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RETIREMENT EFFECTS OF THE SOCIAL SECURITY EARNINGS TEST

by

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I. Introduction

Under current Social Security System rules, individuals eligible for pensions can earn up to a specified amount and receive full benefits, but above that amount, the benefit is reduced by 50 cents for each dollar of earnings until the pension is reduced to zero. This "earnings test" has recently come under attack for decreasing the labor supply of older men by in effect cutting their gross wage in half. To limit the disincentives to working, the exempt amounts not subject to the implicit tax have been substantially increased during the last few years, and there is serious consideration of eliminating the earnings test completely.

The analysis presented below suggests that the theoretical effect of the earnings test is not clear. Eliminating it or raising the exempt amount may encourage pensioners who retire completely under current rules to continue working, and may induce pensioners who work part-time and receive full benefits to increase the hours they work. However, eligible workers who currently do not receive pensions may reduce hours worked if they can receive full pension benefits while working any amount they wish. The net effect on the aggregate supply of individuals eligible for Social Security pensions is shown to be ambiguous.

This paper uses panel data from the National Longitudinal Survey of Older Men (NLS) to solve three problems faced by researchers in this area: lack of variation in earnings test paremeters in cross section data, errors in imputed wage rates, and inadequate data on private pensions. Significant effects on the probability of retirement were found for the individual's hourly wage, his actual or potential Social Security benefit, other types of nonlabor income, health, education, and self-employment. However, there

was no evidence that changes in earnings test rules which occurred between 1970 and 1974 affected the retirement behavior of men eligible for Social Security pensions. Taken together, these findings suggest that liberalizing or eliminating the earnings test would have little effect on the total labor supply of older men but would substantially increase pension benefits, primarily to eligible men with the highest incomes.[1.]

The outline of this paper is as follows: Section II analyzes the theoretical effects of Social Security rules and benefits. Section III explains the estimation technique and describes the variables used. Section IV presents the regression results, and Section V summarizes the paper's findings.

II. Utility Maximization under Social Security

The budget constraint faced by people eligible for Social Security pensions is complicated both by the earnings test and by early retirement penalties. Individuals who choose to receive a pension (B) may also receive income that does not depend on current labor supply decisions (P). Their income at zero hours of work (B + P) is point 1 in Figure 1. If they choose to remain in the labor market they earn an exogenous gross wage (W) and may incur fixed costs of working for commuting expenses, meals away from home, or special clothing (F).[2.] The earnings test stipulates that a certain exempt amount (E) can be earned with no reduction in benefits, but that the pension is reduced by 50 percent of earned income above that amount. The budget contraint for working pensioners thus has slope - W from B+P-F (point 2 in Figure 1) to B+P-F+E (point 3), and slope - W/2 above that point on the vertical axis until the pension is reduced to zero at income 2B+P-F+E (point 6). Above point 6 the slope is -W.

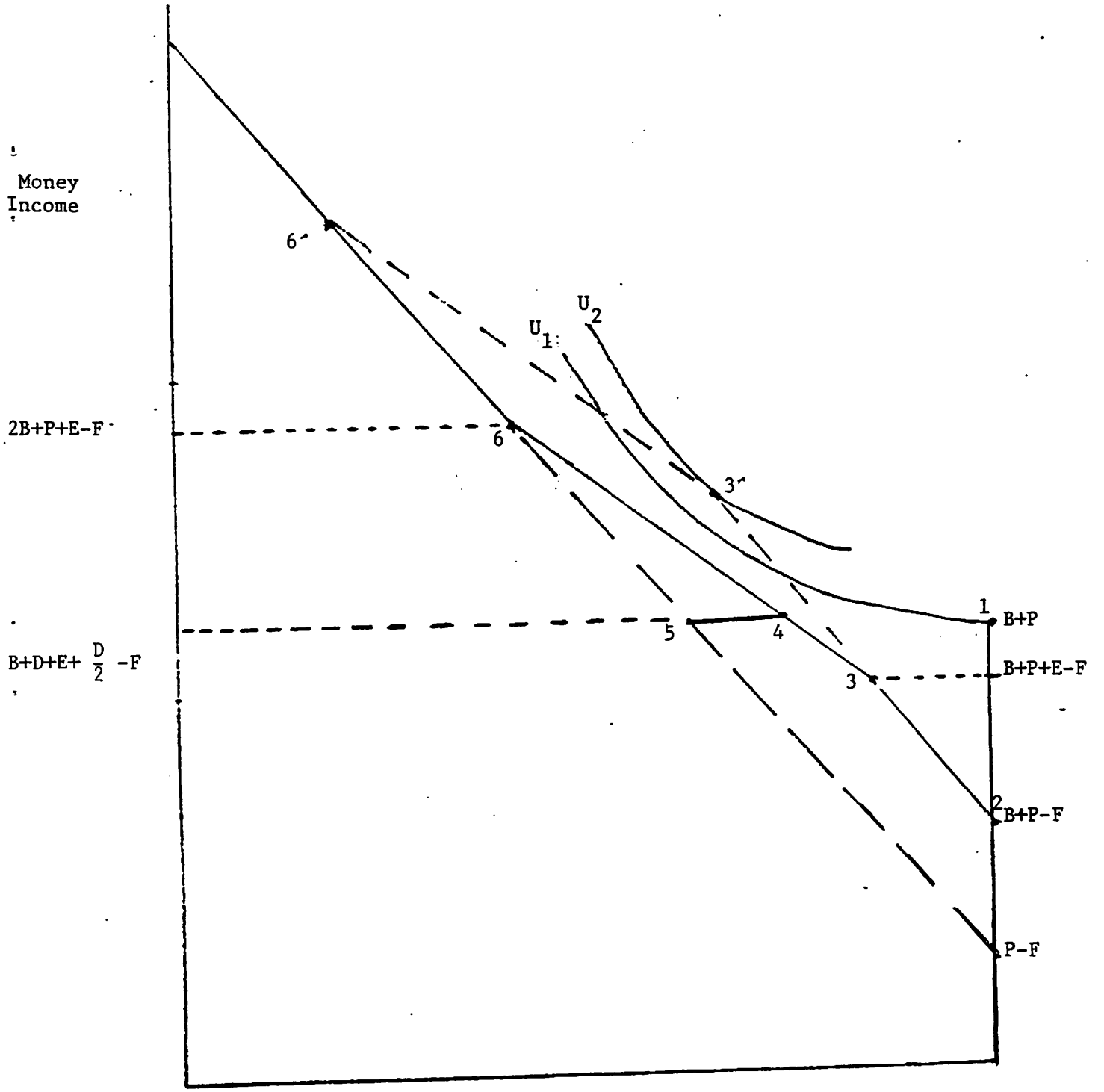
Money Income
2B+P+E-F
B+D+E+ D/2 -F
6'
6
U1
U2
3'
5
4
1
B+P
3
B+P+E-F
2
B+P-F
P-F
Leisure →

