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ECONOMIC RETIREMENT STUDIES: AN ANNOTATED BIBLIOGRAPHY

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PREFACE

This bibliography is a by-product of preparing a review of the economic literature on the effect of Social Security's retirement program on the labor supply of older workers. In the course of organizing a set of scribbled notes, the outline of the current document began to take shape. Several colleagues found earlier, incomplete drafts of these notes to be of some value in their own work, and encouraged me to offer them to a wider audience.

These notes are not intended to represent an exhaustive account of the retirement literature. The rules for inclusion are roughly that 1) the work be empirical in nature, and 2) the research contributes to understanding the effects of Social Security on work and retirement patterns. (Each of these rules is occasionally violated.) Notably absent, therefore, are several excellent survey articles, numerous insightful theoretical contributions, and nearly all empirical work from other countries.

Three indexes are provided at the end of the notes. The articles and papers reviewed here are categorized by data source, retirement definition, and statistical methods used in the research.

These notes are intended to provide a helpful overview of the models, data sources, and statistical procedures used by economists in recent years to investigate the work-retirement decision. Brief summaries are poor substitutes for reading the original papers and articles. Reasonable persons -- in particular, some of the authors -- might disagree with some of the synopses and judgments provided below.

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[1] ANDERSON, KATHRYN H. AND RICHARD V. BURKHAUSER: "The Importance of the Measure of Health in Empirical Estimates of the Labor Supply of Older Men," Economic Letters, Vol 16, 1984, 375-80.

Objective: There is disagreement among retirement researchers about which factors are more important in the retirement decision: economic variables such as Social Security, wage offers, and private pensions, or health status. This paper argues that different answers to this question largely result from different health measures used in statistical models. It is argued that the use of more objective indicators of health status will lead to a greater role for economic factors in the retirement decision.

Data Set: 4,878 men, aged 58-63, selected from the 1969 wave of the Retirement History Study.

Definition of Retirement: No labor-force participation, with the dependent variable set equal to 1 if the person worked at all during 1969.

Estimation Method: Trivariate Logit.

Findings: Two estimated labor-force participation equations are compared and contrasted. The first uses a self-reported measure of health as a regressor;¹ the second uses a mortality measure (a binary regressor equals one if the respondent dies between 1969 and 1979). The estimated coefficients for the two specifications are strikingly different. The wage variable has a significant, positive impact on labor-force participation only when the objective health indicator is used. A variable that measures combined Social Security and private pension wealth has a positive and significant effect in both models.²

Comments: The objective indicator used in this study (mortality during subsequent decade) is crude, and yet demonstrates the sensitivity of estimated labor-force

¹A health dummy equals 1 if health limits the kind or amount of work or housework that can be done.

²This could be the result of this regressor being highly correlated with tastes for work. Alternatively, it could result from misspecifying the way wealth enters the participation equation; changes in wealth that accrue to postponing retirement should be distinguished from the level of wealth.

participation parameters to the measure of health that is used.

[2] ANDERSON, KATHRYN H. AND RICHARD V. BURKHAUSER: "The Retirement-Health Nexus: A New Measure for an Old Puzzle," Journal of Human Resources, 20 (3), Summer 1985, 315-30.

Objective: Single-equation models of elderly labor-force participation or retirement that include a health regressor suffer from two potential problems. First, the health indicator may be endogenous, resulting in inconsistent parameter estimates if the model is inappropriately estimated. Second, self-assessed measures of health are likely to give undue weight to poor health status because this is often used as a socially acceptable justification for leaving the labor market. This paper estimates a joint model of health status and retirement, and examines the sensitivity of the results to replacing a self-reported health measure with one that is constructed from objective mortality information.

Data Set: The 1969 wave of the Retirement History Study, supplemented by mortality observations over the ensuing decade. The analysis is limited to 4,878 males, aged 58-63, and excludes those who are self-employed or farmers, and those who are seriously ill.

Definition of Retirement: No labor-force participation, with the dependent variable coded 1 if the individual worked at all in 1969.

Estimation Method: Multivariate logit.

Findings: Retirement models often find that wages and other economic influences have small effects in comparison with health status on the decision to retire. This model examines the interaction between retirement and health status using two health measures: a self-assessed designation, and an objective indicator derived from subsequent mortality experience. When the objective measure is used, wage elasticities tend to be approximately five times larger on average.

Three different structural models are examined: 1) health and retirement are jointly determined, but only health has an independent effect on retirement, 2) health and retirement are jointly determined, but only retirement has an independent effect on health, and 3) both variables influence each other jointly. Both dependent variables are dichotomous. The objective health measure, DEATH, is set equal to one if the respondent died between 1969 and 1979. Other regressors in the model included average hourly wage, wealth (including

Social Security), race, age, marital status, and number of dependent children.

When health status and retirement are estimated jointly, the wage elasticity does not vary much when different measures of health are used; however, the way in which health affects retirement differs substantially. When a self-reported measure is used, workers in low-wage jobs are more likely to report health problems, and these are then associated with early retirement. When a mortality measure is used, the wage has a smaller effect on health, and a more direct effect on retirement (higher wages tend to cause later retirement).

Comments: In single-equation models, estimated measures of wage elasticity are quite sensitive to the choice of health variable, but less so when a joint model of health and retirement status is measured. When the joint model is estimated, the different results when alternate health indicators are used tend to be more in the manner in which wages, health, and retirement interact, than with the gross wage elasticity. The crude objective measure of health used in this study suggests that further work using more refined indicators is necessary.

