980.[49] Therefore, income effects alone could explain at least 60% of the decline in labor force participation rates.

However, the evidence suggests that the elasticity of labor force non-participation with respect to income has fallen since 1900. Workers may now be less responsive to changes in transfer income if their choices are constrained by a retirement *ethos*, age bars and discrimination against older workers, production processes that prohibit workers from laboring at their own pace, and declines in the possibilities for self-employment.[50]

[49]Calculated from U.S. Bureau of Economic Analysis (1986: 322-370). While I do not know the share of income going to the elderly between 1900 and 1950, I know that between 1950 and 1980 retirement incomes followed per capita wealth, increasing by 73%. (Calculated from U.S. Bureau of the Census 1983b and 1984. In estimating retirement income, I used a log-normal approximation.)

[50]Two other possible factors are declines in the possibilities for part-time work and mandatory retirement.

If, a decline in self-employment eliminates for many men the possibility of remaining in the labor force, then the elasticity of labor force non-participation with respect to pension income will fall.[51] However, the decline in self-employment in non-agricultural occupations has been small.[52] In all age groups, 16% were self-employed in 1910 and 11% in 1980.[53]

Older workers who lose their jobs face greater difficulties on the job market now than at the beginning of the twentieth century. Owen (1991) documents the technological changes that increased the firm-specificity of skills and led to the adoption of an integrated and synchronized production process that prohibited workers from laboring at their own pace. In response to these changes, firms adopted age bars.[54] While the probability of entering unemployment does not increase with age, the probability of exiting unemployment does. Futhermore, the probability of leaving unemployment has decreased by over a month since 1910. In the veteran sample, the elasticity of labor force non-participation with respect to pension income was 0.47 among workers living in a state where the average duration of unemployment among manufacturing workers was 3.5 months. Among workers living in a state where the average duration of unemployment was 4.0 months, the elasticity was 0.41,

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But, estimates of the effects of mandatory retirement are small (e.g. Quinn and Burkhauser 1983) and although long time series on part-time employment are unavailable, the policy of most nineteenth century manufacturing firms to have all workers begin and end their day at the same time (Atack and Bateman 1990) suggests that the hours flexibility that nineteenth century could or would offer was limited. In fact, an examination of census data shows that there was no decline in the percentage of the male labor force employed in part-time work from 1940 to 1980.

[51] Declines in self-employment will have no impact on the elasticity if changes in retirement income lead to changes in hours worked, instead of participation rates.

[52] It is not yet possible to estimate the impact of the decline in self-employment on changes in the elasticity of labor force non-participation with respect to pension income. However, linkage from the 1910 to the 1920 census would permit an examination of retirement patterns among self-employed and wage workers.

[53] Estimated from Preston and Higgs (1989) and U.S. Bureau of the Census (1983b).

[54] See Ransom *et al.* 1993 for more details on age bars.

suggesting that increases in the average duration of unemployment have slightly lowered the elasticity of labor force non-participation with respect to pension income.

Although the medical and managerial theories of the first half of the century already propounded a doctrine of retirement for the sake of efficiency and a retirement ethos was intensified by the Great Depression, in the 1950s, community leaders lamented the inability of Americans to enjoy doing nothing that made retirement so difficult and proposed a national effort to educate people into leisure (Graebner 1980: 228). Graebner (1980) argues that there was just such a national effort and describes how retirement was agresively marketed as a consumable commodity by corporations, labor unions, and insurance companies.[55] Companies established retirement preparation programs and journals aimed at retired employees were increasing filled with idyllic depictions of the retired life. Sociologists argued that retirement of the elderly allowed them to preserve their self-esteem and spared them the embarrassment caused by their declining abilities.

Whether the campaign to glamorize retirement was successful cannot be ascertained with the data at hand. Nor can the available data determine whether the marketing of retirement was the cause or the outcome of a low elasticity of labor force non-participation with respect to transfer income. Interestingly, although the labor supply of Union Army veterans was highly elastic, contemporaries claimed that resistance to retirement was ingrained in the national character (Graebner 1980: 6). The marketing of retirement, however, was accompanied by the growth of leisure industries. Mass tourism and mass entertainment, such as films, television, golf, and spectator sports provided activities for the elderly at a low price. As the desirability of leisure increased, the elasticity of labor force non-participation with respect to pension income may have decreased. Once a sizable fraction of older men

[55]Insurance companies were pension plan trustees.

are retired, then unresponsiveness to pension payments may be the outcome of a "bandwagon" effect or of a desire to conform to societal expectations. The men remaining in the labor force may be those who love their work and who could only be induced to leave the labor force by a very large sum of money.

7 Concluding Remarks

This paper investigated the causes underlying the secular rise in male retirement rates by examining patterns of labor force participation among older men prior to the institution of Social Security and of private pensions plans. A newly created longitudinal, historical data set based upon the military, census, and pension records of Union Army veterans was used. Pension receipiency depended not upon earnings or labor force status, but upon health. But, veterans who could trace their disabilities to the war received more for the same disability than veterans who could not. Therefore, controlling for health, the impact of pensions could be distinguished from health.

Estimates of the impact of pensions on labor force participation rates suggest that while the secular increase in income can explain a substantial portion of the rise in retirement rates they can not explain all. Evidence from Fogel, Costa, and Kim (1993) shows that, on average, the prevalence of disabling conditions has declined since 1900. Therefore, a worsening of average health cannot explain the decline. The decline cannot be attributed to the shift from farming to manufacturing because farmers were no less likely to retire than non-farmers (Costa 1993). The elasticity of labor force participation with respect to transfers derived from the Union Army sample was greater than that derived from recent data and suggests that the elasticity has fallen. One plausible reason for the decline is the increasing attractiveness of leisure caused by the development of mass tourism and mass entertainment. If leisure continues to grow more attractive, changes in transfer policies alone may not be enough to induce large increases in labor force participation rates among the elderly.

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