Figure 1

The labor supply effect of increases in the exempt amount (E) will depend on the segment of the budget set which the individual has initially chosen. People who retire completely by choosing point 1 on indifference curve U_1 may decide to move to indifference curve U_2 at or near point 3′. (Note that individuals initially at point 1 will not be affected by changes in the earnings test if there are no fixed costs of working.) An individual who initially chose a combination of income and leisure between points 2 and 3 will not be affected by an increase in E, but workers at point 3 may increase their hours of work if the exempt amount increases. The effect of an increase in E on workers who initially received reduced benefits (those between points 3 and 6) is ambiguous, since the change includes both income and substitution effects. Finally, workers who initially chose not to receive a pension may instead choose a combination of leisure and market goods near point 3′ as the exempt amount rises.

This discussion accurately reflects current earnings test rules. Until 1971, however, there was also a horizontal segment in the budget constraint. Then as now, pension recipients were allowed to earn a certain amount (E) with no reduction in their benefits. The next $1000 of earnings (D) were implicitly taxed at 50 percent. Finally, when earnings exceeded E + D (and money income exceeded B + P + E + D/2 - F) there was 100 percent taxation, as benefits were reduced by the full amount of earnings until no benefits were paid, at point 5. After 1971, however, this horizontal segment of the budget constraint was eliminated, and benefits were exhausted at point 6 (with money income 2B + P + E - F).

The purpose of this increase in the level of money income at which no pension was paid was undoubtedly to encourage workers at point 4 to increase their labor supply. It may also have induced individuals previously out of the labor force at point 1 to work along the segment from point 4 to point 6. However, the elimination of the horizontal segment may also have encouraged individuals who did not receive pensions, who were on the segment between points 5 and 6, and to reduce their working hours and become pensioners on the segment between points 4 and 6.

The net effect of an increase in the exempt amount or of elimination of the 100 percent tax segment on aggregate labor supply is thus ambiguous. The increase in E may decrease the number of fully retired pensioners, and increase hours supplied by workers receiving full benefits. However, it may reduce hours worked by individuals receiving reduced benefits and by workers who initially received no pension. The net effect depends on the relative number of individuals on each arm of the budget constraint and on their income and substitution elasticities of labor supply.

One additional complication is introduced by the early retirement penalty. If an individual chooses not to receive a pension, his future benefits will rise, especially for workers under 65. Under the assumption of perfect capital markets, the present discounted value of this increase in future benefits (M) can be included in nonlabor income. M varies with the individual's age, life expectancy, wage rate, and the market interest rate. Burkhauser (1977) has shown that for individuals 62 to 64, certain interest rates and life expectancies imply a value of M greater than potential current period benefits (B). In this case, the budget constraint for not accepting a Social Security pension will lie above the "acceptance" budget constraint at all

points. Simple wealth maximization will preclude accepting a pension. In the more typical case for men 62 to 64 and for all men 65 and over, B will exceed M. If M exceeds B - F, individuals will never work part-time while receiving a pension, but will always leave the labor market when they begin receiving Social Security benefits. In this case, the earnings test will not affect their behaviour. If M is less than B - F, the relevant segment of the budget constraint between points 3 and 6 is shortened.

III. Estimation Technique and Definitions of Variables

Estimation of the labor supply response to changes in earnings test rules is complicated by the fact that a portion of the budget constraint is convex from below, since the net wage rises as hours of work rise after the pension is exhausted. In the typical case in which the budget constraint is linear or mildly concave because of the progressive income tax, marginal changes in exogenous variables will produce only marginal changes in hours of work. Labor supply functions can then be estimated by linear regression techniques. When the budget constraint is convex, however, small changes in the slope of one arm, caused for instance by a marginal change in the gross wage, may induce large changes in hours worked as the individual shifts from one arm of the budget constraint to another. Linear estimation techniques which implicitly assume that the labor supply function is continuous are clearly not appropriate.