[3] ANDERSON, KATHRYN H., RICHARD V. BURKHAUSER, AND JOSEPH F. QUINN: "Do Retirement Dreams Come True? The Effect of Unanticipated Events on Retirement Plans," Industrial and Labor Relations Review, 39 (4), July 1986, 518-26.

Objective: Economic models of the retirement decision usually assume that workers are well-informed, rational planners. Empirical models tend to explore the factors that influence the observed act of retiring, somehow defined. This study looks at the planned retirement age of older men in the 1969 wave of the RHS, and then verifies in the subsequent 10 years of RHS data, whether these plans proved to be accurate (43 percent of their sample made an error of a year or more in forecasting their retirement date). The paper investigates the factors associated with inaccurate retirement planning.

Data Set: Retirement History Study. 1,580 men, aged 58 to 63 in 1969, who were in the labor force (but not self-employed), and reported specific planned retirement ages.

Definition of Retirement: Retirement is taken to be withdrawal from the labor force, which is consistent with the RHS question on retirement plans.

Estimation Method: Workers are categorized as having retired early, on time, or late with respect to their stated plans. The determinants of the probability of falling into each of these categories are estimated by multinomial logit.

Findings: Economic models imply that large errors in planning the actual date of retirement are likely to be associated with unanticipated changes in exogenous factors. The likely causes would be unpredicted changes in the value of Social Security payments (or Social Security wealth), marked changes in health status, and changes in local labor market conditions. Given the large real increases in the value of Social Security payments in the 1970s, the time period covered by this study provides a good opportunity to test these ideas. All empirical signs are in accord with theoretical predictions, with the exception of the impact of the local unemployment rate. Higher local rates are associated with delays in retirement, a finding that runs counter to the usual image of the older worker being particularly vulnerable in the face of economic downturns.

Comments: This is an excellent study that could serve as the basis for some interesting follow-up investigation. No allowance is made for the fact that many RHS respondents gave no planned retirement age. Given their ages, the degree of sample selection bias may be substantial.

[4] BAZZOLI, GLORIA J.: "The Early Retirement Decision: New Empirical Evidence on the Influence of Health," Journal of Human Resources, 20 (2), Spring 1985, 214-34.

Objective: This paper assesses the relative merits of a number of measures of health that might be included as explanatory variables in retirement models. Indicators of self-assessed health status tend to overstate the impact of poor health on retirement, perhaps as people attempt to rationalize the decision to reduce work effort. This is a likely cause of the common finding that economic factors are less influential in the work decisions of the elderly. This study examines the impact of financial variables when superior measures of health status are employed.

Data Set: 1,352 white, married men from the Retirement History Study. Data from the 1969-75 waves are used. The sample is restricted to men who are 1) aged 59-61 in 1969, 2) wage or salaried employees for at least 35 hours per week in 1969, do not face mandatory retirement before age 65, and 4) were not seriously ill or housebound in 1969.

Definition of Retirement: Early retirement occurs when a person leaves his 1969 job and either 1) leaves the labor force completely, or 2) reduces subsequent hours of work.

Estimation Method: Probit analysis.

Findings: Early retirement is hypothesized to be influenced by health, the availability of private pension income (both before and after age 65), the present value of Social Security benefits claimed at age 65, the (average) present value of postponing retirement each year prior to age 65 and each year afterwards, net real wage at age 60, average real wage growth between ages 60 and 64, work experience, spouse's work experience, wife's health, asset income, age, and a dummy variable set equal to 1 if there is mandatory retirement at age 65.

Health is measured in four different ways. HLIMIT1 equals 1 if a person reports a health condition that limits the amount or kind of work in the year prior to early retirement or immediately prior to age 65 for later retirement. HLIMIT2 equals 1 if the condition is reported in the year after early retirement or immediately after age 65 if later retirement is chosen. HEALTH1 and HEALTH2 are dummy variables based on the RHS's Fillenbaum-Maddox Health Index which has people rate their health on the basis of responses to several questions.³ These variables work in a similar manner to HLIMIT1 and HLIMIT2; a score of 1 implies poor health.

The results indicate that HLIMIT1 has no effect on early retirement, but HLIMIT2 has a large positive impact. Both HEALTH1 and HEALTH2 have large positive effects on the probability of early retirement (.104 and .247 increases in the probability of early retirement). There are three possible reasons for these findings. First, perhaps people use "poor health" as a justification for retirement. Second, health may deteriorate quickly. Third, when the health problem is defined as one that limits work, regressing a measure of work on this variable is tautological.

Comments: The effects of health on the retirement decision have probably been overstated. More objective indicators of health are preferable to self-assessed measures. When pre-retirement measures of health are used to capture the effects of poor health, economic variables appear to play a more important role in the decision to work.

³The index is scored on an integer basis over the 1 to 5 interval. Respondents were asked how their health compares with that of others, as well as whether health limits work.

[5] BERKOVEC, JAMES AND STEVEN STERN: "Job Exit Behavior of Older Men," unpublished manuscript, University of Virginia, 1989.

Objective: The paper presents an estimated dynamic programming model of job exit choices in which older males choose among the alternatives of full-time employment, part-time employment, and complete retirement. The model incorporates both unobserved individual effects and unobserved specific "job" effects.

Data Set: 2,497 job histories were constructed from the 1966 to 1983 waves of the National Longitudinal Survey of Mature Men. The estimation procedure uses a subsample of 500 persons aged 55 and older at the start of the survey.

Definition of Retirement: No work during a period.

Estimation Method: Multinomial logit estimated by the method of simulated moments.⁴

Findings: Individuals are assumed to maximize a time-separable utility function where consumption and leisure are separable and leisure choices are discrete. A decision about employment or retirement is made at the beginning of each period. This decision is based on observed values of monetary payments and leisure associated with each state in the current period, as well as expected values of these variables in future periods contingent on current and past choices. Full- and part-time job offers contain a job-specific error, and utility associated with each option has a time-specific component. A person working in a given period has four options in the next: continue on the same job, switch to a new full-time job, switch to a new part-time job, or retire. A retired person has three options in the next period: continued retirement, unretire to a full-time job, and unretire to a part-time job.

Both static and dynamic specifications are estimated. Poor health, age, and lack of education increase the probability of retirement in both the static and dynamic formulations. There are important differences in the behavior predicted by the two formulations, but generally the dynamic model appears to fit the data better. Because the dynamic model allows a change in an explanatory variable to affect the relative values of the states in future periods as well as in the current period, dynamic retirement and part-time job coefficients tend to be smaller than their static

⁴See Daniel McFadden, "A Method of Simulated Moments for Estimation of Discrete Response Models Without Numerical Integration," Econometrica, 57 (5), September 1989, 995-1026.

counterparts. The static model has large job-specific and status-specific effects, probably because large effects are required to be established that will outweigh any unanticipated shocks in later periods during a specific job tenure. The authors conclude that it is important to model the dynamics of these decisions explicitly rather than use the parameters of a static model to predict dynamic behavior.

Comments: The primary contribution of this paper is methodological. It demonstrates how the method of simulated moments can be used to estimate a dynamic work-retirement model with a complex error structure. Due to several simplifications used to ease the computational burden, no empirical magnitudes appear to be particularly reliable. The major weaknesses of the empirical work (admitted by the authors) are that it assumes that a number of magnitudes (e.g., future health status) are known with certainty, and the potential influence of the Social Security system is not treated. An interesting observation in the data is that nearly 8 percent of the sample "unretire" at some stage.⁵ Previous researchers have not allowed for this behavior.

[6] BERNHEIM, B. DOUGLAS: "Social Security Benefits: An Empirical Study of Expectations and Realizations," in Issues in Contemporary Retirement, ed. Rita Ricardo-Campbell and Edward P. Lazear. Stanford, CA: Hoover Institution Press, 1988, 312-50.

Objective: The paper tests the accuracy with which expectations are formed about Social Security benefits. Regression analysis is used to identify the correlates of actual benefits received.

Data Set: Information on approximately 5,000 men and women taken from the 1971 and 1973 waves of the Retirement History Study. Regression estimates use 1,949 observations from 1971, and 942 for 1973.

Definition of Retirement: Self-assessed definition.

Estimation Method: Ordinary least squares; instrumental variable estimation.

Findings: In the 2 waves used in this analysis, RHS respondents were asked about the level of Social Security

⁵This number might be inflated by including persons who were unemployed in the "retired" category.

benefits they expected to receive at retirement. Matched SSA earnings records permitted estimation of the benefit amounts to be received at the planned retirement age. 56 and 58 percent of respondents did not report expected benefit levels in 1971 and 1973, and were thus excluded from the sample.⁶

Bernheim presents some simple tabulations of response rates, forecast errors, and correlations between realizations and forecasts for population subgroups. All subgroups underestimated their benefit amounts, suggesting that the large real increases in Social Security benefit levels that occurred in the early 1970s were unanticipated. In 1971 single women and widows were least likely to report an expectation about future benefit amounts, but most likely in 1973, suggesting that women become more serious in their retirement planning as the date nears. Their benefit forecasts tend to be conservative, but the most accurate of the subgroups studied. Married men are the least accurate in their predictions. Two peculiarities are reported: married men become less likely to report an expectation as time passes, and highly-educated, married men are the least accurate forecasters.

Regression results give somewhat mixed support for the ideas in this paper. However, when realizations are regressed on expected values of future benefits and a vector of personal characteristics, using an instrument for the forecasted Social Security values (that are presumably measured with error), the results indicate that reported expectations are unbiased predictors of realizations. Sixty percent of the variation in realizations is associated with variation in benefit forecasts. Respondents appear not to use all the readily available information about Social Security benefits in making their forecasts; however, the information they do have is used consistently to forecast benefits, retirement dates, and other income.

Comments: People appear to think seriously about future benefits, but do not forecast values very precisely. While people process the information they have reasonably efficiently, they appear not to incorporate a great deal of relevant information available from the Social Security Administration. Women tend to be more accurate forecasters than men, and the accuracy of forecasts improves with a person's age.

Unfortunately, the RHS question about expected benefits is not clear about whether expected benefits are in nominal or real terms; Bernheim assumes the interpretation was in terms of survey-year dollars. While this appears reasonable, the

⁶Bernheim claims that this selection rule does not bias the regression results if the forecast errors are not correlated with the error term in the realizations equation.

extent to which this is incorrect will bias the results. Similarly, realizations are estimated by using matched earnings records to compute benefits received.

[7] BERNHEIM, B. DOUGLAS: "The Timing of Retirement: A Comparison of Expectations and Realizations," in The Economics of Aging, ed. David A. Wise, Chicago, IL: University of Chicago Press, 1989, 335-55.

Objective: This paper examines the accuracy with which older individuals forecast their age of retirement. The accuracy of expectations is compared for different population subgroups.

Data Set: Observations were selected for several thousand male and female respondents from the 1969 to 1979 waves of the Retirement History Study. Retirement expectations variables for the first four waves are analyzed.

Definition of Retirement: Self-reported retirement.

Estimation Method: Ordinary least squares.

Findings: This paper utilizes information in each wave of the RHS in which persons not yet retired were asked about their retirement plans. The panel structure of the data set permits verification of the accuracy of planned retirement age by observing work status in subsequent waves.