Another approach is to characterize the budget constraint by its various slopes or intercepts, and to use as a dependent variable not the number of hours worked but the choice of difference segments of the budget

constraint. Logit estimation can then be used to estimate the effects of the independent variables which describe the budget constraint on the probability of being on a certain segment.[4] An individual eligible for Social Security pensions can choose to locate on one of four segments of his budget set. He can receive his full pension and do no market work (C1: point 1 in Figure 1). He can receive his full pension and still continue working (C2: the segment from point 2 to point 3). He can receive a reduced pension while working (C3: the segment from point 3 to point 4 in 1971 or point 6 after that year). Finally, he can work and receive no Social Security pension (C4: the segment to the left of point 5 or 6).[5] Since individuals must first decide whether or not to accept Social Security benefits, the probability that C4 was one was estimated for all observations. For individuals who did choose to receive benefits, logit regressions were also estimated with C1, C2, and C3 as dependent variables.

Since the individual's choice of C1 to C4 depends on his budget constraint, the independent variables must include a parameterization of the constraint. For analytical purposes, describing the constraint by the slope of each segment and the intercept at zero hours of work is perhaps most useful. For empirical work, however, this is not possible, since the slope of C2 equals the slope of C4 and half the slope of C3. Instead, the independent variables used to describe the budget constraint included the individual's real wage in 1971 dollars (W), the nonlabor income he could receive if he worked zero hours (B + P), and, to capture the effect of the earnings test, the difference in real money income between point 2 and 3 (E), and between points 2 and 5 or 6 (G=E+D/2 or =E+2B). The wage and nonlabor income elements of the budget constraint vary across

time periods. As explained below, the data used in each labor supply regression included individuals in different years. Therefore, these five variables (w, B, P, E, and G) vary across observations and are not colinear.

Since no wage was observed for nonworkers, an imputed wage, based on their observable characteristics and on an individual specific error term, was used for them. In order to eliminate possible bias from the correlation between past and present tastes for leisure, a potential Social Security benefit was imputed for all men. These two imputations are discussed in the Appendix. Actual or potential private pension income was calculated from data on income actually received and from questions on the age of eligibility and level of pensions not received. Since this type of income is not subject to the earnings test and is not indexed, it seemed preferable to allow its effect to differ from the effect of Social Security benefits rather than constraining the two to be identical. Imputed rent was calculated as six pecent of the difference between the value of the individual's home and his mortgage debt. Although imputed rent is theoretically no different from other types of property income, imperfections in capital markets and differences in tax treatment make it different in practice. Other asset income, including capital gains, interest, dividends, and rental income, was therefore defined separately from imputed rent. The final type of income included transfers, workmen's compensation, veteran's compensation, and disability income.

Other independent variables included demographic characteristics which might affect the allocation of time between the market and household, as well as variables that determine the budget constraint. Other labor supply studies have found that education and race affect the probability of labor

force participation, perhaps because they reflect nonpecuniary aspects of work not captured by the market wage. Education, health, and age may be correlated with the marginal utility of home time, other things equal. Married men may work more than single men if the home time of husbands and wives are substitutes, or less if they are complements. Poor health and age are negatively correlated with life expectancy, and short life expectancy reduces the value of postponing receiving a pension (M). The analysis above indicated that low values of M made retirement more attractive. All of these points suggest that age, poor health, and being black are expected to increase the probability of retirement; education should increase the probability of continued work; while the effect of marital status is ambiguous.[6.]

The data used to estimate the retirement regressions come from the National Longitudinal Survey of Older Men (NLS). The NLS first interviewed 5020 men aged 45 to 59 in 1966, and reinterviewed them extensively in 1967, 1969, 1971, 1973, and 1975.[7.] Since the NLS contains information on individuals in several periods, the sample of observations eligible for Social Security pensions includes up to three observations on the same individual. The standard logit estimator requires that error terms be independent across observations. Since each individual has unmeasured tastes which are correlated over time, pooled data on the same man in different years do no meet this requirement. Therefore, three separate samples were used to estimate the retirement equations. These included observations on men 62 or 63, 64 or 65, and 66 or 67.[8.] Each sample included at most one observation per individual, but an individual could be in all three samples. Since the error terms in any one sample were independent of one another, the retirement equations could be estimated by logit techniques.

IV. Labor Supply Regressions

Table 1 presents the partial derivatives for the probability of working full-time and receiving no pension (C4) for the three age groups[9]. Asymptotic t statistics of the hypothesis that each partial effect is zero are in parentheses. Since over three quarters of men eligible for Social Security pensions choose either full-time work of full-time leisure (C1), the wage effect on the probability of C4 is positive, like the wage effect in a labor force participation regression. For the older two groups, the wage coefficient is statistically significant, and implies that each dollar increase in the hourly wage raises the probability of full-time work by about two percent. The wage effect for the youngest group is also positive, but small and insignificant.

According to the analysis of Figure 1 above, elimination of the 100 percent tax segment should make accepting a pension more attractive and decrease the probability of full-time work. Increases in the exempt amount of earnings not subject to pension reduction should have the same effect. Therefore, E and G should both have negative coefficients in the C4 regressions. However, they do not. Although the coefficient on G for the youngest men was negative and significant, the coefficients on E for both 62-63 year olds and 64-65 year olds were positive, significant, and implausibly large. When G was omitted from the youngest regression, the coefficient on E was as large as before, but with the opposite sign.