The central empirical question investigated is whether when indicating an expected age of retirement in response to a survey question, people are giving the mean or mode of a subjective probability distribution. On the surface, Bernheim finds that there is a weak relationship between the stated expected age of retirement and actual retirement date. For each of the first four survey years (1969-75) of the RHS, Bernheim groups observations for individuals who indicate the same expected date of retirement. These planned ages are compared with the average dates of actual retirement. There is very little relationship between the two. A one-year change in expected date is associated with less than a one-half year change in realized date. Contrary to what would be expected, accuracy of forecasts does not appreciably improve when earlier retirement dates are expected. Several regressions provide additional evidence that the "mean value" hypothesis is rejected.

In contrast, there is some evidence in support of the view that people give the most likely retirement age (lower than the mean) when asked about retirement plans. When the modal actual retirement date is compared with planned dates for groups with common expected ages for retirement, there appears

to be far more accuracy in planning. Accuracy appears to improve, the earlier the planned retirement age. The conditional distributions for planned retirement ages appear to be highly skewed, with modes very different from means. When expected age of retirement is low, the skew is positive; the reverse is true for later planned retirement ages.⁷ Higher expected retirement ages are associated with a greater tendency to retire earlier than planned.

Comments: In contrast to the results of Anderson, Burkhauser, and Quinn [1986], this study finds that people accurately plan their retirement ages, although married women appear to be somewhat more prone to underestimating the number of years of work remaining. Some of the ABQ findings are possibly artifacts of the distribution of expected retirement ages, and thus should be viewed with suspicion. For example, the earlier study claimed that large, unanticipated increases in Social Security benefits were associated with retiring earlier than planned. However, ABQ's measure of unanticipated benefits depends on expected retirement age. The later the planned retirement age, the higher the unexpected benefit, and the more likely that earlier retirement would be observed.

[8] BLINDER, ALAN S., ROGER H. GORDON, AND DONALD E. WISE:
"Reconsidering the Work Disincentive Effects of Social Security," National Tax Journal, 33 (4), December 1980, 431-42.

Objective: Many analysts have concluded that Social Security deters labor market activity among older workers, especially through its earnings test. This paper considers how two other features of the system interact with the earnings test to provide a net incentive to work for most people.

Data Set: 907 men who turned 65 in 1975, selected from the Retirement History Study.

Definition of Retirement: None used.

⁷The shape of the distributions of planned and actual retirement ages reflect several phenomena occurring jointly. First, the older the cohort, the more compact the distribution of expected retirement ages among those not yet retired; accuracy improves with age. Second, for younger cohorts who expect to retire early but make a mistake, individuals are more likely to retire later than earlier. The variance of the mean exceeds that of the mode for the distribution of expected retirement ages.

Estimation Method: Calculations are performed to estimate Social Security's implicit wage subsidy for workers with different marital status and numbers of dependents, given different interest rate assumptions. No econometric work is presented.

Findings: Although the earnings test is thought to deter work effort in the range where earnings are sufficiently high to lose benefits, two other aspects of the Social Security system tend to offset its effect. First, actuarial adjustments for nonreceipt of benefits imply that some benefits apparently lost because of the earnings test are later recouped. Blinder, Gordon, and Wise (BGW) argue that for most individuals the actuarial adjustment prior to age 65 is fair, thus fully offsetting the effect of the retirement test. The 3 percent delayed retirement credit (DRC) is, however, well below an actuarially fair rate.

Second, automatic benefit recomputation (ABR) usually means that continued work will cause the primary insurance amount (PIA) to rise. Even with the indexing feature introduced in the 1977 amendments, nominal earnings usually rise at a sufficiently rapid rate so that recent earnings will replace the lowest value included in the computation years used to calculate average indexed monthly earnings (AIME). BGW estimate that ABR implicitly subsidizes wages by approximately 54 percent on average.⁸

The article concludes that Social Security introduces a number of conflicting distortions in the work-retirement decision, and that it will take a very complex model to ascertain the overall net effect.

Comments: This is a very sound piece that raises important questions about the specification of econometric models that purport to show that the retirement test deters work. It also raises the intriguing question about the extent to which work disincentives might result from workers' misunderstanding of the Social Security system, rather than from the system's actual design features. A valuable research project might be to 1) identify the ways in which workers' understanding of the Social Security system differs from reality, and 2) discover to what extent behavior might be conditioned by false information. A desirable and inexpensive policy might be one that improves work incentives by raising public awareness of Social Security rules.

⁸This is prior to the introduction of indexing. They claim that indexing cuts the average subsidy rate by about one-third of its previous level.

[9] BLINDER, ALAN S., ROGER H. GORDON, AND DONALD E. WISE:
"Rhetoric and Reality in Social Security Analysis - A
Rejoinder," National Tax Journal, 34 (4), December 1981, 473-
8.

Objective: This is a brief reply to the criticisms of
Burkhauser and Turner [1981].

Data Set: Retirement History Study

Definition of Retirement: None used.

Estimation Method: None.

Findings: The authors present revised versions of their
estimates of the wage subsidy implicit in the ABR feature and
actuarial adjustments for delaying benefit acceptance.

Comments: The basic points of their original paper remain
valid.

[10] BOSKIN, MICHAEL J.: "Social Security and Retirement
Decisions," Economic Inquiry, 15 (1), January 1977, 1-25.

Purpose: This research examines the extent to which the
retirement provisions of OASDHI induce earlier retirement than
would have occurred in the absence of such a program. Do
workers substitute benefits for earnings?

Data Set: 131 households headed by white males for the 1968-
72 waves of PSID. Selection was governed by the requirement
that these heads be 66-70 in the last interview. 40 percent
of the sample retired before age 65. Social security benefits
had to be estimated for non-retired individuals.⁹ Little
information is available for private pension entitlements.

Definition of retirement: Less than quarter-time work.¹⁰
"Quasi-retirement" was defined as half-time work.

⁹These are estimated to be the maximum for those with maximum
taxable earnings. For others workers benefits are imputed by
regression methods, or by adjusting recorded values of
previously received benefits.

¹⁰These are the results reported in the paper. Boskin used
three other definitions: less than half-time work, less than
one-tenth time work, and self-reported retirement status.
Results were reported to be similar.

Estimation method: Conditional logit estimated by maximum likelihood. Both two-state (retirement/work) and 3-state (retirement/quasi-retirement/work) models are estimated.

Findings: In a large number of surveys of retirees conducted by SSA and academic researchers between 1941 and 1963, a majority of respondents claimed they retired either because their employers terminated jobs, or because of health problems. However, long term trends in labor-force participation suggest that rising income levels are associated with less work, particularly among males. Since WWII, the sharpest declines have occurred for males over the age of 65.¹¹ This study estimates several specifications of a "probability of retirement" equation, using observed (imputed for non-beneficiaries) values of annual Social Security benefits as a regressor.

The value of current annual Social Security retirement benefits has a pronounced effect on the decision to retire. A \$1000 rise in benefits is associated with a rise in the probability of retiring from .075 to .16, implying that the expected number of years of work between ages 61 and 70 falls from more than 5 to less than 4. The effect of a \$1 increase in the Social Security guarantee is 7 times as large as the effect of a like increase in income from assets. The conjecture is that this might be due to the latter income source being indexed. Net earnings have a strong negative effect on the probability of retirement. The most powerful variable, however, is the AGE65 dummy, which is usually a thousand times the magnitude of that on the Social Security benefit regressor.

Similar results hold for the 3-state model. A \$1000 rise in benefits is associated with a 40 percent increase in the probability of quasi-retirement and a 60 percent rise in the probability of full retirement.

Comments: This is the earliest econometric paper that explicitly addresses the transitions from full-time work to part-time work and full-retirement, and has to be regarded as one of the seminal pieces of research in this area. The author reports some of the largest estimates of the effects of social security on the work effort of the elderly.

Nonetheless, Boskin's estimates must be regarded with some skepticism for a number of reasons. First, although a life-cycle model is sketched in an appendix, the empirical work in the body of the article is a current-period, static formulation. The effects of the complex structure of the retirement provisions of social security are allowed to

¹¹In 1948 the LFPR for white and nonwhite males aged 65 and over were 46.5 and 50.3 percent, respectively. By 1974 these had fallen to 22.5 and 21.7 percent.

influence work decisions only by the current-period income effect of the annual benefits received. This is decidedly inferior to the richer structure of more recent applied work. Second, the health variable used is not well measured, with the precise method of calculation dependent on the respondent's labor-force status. Third, the sample size is very small (131 white, male, household heads). Fourth, the PSID does not contain accurate information on Social Security or private pension entitlements for those workers not yet retired.

[11] BOSKIN, MICHAEL J. AND MICHAEL D. HURD: "The Effect of Social Security on Early Retirement," Journal of Public Economics, 10 (3), December 1978, 361-77.

Objective: The paper estimates the effect of Social Security on early retirement, both complete and partial.

Data Set: Approximately 1,000 white males, aged 60 to 63 in 1969, selected from the Retirement History Study. Data from the 1969 and 1971 waves were utilized. For inclusion in the sample, men must have worked in 1969, had no working wife, and received no welfare transfer payments during the interval.

Definition of Retirement: Complete retirement is defined as zero hours of work. Semiretirement is defined as working but receiving Social Security payments.

Estimation Method: Nonlinear, two-stage least squares. The budget constraint is considered to be partly endogenous in that it depends on a worker's earnings history and tastes for work. Thus, in a first stage, a logit retirement equation is estimated assuming the budget constraint to be exogenous. In the second stage, estimated variance terms from the first-stage variance-covariance matrix are used to perform a weighted least squares re-estimation.

Findings: While the theoretical discussion of Social Security and the retirement test motivates the authors to suggest three different estimation strategies for addressing the endogenous, nonconvex budget constraint, the empirical work presented in this paper is a modified, reduced-form, version of one of them. Two logistic transition models are estimated by two-stage least squares. The first of these estimates the probability of exiting full employment to complete retirement; the other examines the probability of moving from full-time work to semiretirement. Explanatory variables include gross wage, net wage, annual nonlabor income, annual Social Security benefit, and dummies for bad health, compulsory retirement,

age 62, age 65, and both wife and child present.

About 12 percent of the sample fully retired between 1969 and 1971; approximately 9 percent became semiretired. Results for the complete retirement equation are generally consistent with expectations. A worker who claims that health limits work has an .10 higher probability of retiring. A \$1,000 rise in annual Social Security benefits increases the probability of retirement by .08. The coefficient on the net wage is huge, highly significant, and positively signed (a \$1 rise is associated with a 1.2 increase in the probability of retiring!), suggesting that substantial specification problems exist. Results for the semiretirement equation are far less satisfactory. The signs of all financial variables are contrary to expectations, and are estimated with less precision. Neither equation permits isolation of the effects of specific Social Security features such as the automatic benefit recomputation provision and the retirement test.