Table 1

Partial Derivatives of Working Fulltime With No Pension (C4)

	Age 62-63	Age 64-65	Age 66-67
Wage	.006 (1.04)	.020 (3.78)	.024 (3.06)
Exempt Amount (E)	.651 (2.14)	1.036 (2.58)	--
G	-.133 (4.04)	--	--
Social Security Benefit (B)	.403 (5.91)	-.119 (3.98)	-.147 (3.28)
Other Pensions	-.014 (2.07)	-.038 (3.59)	-.033 (2.33)
Imputed Rent	-.004 (0.30)	.020 (1.61)	-.019 (1.21)
Other Asset Income	-.044 (0.70)	-.006 (0.95)	-.006 (1.20)
Transfers	-.045 (2.38)	-.021 (1.62)	.007 (0.43)
Married, Spouse Present	-.060 (2.08)	.019 (0.50)	.004 (0.09)
Poor Health	-.118 (5.42)	-.168 (5.53)	-.061 (1.60)
Black	.039 (1.38)	.024 (0.71)	-.026 (0.51)
Self-Employed	.019 (0.71)	.062 (2.13)	.087 (2.37)
Education	.011 (3.54)	.009 (2.34)	.016 (2.75)
Probability	.636	.278	.204
NOBS	816	475	201

Note: Asympototic t statistics in parentheses.

Several other specifications, including hours at the kink points and money income at the kink points, also yielded coefficients that were implausibly large and had unexpected signs. These signs suggested that the earnings test variables were picking up the effect of a trend away from full-time work. When a trend term was included along with the previous variables, its coefficient was not significant and the coefficients on E and G were smaller and less significant than those shown in Table 1, but had the same signs. When only the trend term was included, with E and G omitted from the regression for 62 and 63 year olds, the estimated coefficient indicated a trend away from full-time work of five percent per year. For 64 and 65 year olds, the down-trend was 3.3 percent per year.

The estimated effects of the five types of nonlabor income were generally negative, as expected, but there was a wide range of size and significance. For the two older groups of men, an increase in Social Security benefits of $1000 decreased the probability of full-time work by about 13 percentage points. However, the estimated effect for the youngest men was an increase of 40 percentage points. This unintuitive result may be due to a correlation between the benefit itself and the reward to working an additional year (M), which falls sharply at age 65.

An increase of $1000 in other pension income decreased the probability of full-time work by about 3.5 percentage points for the older two groups. This was more than twice as large as the effect on the youngest groups. The effect of private pensions may have been smaller than the effect of Social Security benefits because the latter are indexed but the former are not.[10.]

Property income had little effect on the probability of full-time work. Coefficients on imputed rent to owner-occupied housing and on income from other assets were negative, but small and insignificant. Transfer income decreased the probability of full-time work for the youngest men, but had little effect on the older two groups.

Other things equal, married men aged 62 or 63 were six percentage points less likely to work with no pension than unmarried men, though marital differences were small and insignificant for older men. Education, self-employment, and good health all significantly increased the probability of full-time work. There were no significant differences between blacks and whites. The dramatic effect of age on retirement is apparent from overall probabilities of working full-time. Almost 64 percent of men 62 or 63 years old worked without receiving a Social Security pension, compared to 28 percent of 64 and 65 year olds and 20 percent of 66 and 67 year olds. (Note that this decline does not indicate the effect of age, holding other factors constant.)

A second set of logit regressions was run for men who received Social Security pensions. These "retired" men could choose not to work at all (C1), to limit their work so that they received the full pension for which they were eligible (C2), or to work and receive a reduced pension (C3). Logit regressions were run for all three dependent variables for all three age groups. Table 2 presents the partial derivatives computed from the coefficients for these nine regressions.[11]

Analysis of Figure 1 suggested that an increase in E would decrease the probability of an individual choosing full retirement (C1) if there were fixed costs of working. An increase in E should increase the probability of

Table 2

Partial Derivatives of Working Among Pensioners

	Age 62-63			Age 64-65			Age 66-67		
	Full Pension, No Work (C1)	Work, Full Pension (C2)	Work, Reduced Pension (C3)	Full Pension, No Work (C1)	Work, Full Pension (C2)	Work, Reduced Pension (C3)	Full Pension, No Work (C1)	Work, Full Pension (C2)	Work, Reduced Pension (C3)
Wage	.012 (.86)	-.005 (0.58)	-.006 (0.49)	.003 (0.32)	.003 (0.44)	-.003 (0.51)	.010 (0.82)	.002 (0.43)	-.008 (0.70)
Exempt Amount (E)	-.256 (0.46)	.266 (.79)	.018 (0.04)	.125 (0.26)	-.229 (0.59)	.036 (0.09)			
G	.119 (1.82)	-.032 (0.90)	-.056 (1.26)						
Social Security Benefit (B)	.148 (0.99)	-.025 (0.32)	-.171 (1.65)	.213 (5.36)	-.062 (1.93)	-.154 (4.70)	.088 (2.09)	-.010 (0.53)	-.086 (2.09)
Other Pensions	.022 (1.40)	-.014 (1.13)	-.013 (0.99)	.041 (3.32)	-.023 (1.34)	-.028 (2.83)	.011 (0.90)	-.015 (1.13)	-.005 (0.38)
Imputed Rent	.005 (0.19)	-.007 (0.45)	-.001 (0.03)	.022 (1.06)	-.006 (0.26)	-.011 (0.62)	.007 (0.32)	.031 (2.11)	-.037 (1.46)
Other Asset Income	.037 (1.90)	-.030 (1.23)	-.017 (1.25)	.004 (0.44)	-.532 (1.45)	.001 (0.14)	.001 (0.11)	-.012 (0.99)	.002 (0.20)
Transfers	.043 (1.20)	.004 (0.37)	-.113 (1.73)	.022 (1.33)	.010 (0.63)	-.018 (1.24)	.011 (0.37)	-.074 (0.64)	-.000 (0.01)
Married, Spouse present	-.100 (2.09)	-.031 (0.84)	.067 (0.62)	-.015 (0.36)	-.038 (1.28)	.031 (0.89)	-.046 (0.83)	.255 (1.27)	.008 (0.15)
Poor Health	.111 (3.06)	-.106 (3.68)	-.011 (0.40)	.108 (3.30)	-.101 (3.20)	.044 (1.66)	-.044 (1.14)	-.078 (2.28)	.004 (0.11)
Black	.135 (2.78)	-.038 (1.08)	-.096 (2.46)	-.015 (0.36)	-.052 (1.57)	.025 (0.72)	.012 (0.26)	.024 (0.86)	-.018 (0.39)
Self-Employed	-.090 (1.94)	-.011 (0.36)	.070 (1.95)	-.101 (2.50)	-.028 (0.80)	.088 (2.68)	-.067 (0.96)	.030 (1.23)	.020 (0.41)
Education	-.006 (1.00)	.006 (1.61)	-.0001 (0.03)	-.011 (2.28)	-.004 (0.55)	.011 (2.68)	.009 (1.51)	-.001 (0.40)	.012 (1.95)
Probability	.653	.121	.226	.668	.087	.245	.706	.050	.244
NOBS	297	297	297	343	343	343			