Comments: The econometric estimation is not closely tied to the theoretical model presented, and the unexpected signs in both equations and poor performance of the semiretirement equation indicate either substantial problems with the construction of some of their financial variables, model misspecification, or both. The two equations are apparently estimated separately, although it would be more appropriate to estimate them jointly. The theory indicates that they are both derived from an underlying utility function, and therefore share common structural parameters.

While the paper presents some evidence that higher Social Security benefits are associated with early retirement, and that poor health has a large negative effect as well, other studies provide more reliable quantitative results concerning both influences.

[12] BURBIDGE, J.B. AND A.L. ROBB: "Pensions and Retirement Behavior," Canadian Journal of Economics, 13 (3), August 1980, 421-37.

Objective: This is a theoretical paper that examines the effect of actuarially unfair pension plans on retirement behavior. Plans are shown to have both income and substitution effects with opposing effects on the choice of retirement date. Analysis of data collected for periods where new pension plan rules are being phased in can lead to misleading conclusions regarding long term behavior.

Data Set: None.

Definition of Retirement: Complete withdrawal from the labor force.

Estimation Method: None.

Findings: The paper presents a comparative static analysis of a life-cycle model in which an individual receives a pension financed by a proportional payroll tax on earnings. Increases in (pension) wealth are expected to induce earlier retirement if leisure is a normal good. The "price" of retirement leisure changes due to: 1) changes in the payroll tax rate, or 2) changes in the pension plan rules. Policies that change the price set up both income and substitution effects working in opposition to each other, with ambiguous effects on retirement age. Earlier studies that concentrated on actuarially fair plans focused on substitution effects, because there is no lifetime income effect by definition.

Comments: The paper clearly demonstrates how choice of retirement age is influenced by the lifetime streams of contributions and benefits. In theory, the overall effect of a pension plan on retirement is often ambiguous.

[13] BURKHAUSER, RICHARD V.: "The Pension Acceptance Decision of Older Workers," Journal of Human Resources, 14 (1), Winter 1979, 63-75.

Objective: The paper presents and estimates a model in which the retirement decision is influenced by the asset value of private pension rights and the present value of future earnings, rather than simply payments for working versus not working in a given year.

Data Set: The Michigan Study of Auto Workers, conducted by the Institute for Social Research, University of Michigan, from 1966-9. Burkhauser uses a sample of 761 male automobile workers, aged 59 to 64.

Definition of Retirement: Acceptance of private pension.

Estimation Method: A single-equation reduced form model of pension acceptance is estimated by OLS, probit, and logit.

Findings: The 1965 United Auto Workers contract contained provisions allowing for Supplementary Early Retirement Benefits payable to workers retiring early (between the ages of 55 and 64). The pension rules were such that there was a large incentive to retire before age 65. Restrictions on market work were the same as under Social Security's earnings

test.

A dummy variable for early pension acceptance was regressed against: 1) the difference between the after-tax present value of early pension acceptance and the after-tax present value of accepting it at age 65, 2) the present value of expected post-tax earnings until age 65, and 3) health, assets, race, age, and marital status. The difference variable was found to be positive and significant in all three estimations. The mean value of the difference variable was \$9,705. A 10 percent increase in this difference would increase the probability of early retirement by 6.8 percent; in comparison, a 10 percent increase in the earnings variable decreased the probability of early retirement by 18.5 percent.

Comments: The study supports the view that private pensions can be modeled as an asset in studying retirement behavior. The magnitudes of effects should be treated cautiously in that the study does not include the effects of Social Security. In the statistical analysis all retirements prior to age 65 are classified as "early retirements." The sample consists of workers from a single industry who were subject to private pension provisions with very strong inducements to retire early.

[14] BURKHAUSER, RICHARD V.: "The Early Acceptance of Social Security: An Asset Maximization Approach," Industrial and Labor Relations Review, 33 (4), July 1980, 484-92.

Objective: Over half of all men eligible for Social Security retirement benefits retire before age 65. Previous studies have usually treated the retirement decision as a single-period choice problem. This study implements a life-cycle approach by estimating a model of early retirement in which workers weigh the present value of Social Security benefits and foregone market earnings associated with retirement at age 62, against the change in present value of private pensions and Social Security benefits if retirement is postponed.

Data Set: The 1973 CPS-IRS-SSA Exact Match File, supplemented with information from the 1971 wave of the Retirement History Study. Models were estimated on a sample of approximately 700 men eligible for Social Security retirement benefits at age 62, who had not received Social Security disability payments.

Definition of Retirement: Early retirement is defined to be acceptance of Social Security benefits at age 62.

Estimation Method: Multivariate probit. The dependent variable is dichotomous, and indicates that Social Security benefits were accepted at age 62.

Findings: If it were not for the earnings test, it would make sense to accept Social Security benefits at the age where the present value of benefits is maximized. It is the existence of the retirement test and unfair actuarial adjustments after the age of 65 that necessitates that workers evaluate both pension and earnings streams simultaneously. The statistical work presented in this paper supports a life-cycle view of the retirement decision. Early retirement is positively related to the asset value of Social Security entitlements and the probability of an early private pension; it is negatively related to market earnings, later private pension eligibility, education, and marital status. Evaluated at sample means, a 10 percent increase in the asset value of Social Security increases the probability of retirement at age 62 by 14 percent.

Comments: Because there is no information on health in this data set, the statistical model lacks any health indicator. Other research suggests that this is a serious omission in a model of the early retirement decision. The measures for private pension effects are crude. Industry-specific measures of the probability of 1) eligibility for a pension at or before the age of 62, and 2) eligibility for a private pension at any age, are included as explanatory variables. Nonetheless, the results presented here are consistent with life-cycle theory, and imply that OASI induces early retirement. The paper never directly tests the life-cycle approach directly against a myopic view.

[15] BURKHAUSER, RICHARD V. AND JOSEPH F. QUINN: "Is Mandatory Retirement Over-rated? Evidence from the 1970's," Journal of Human Resources, 18 (3), Summer 1983, 337-58.

Objective: Mandatory retirement is but one of a number of factors influencing the timing of retirement. The 1978 amendments to the Age Discrimination in Employment Act raised the minimum age at which employees can be forced to retire solely because of age from age 65 to 70. This change would be expected to increase the labor supply of older workers. This paper argues that the institutional features of private pensions and Social Security have also provided strong incentives to retire at the mandatory retirement age, and attempts to isolate the contribution made by each factor in the retirement decision. Mandatory retirement is shown to have a significant impact on retirement patterns, but smaller

than a simple count of who is subject to such provisions would indicate.

Data Set: 1,048 men from the 1969 through 1975 waves of the Retirement History Study. Respondents were aged 64-66 in 1975. 127 men were subject to mandatory retirement during the 1973-5 transition period studied; 921 were not.

Definition of Retirement: Respondent leaves 1973 RHS job by 1975 interview.

Estimation Method: Ordinary least squares and logit analysis.

Findings: Neither Social Security nor private pension plans are usually neutral with respect to the timing of retirement. In this sample, 77 percent of men subject to mandatory retirement were also eligible for private pensions during the following two years. A labor-force transition model is derived to predict the probability that a fully-employed male in 1973 leaves his job by the 1975 interview. Job exit is hypothesized to depend on health, the existence of mandatory retirement sometime after 1975, marital status, prior year's earnings, Social Security wealth, private pension wealth, and the net (of taxes) increment to each of these last two magnitudes generated by another year of work. The model is estimated on the subsample of workers not subject to mandatory retirement before the 1975 interview. The results show health deterioration to be the strongest influence on early exit; higher earnings induce longer duration on the job. The changes in both Social Security and private pension wealth are positively associated with exit: larger wealth losses due to additional work spur earlier retirement. Social Security wealth has no impact.¹²

The estimated equations are then used to predict the exit behavior of those who faced mandatory retirement prior to the 1975 interview. The raw data indicate that the rate of job exit was twice as large for this group (83 versus 41 percent). Nonetheless, when other influences are taken into account (through predicting their behavior with the estimated equation for the other subsample), approximately half of the difference in exit behavior is explained by these other characteristics. The paper concludes that had there been no mandatory retirement prior to age 70 during 1975, 48,000 more men would

¹²This is a common result and may, in part, reflect an unobserved correlation between Social Security wealth and tastes for work. Social Security wealth depends directly on the individual's earnings record, and a history of higher earnings is likely to be positively correlated with a taste for work.

have continued working, raising their cohort labor-force participation rate by 2 percentage points.

Comments: Mandatory retirement provisions had a significant effect on those workers who desired to continue working past age 65. Nonetheless, given that the majority of men wanted to retire earlier, this statistically significant effect translates into a small effect on aggregate labor supply.

A crucial assumption in the methodology is that workers who face mandatory retirement provisions have the same unmeasured, unobserved characteristics as those who do not. If people with preferences for earlier retirement seek out jobs where mandatory retirement is a feature, the effect of this provision would be overstated.

[16] BURKHAUSER, RICHARD V. AND JOSEPH F. QUINN: "Financial Incentives and Retirement in the United States," in Social Insurance, ed. Lars Soderstrom. Amsterdam, The Netherlands: North Holland Publishing Company, 1983, 207-24.

Objective: There has been a long term trend towards earlier retirement ages and less labor-force participation by people aged 65 and older. This project investigates the extent to which part of the explanation may lie with monetary incentives associated with private pensions and Social Security. This paper: 1) calculates the level of private pension and Social Security wealth, and the prospective gain in their values associated with working another year, and 2) estimates their effect on the propensity to quit among male workers aged 62 to 64.

Data Set: A sample of approximately 1,000 employed males, aged 62 to 64 in 1973, drawn from the Retirement History Study. Variables were constructed from information in the 1973 and 1975 waves. People subject to mandatory retirement were excluded from the sample.

Definition of Retirement: A person "retires" if he leaves his 1973 job during the 1973-5 interval.

Estimation Method: Ordinary least squares and logit analysis.

Findings: Estimates of the level of private pension and Social Security wealth, and the changes in their values attributable to another year of employment, were estimated for employed males. Present values were computed using discount rates of 2, 5, and 10 percent. Fifty-five percent of the selected sample claimed pension wealth from a previous or current job; Social Security coverage was virtually universal

in the sample selected for this study. Using a 2-percent discount rate, the median value of pension wealth was \$22,399; median Social Security wealth value was \$72,338. For all discount rates and ages, the private pension returns to working another year were negative (pension wealth declined). Social Security wealth increased for 63- and 64-year-olds using a 2 percent discount rate, and declined slightly at 10 percent. Social Security wealth fell for continued work at age 65. There appeared to be a notable disincentive for continued work for most respondents.

A "quit" equation was estimated by both OLS and logit; no distinction is made between leaving the labor force and changing employers. Explanatory variables included pension wealth, Social Security wealth, changes in both of these variables associated with another year of work, health, marital status, and previous year's earnings. Greater declines in the two wealth variables increased the probability of quitting. High earners are more likely to continue working; onset of a health problem was a negative influence.

Comments: This paper provides reasonable evidence for the retirement decision being responsive to the financial incentives implicit in private pension and Social Security wealth accrual rates.