Note: Asymptotic t statistics in parentheses.

choosing to work while receiving full benefits (C2), but the net effect of E on C3 is ambiguous. However, an increase in G, such as occurred with the elimination of the 100 percent tax segment after 1971, should increase the probability of C3. Since the regressions are conditional on retiring and the partials sum to zero, this might result in negative coefficients for G in the C1 and C2 regressions.

The partial derivatives presented in Table 2 suggest that changes in the earnings test between 1970 and 1974 did not have much effect on the labor supply of men receiving Social Security pensions. None of the six coefficients was significant at the five percent level, and only one was significant at the 10 percent level. Although an increase in the exempt amount (E) was estimated to decrease full-time leisure and increase working with full benefits for 62 and 63 years olds, it was estimated to have the opposite effects for 64 and 65 year olds. Other specifications, discussed above in connection with Table 1, also did not produce evidence that changes in the earnings test decreased the probability of full-time leisure among pensioners. In regressions that included a trend term but did not include earnings test variables, the estimated trends were a 4.2 percent per year increase in full-time leisure and a 3.2 percent per year decrease in working with reduced benefits for men 62 and 63. Other trend coefficients were not significant.

An increase in Social Security benefits increased the probability of not working for all three age groups, but the effect was only significant for the older two. A $1000 rise in benefits implied that the probability of not working was 21 percentage points higher for men 64 and 65 and nine percentage points higher for men 66 and 67. The other four types of nonlabor income all increased the probability of not working, but the coefficients were not significant.

Among the youngest group of pensioners, whites and married men were significantly less likely to stop working completely than blacks and unmarried men. Although the same pattern among older pensioners, the differences by race and marital status were smaller and not significant. Poor health significantly increased the probability of not working and decreased the probability of working while receiving full benefits for all age groups. For the two younger age groups, being self-employed significantly increased the probability of working and receiving a decreased pension and significantly decreased the probability of not working at all. The effect of self-employment was the same for the oldest group but smaller and not significant. The education coefficients had a similar pattern, but were larger and significant for the two older groups instead of the youngest.

V. Conclusions

This paper has analyzed the theoretical effects of two aspects of Social Security pensions--the rewards for postponing retirement past the age of initial eligibility and the earnings test, which reduces the benefit received if earnings exceed certain levels. The reward for postponing the acceptance of a pension depends on the percentage increase in future benefits, the market interest rate, and the individual's life expectancy. If this reward exceeds the current benefit, an individual will always be better off not receiving the benefit.

In most cases, however, the current benefit will exceed the reward, and the decision to receive a Social Security pension will depend on the rules of the earnings test and on the individual's wage rate, other non-labor income, and tastes. The lower the tax rate or the higher the exempt amount under the earnings test, the more likely a person is to accept a

pension, other things constant.

Once an individual has decided to receive a Social Security pension, the rules of the earnings test may also affect whether and how much he works. If there are fixed costs of working, increases in the exempt amount may induce pensioners who currently stop working to work part-time. Pensioners who currently work part-time with full benefits may increase the amount they work. The effect on pensioners who currently earn more than the exempt amount and receive reduced benefits is ambiguous. The aggregate effect of increasing the exempt amount is also ambiguous. More individuals will become pensioners, but more pensioners may choose to work, and they may work more hours.

To see the practical importance of the earnings test, longitudinal data on a panel of men 62 to 67 were used to estimate the determinants of the probability of not receiving a pension, of retiring completely, and of working while receiving a pension. The results suggest that at least during the period covered by the data, changes in the earnings test did not significantly affect retirement behavior. Although the estimated coefficients were sometimes large and significant, they often had signs opposite to those predicted by theory. The most plausible interpretation is that variables designed to capture the effects of the earnings test were actually measuring trends. Estimates of trend effects under the assumption that the earnings test had no effect on retirement decisions indicate a significant decrease in the probability of full-time work or of working while receiving a reduced pension and a significant increase in complete retirement during the survey years.

Another piece of evidence that suggests that changes in the earnings test had little effect in encouraging Social Security pensioners to work was the wage coefficients. They indicate that higher wage rates had a significant effect in encouraging men 64 and over to postpone receiving benefits, but no significant effects in encouraging men to work once the benefits did start. Eliminating the earnings test, substantially raising the exempt amount, or reducing the implicit tax rate are all similar to raising the individual's net wage rate, and should be expected to affect his labor supply in the same way that wage rates do in the data used here. Since higher wage rates did not result in significantly more labor force participation among pensioners, there is little reason to think that changes in the earnings test would have that effect.

The level of actual or potential Social Security benefits had large and significant effects both on the probability of receiving a pension and on the probability of working if a pension was received. For men 64 to 67 large benefits significantly increased the probability of withdrawing completely from the labor force. However, men 62 or 63 who were eligible for large benefits were less likely to accept them than men eligible for small benefits. Eligibility for large pensions other than Social Security also encouraged men to stop working. Although both effects were statistically significant, the private pension effect was much small than the Social Security benefit effect. Other types of nonlabor income, including property income and transfers, encouraged retirement, but the effects were small and generally not significant.

Age and poor health had the expected effects on retirement behavior, while race and marital status coefficients were generally not significant. Being self-employed and well educated increased the probability of postponing pension acceptance or of working while receiving Social Security benefits. This suggests that nonpecuniary aspects of working may be especially important to men with the alternative of complete retirement. It also suggests that pensioners may choose full-time leisure over full-time work, but might choose part-time work over complete retirement if employees had the same control over hours that the self-employed have.

The most important policy implication of this study is that liberalizing or eliminating the Social Security earnings test would probably increase the number of pensioners and the total amount of pension benefits without increasing the total amount of market work performed by older men. Men who under current rules continue to work full-time while postponing receiving benefits would generally choose to receive benefits and reduce hours worked slightly. According to the findings of other studies, men who now receive pensions while working part-time might work slightly more. And men who currently retire completely would not choose to work even if the earnings test were eliminated. Thus, the net results would be little or no change in total labor supply of men eligible for Social Security pensions, but a substantial increase in costs of the pension system to the government. Furthermore, since older men who work usually have above average wage rates, the elimination of the earnings test would benefit primarily those who need help the least.

APPENDIX

This appendix describes the imputation of a wage rate to nonworkers and a potential Social Security benefit to all men. The traditional method of imputing wages has been to estimate a wage regression for workers and then to impute a wage for nonworkers based on their own characteristics and the rewards to them estimated from the wage regression. In panel data, this imputation can be made considerably more accurately by including an individual specific error component as well as characteristics and their rewards in the imputed wage.

Suppose the log of the wage of the i^{th} individual in the t^{th} time period (w_{it}) is a linear function of certain exogenous variables (X^w_{it}) such as education, age, and location, plus a randomly distributed error. This error term has two components, one of which is constant for an individual over time but varies across individuals (u^w_i), and another which is uncorrelated over time and across individuals (v^w_{it}).

$$w_{it}=X^w_{it}\beta+u^w_i+v^w_{it} \tag{A1}$$

The β in (A1) were estimated on a sample of observations limited to men who would be eligible for Social Security benefits by the end of the NLS survey period. The sample included 5998 observations on whites and 2642 observations on blacks for the years 1966, 1967, 1971, 1972, and 1974. The dependent variable was the log of the hourly wage in 1967 dollars. Because F tests revealed that wage functions differed significantly by race, all regressions were run separately for whites and blacks. The independent variables included age, education, and dummy variables for poor health, for living in labor markets with more than one million workers (Big) or fewer than 50,000 workers (Small), or in the South, and for five time periods.

Four age terms were used in the regressions, including actual years of age, age if over 57, age if over 61, and age if over 64. This linear spline specification constrains the age-wage relation to be continuous, but allows it slope to vary by age category. The age coefficients should be interpreted as the change in slope from the previous category. The slope for each category, that is, the effect on the wage of an additional year, is equal to the sum of the coefficients up to and including that category. See Poirier (1976) for further explanation of linear spline techniques and Carliner (1979) for fuller discussion of their use in estimating the effect of aging on wage rates.

Because of geographic variations in consumer prices and possible differences in labor market demand, a positive sign is anticipated for Big, and negative signs for Small and South. The time dummies were included to reflect changes in the general level of wage rates from improvements in technology, increases in the capital stock, or fluctuations in business conditions. A dummy variable specification seemed preferable to including a trend term and a period specific error component to allow for deviations from trend, since there was little reason to think such an error would be randomly distributed with an expected value of zero in all periods.

The results of wage regressions are presented in Table A1. The coefficients for education, health, and the location variables are all significant with the expected signs. The time period coefficients indicate that real wage rates rose throughout 1966-74, but at an uneven rate of increase and more rapidly for blacks than for whites.

Table A1

Wage Regressions

	Whites		Blacks	
	Coefficient	Standard Errors	Coefficient	Standard Errors
Education	.057	.002	.019	.002
Health	-.139	.014	-.081	.019
Big	.056	.015	.052	.026
Small	-.213	.013	-.389	.019
South	-.083	.014	-.213	.022
Age	.004	.006	-.004	.009
Age57+	-.010	.010	-.015	.014
Age61+	-.009	.015	-.006	.021
Age64+	-.008	.040	-.077	.053
D67	.016	.021	.019	.030
D69	.076	.021	.137	.029
D71	.111	.020	.193	.028
D72	.157	.021	.223	.030
D74	.185	.022	.283	.031
Constant	.618		.791	
R^2	.27		.37	
NOBS	5998		2642	

The effects of age were also somewhat different by race. For whites, wage rates rise by 0.4 percent per year for men aged 54 to 60, then decline by 0.6 percent, 1.5 percent, and 2.3 percent for men 57 to 60, 61 to 63, and 64 to 67 respectively. For blacks, the rate of wage decline is considerably larger, 0.4 percent down for the youngest category, then 1.9 percent annual decline, 2.5 percent, and 10.2 percent for the oldest age group. Although the differences in the slopes are not significant from one age category to the next, the overall effect of age on wage rates is highly siginificant.

These wage coefficients were used, together with the pre-retirement wage rates and characteristics of men who eventually retired, to estimate individual specific error terms from

$$\hat{u}_i = \frac{\Gamma}{T_i} \sum_{t=1}^{T_i} w_{it} - X^w_{it}\hat{\beta} \qquad \text{(A2)}$$

Finally, a wage was imputed to them for the periods during which they did not work from their characteristics in those periods and their indivudal component.

$$\hat{w}_{it} = X^w_{it}\hat{\beta} + \hat{u}_i \qquad \text{(A3)}$$

This imputed wage is considerably more accurate than the typical one based on $X^w\hat{\beta}$. Standard log wage regressions account for at most one-third of the variance of the dependent variable, so the traditional imputed wage misses two-thirds of the variance for different individuals. Carliner (1979), Lillard and Weiss (1979), and Hanushek and Quigley (1978) have found that the individual specific error component accounts for about two-thirds of the unexplained variance in log wage regressions. Thus the variance of $\hat{w}$ is approximately 80 percent of the wage variance, compared to only 33 percent for the variance of $X^w\hat{\beta}$.

Just as the potential market wage is not observed for nonworkers, a potential pension is not observed for men who choose to continue working. This is true not only for men who work full time and receive no Social Security benefit. Because the earnings test reduces the amount of pension received as earnings rise, it is also true for men who work and receive a reduced pension at the same time.

The imputation of a potential pension is different from the wage imputation discussed above, however, because the potential benefit depends on past earnings, which depend on past hours of work. Since taste for leisure in the past is likely to be highly correlated with taste for retirement in the present, even if the potential pension were observed for all men, it would be correlated with the error term in the retirement equation. This correlation would bias the retirement coefficients and produce spurious estimates of the effect of the level of Social Security benefits on the probability of retirement. To avoid this problem, potential benefits must be imputed to all men.

Let hours worked (H) by men prior to retirement age ($m<t$) be a linear function of certain observed characteristics (X^h) and an error term which includes individual taste differences in the demand for leisure (e^h).

$$H_{im}=X^h_{im}\,\alpha + e^h_{im} \tag{A4}$$

Suppose that the probability of complete retirement by the i^{th} man in the t^{th} period is a function of the potential market wage (W), the potential Social Security benefit (B), other observable factors such as age, health, and marital status (X^R), and an unobservable error term (e^R) which is correlated with e^h.

$$Pr(R)=\gamma_1 w + \gamma_2 B + \gamma_3 X^R + e^R \tag{A5}$$

The potential Social Security benefit for men of a given age and marital status is a complicated function of past earnings. Since earnings equal the wage times hours worked, B is also a function of the exogenous determinants of wages and hours and their error terms.

$$B=b(W\ H) = f(X^w, X^h) + g(e^w e^h) = f(X^B) + e^B \qquad (A6)$$

The error term in (A6) (e^B) will be correlated with the error term in the retirement equation (e^R). Therefore, using B to estimate (A5) will yield a biased estimate of γ_2. The solution is to impute a benefit to all men based only on the component of B that is uncorrelated with e^R.

$$\hat{B} = f(X^B) \qquad (A7)$$

This imputed benefit will result in unbiased estimates of the γ.

In estimating the benefit regression, the sample selection criteria, functional form, and independent variables used were all derived from Social Security System rules determining the size of an individual's benefit. The first relevant rule is that once a man chooses to receive a Social Security pension, the real value of the benefit he receives if he earns less than the exempt amount is constant over time, except as noted below. Unlike additional wage observations, additional observations on benefits received by the same individual in different periods do not provide further information on that individual's potential Social Security pension. Therefore, only one observation was used for each man.

Second, under the earnings test, benefits are reduced if earnings exceed the exempt amount. Since it was not possible to infer the potential benefit from the actual benefit received and NLS data on hours and weeks of work, the observation used in the benefit regression was from the earliest year in which hours of work were zero. If the individual never withdrew completely from the labor force, he was not included in the benefit regression.

Third, the potential benefit is a concave function of earnings in covered employment over the 15 to 20 years prior to retirement. Because the benefit/earnings ratio falls as past earnings rise, the log of annual income from Social Security pensions was used as the dependent variable in the benefit regression. Because men who worked for part (but not all) of their careers in jobs not covered by Social Security receive lower benefits than otherwise similar men, dummy variables for the self-employed and for government and farm workers were included as independent variables in the regression. Because only a fraction of the earnings history was available in the NLS, the average nominal wage and its determinants (education, race, health, and location) were both included as independent variables. Because nominal earnings have been rising and because the period of the earnings history is more recent for younger men, the individual's year of birth was also included as an independent variable.

Fourth, because benefits are larger for married men than for the unmarried, and because marital status also affects past labor supply, a dummy variable for being married spouse present was also included in the benefit regression. Finally, the potential benefit increases by 6.7 percent

for each year that receipt is postponed between 62 and 65. Therefore, the number of years the individual waited after age 62 before choosing to receive a pension was included as the last independent variable in the benefit regression.

To summarize, the log of Social Security pension income was regressed on education, year of birth, age at receipt of pension, and dummy variables identifying men in large or small labor markets, in the South, in poor health, in government, farm, or self-employment jobs, married men, and blacks. Observations were included in the sample only if Social Security pension income was positive and annual hours of work were zero. As explained above, no labor supply or earnings measures were included in benefit regressions, but the average nominal wage prior to retirement was used in one specification (B1) and excluded from a second one (B2). B2 was used in the logit regressions presented in Tables 1 and 2, but results using B1 were very similar.

Table A2 presents the estimated coefficients from the two benefit regressions. Almost all have the expected sign and are generally siginificant. Other things equal, married men have Social Security pensions that are about 17 percent larger than those of unmarried men. Former government and farm workers have significantly lower Social Security pensions, but self-employed men receive about the same benefits as employees. Each year that a man delays receiving his pension between age 62 and 65 increases the benefit by over 10 percent, even when account is taken that his average nominal wage may also be increasing. Year of birth, with a range of only six years for the men in this regression sample, has little effect. Finally, the average nominal wage and its determinants--education, race, location, and health--have the anticipated effects on benefits.

Table A2

Benefit Regressions

	With Average Wage (B1)		Without Average Wage (B2)	
	Coefficient	Standard Errors	Coefficient	Standard Errors
Education	.003	.005	.003	.001
Health	-.058	.047	-.077	.047
Big	.009	.058	.016	.058
Small	-.146	.050	-.152	.050
South	-.127	.052	-.136	.052
Black	-.181	.050	-.192	.050
Year of Birth	.014	.017	-.019	.017
Age at Receipt of Pension	.101	.028	.112	.027
Married, Spouse Present	.165	.055	.179	.055
Self-Employed	.001	.068	-.017	.067
Government	-.151	.120	-.138	.121
Farm	-.163	.082	-.174	.082
Average Wage	.007	.003	-	-
Constant	8.245		8.592	
R^2	.21		.21	
NOBS	619		619	

Footnotes

[1] Early studies by Sanders (1968) and Vroman (1971) found evidence that working pensioners adjust their labor supply to avoid having benefits reduced by the earnings test. More recently, Boskin (1977) and Pellechio (1978) concluded from their results that eliminating the earnings test would result in substantial increases in the labor supply of older men. See Campbell and Campbell (1976) and Bixby (1976) for surveys of an extensive literature on the causes of retirement. Burkhauser (1977), Quinn (1977), Gordon and Blinder (1978), and Pellechio (1979), have also estimated the effects of health, wages, and pensions on the probability of retirement. Hanoch and Honig (1978), and Boskin and Hurd (1978) discuss the budget constraint faced by individuals eligible for Social Security pensions. Boskin and Hurd estimated retirement equations, but did not draw inferences on the labor supply effects of the earnings test.

[2] This discussion ignores payroll and income taxes, since they introduce only a slight degree of concavity to the budget constraint. See Ashenfelter and Heckman (1973) and Wales (1973) for unsuccessful attempts to take into account this concavity in estimating labor supply functions for prime age men.

[3] This will also be true if the budget constraint is convex between points 2 and 3, which would occur if the wage rate for part-time work increased as hours increased.

[4] See McFadden (1973) for the theoretical underpinnings of this approach, and Barr and Hall (1973), Boskin and Hurd (1978), and Levy (1979) for applications. Burtless and Hausman (1978) propose a different solution to this problem.

[5] Because there was no way to tell from the NLS data whether a pension was reduced by the earnings test, the following definitions were used. An individual was assumed to have chosen C1 if he claimed to be fully retired and out of the labor force during the survey week. If he received a Social Security pension and earned less than the exempt amount, C2 was equal to one. If he received a pension and earned more than the exempt amount, C3 was equal to one. And if he worked and did not receive a Social Security pension, C4 was equal to one. Since all men in the sample were eligible for Social Security, all men had a value of one for one of these variables and zero for the other three.

[6] The health variable was set equal to one if the individual reported health problems which limited the kind or amount of work he could do in any survey year.

[7] The brief 1968 interview contained little information and was not used in this study.

[8] Because E varies across years but not across individuals in the same year, it could not be included in the regression for 66 and 67 year olds, since all observations in that sample were for 1974. Although G varies slightly across observations in 1972 and 1974, it was too highly correlated with benefits for 64 and 65 year olds, and was omitted from their regression.

[9] Since coefficients from logit regressions have no direct economic interpretation, the partial effects on the probability of being on the i^{th} segment of the budget constrain of the i^{th} dependent variable are presented instead. These are calculated from

$$\partial Pr(C_i)/\partial X^R_j = \delta_{ij} P_i (1-P_i)$$

where δ_{ij} is the coefficient of the j^{th} independent variable in the i^{th} regression, and P_i is the fraction of observations with a value of one for the i^{th} independent variable.

[10] Another difference is that private pensions are voluntary. If men with a taste for retirement choose jobs with generous private pensions, the coefficients in Table 1 will overestimate the effect of private pensions on the probability of full time work. The fact that private pension effects are so much smaller than Social Security benefit effects suggests that this type of sample selection bias is unimportant.

[11] Since C1, C2, and C3 constitute the entire choice set, the partial effects for any independent variable must sum to zero. This constraint was not used in the estimation, but seems generally to be satisfied by the rows of Table 2.

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