[17] BURKHAUSER, RICHARD V. AND JOHN A. TURNER: "A Time-Series Analysis on Social Security and Its Effect on the Market Work of Men at Younger Ages," Journal of Political Economy, 86 (4), August 1978, 701-15.

Objective: While most studies of Social Security's labor supply effects focus on older workers, economic theory suggests that there are possible intertemporal substitution effects on the amount of work effort supplied by younger cohorts. The earnings test provides an incentive to shift earnings to pre-retirement periods, raising the labor supply of prime-age workers via a substitution effect. However, this might be offset by Social Security's lifetime wealth effect. This paper attempts to estimate the size of these effects.

Data Set: Annual U.S. times series data for the period 1929-71, excluding 1943-45.

Definition of Retirement: None used.

Estimation Method: Ordinary least squares.

Findings: The paper first presents a set of calculations of wealth and substitution effects based on a relationship

derived from income-consumption and time-allocation identities. Several key parameters are taken from macroeconomic studies, as well as Feldstein's 1974 estimate of the effect of Social Security on private saving (i.e., Social Security has reduced savings by 30 to 50 percent). It is estimated that the wealth effect lowers weekly work by .8 to 1.7 hours, while the substitution effect increases work by .6 to 3.8 hours per week.¹³

The paper then presents results of a time series regression of (the natural logarithm of) hours worked per week (by males in private, nonagricultural employment) on Social Security wealth, Social Security wealth interacted with time, the real wage rate, the unemployment rate, the price of recreation, and family size. The coefficient on Social Security wealth captures both wealth and substitution effects. Its coefficient is positive and significant, indicating that the substitution effect is dominant. The various specifications imply that Social Security increases average weekly hours by 2 to 3 hours.¹⁴

Comments: The paper presents statistical evidence that Social Security has increased work by prime-aged males on the order of 2 to 3 hours per week via an intertemporal substitution effect, a figure that appears to be implausibly large. The results are not stable for sample subperiods. Specifically, Social Security wealth has no effect on work in the 1946-71 interval when a separate regression is run on these data. Furthermore, the dependent variable in the regression model measures hours of work for all male workers, including the elderly.

¹³If there is no effect of Social Security on saving, the Burkhauser-Turner estimated wealth effect is zero, but the substitution effect is unchanged.

¹⁴Burkhauser and Turner estimate their model using the incorrect Feldstein Social Security wealth series. In a 1982 follow-up note in the Journal of Political Economy (Vol. 90, No. 3), they present a revised model estimates using the Leimer-Lesnoy corrected series. The net effect on labor supply is virtually unchanged.

[18] BURKHAUSER, RICHARD V. AND JOHN A. TURNER: "Can Twenty-five Million Americans be Wrong? - A Response to Blinder, Gordon, and Wise," National Tax Journal, 34 (4), December 1981, 467-78.

Objective: The conclusion of the Blinder, Gordon, and Wise (BGW) article that Social Security provides a net work incentive for most older workers is disputed. Several errors in the earlier paper are identified. When these are rectified, it is claimed that the BGW conclusions are weakened.

Data Set: Retirement History Study

Definition of Retirement: Not used in study.

Estimation Method: None.

Findings: Two basic points of the BGW article are disputed. First, it is argued that the wage subsidy implicit in the automatic benefit recomputation provision for older workers is much lower than BGW claimed when viewed from a life-cycle perspective. An additional dollar of earnings has the same impact on average monthly earnings (AME) whether it comes early or late in the computation years. However, the existence of the retirement test provides an incentive to accrue the earnings earlier rather than later. Second, it is argued that BGW misrepresent the way in which Social Security cost-of-living adjustments were made prior to 1977. The result is that actuarial adjustments prior to age 65 were not fair. A revised set of calculations, using nominal interest rates, shows the actuarial adjustments to be a little more than half the rate that would be fair.

Comments: Although Burkhauser and Turner correctly identify several errors in the BGW paper, the basic conclusions of the earlier paper remain valid, particularly under post-1977 Social Security rules in which earnings prior to age 60 are indexed.

[19] BURKHAUSER, RICHARD V. AND JOHN A. TURNER: "Social Security, Preretirement Labor Supply, and Saving: A Confirmation and Critique," Journal of Political Economy, 90 (3), June 1982, 643-46.

Objective: This paper presents revised estimates of the time-series model presented in their 1978 JPE article, using corrected estimates of Social Security wealth variable. They make the further theoretical point that the effect of Social

Security wealth on saving cannot be accurately estimated from an ordinary consumer expenditure function which fails to account for induced changes in labor supply. Ignoring the labor supply response leads to an overestimate of Social Security's negative impact on savings.

Data Set: Aggregate U.S. time series.

Definition of Retirement: None used.

Estimation Method: Ordinary least squares.

Findings: The earnings test leads to a reduction in work at older ages, and increased work at younger ages. The greater the intertemporal substitution effect, the greater the increase in prime-age hours worked and earnings, which, in turn, stimulates savings. Burkhauser and Turner simulate this using a consumer expenditure function, and predict that overlooking the induced change in savings will understate the positive effect of the earnings test by one third.

Comments: While the paper does not directly estimate its main point, it does make a valid point about the manner in which the earnings test might actually stimulate labor supply and savings earlier in the life cycle.

[20] BURTLESS, GARY: "Social Security, Unanticipated Benefit Increases, and the Timing of Retirement," Review of Economic Studies, 53 (5), October 1986, 781-805.

Objective: Empirical results have been somewhat mixed on the extent to which Social Security has contributed to the marked trend to earlier retirement. Between 1969 and 1972 there was a 20-percent increase in the real value of Social Security retirement benefits. This increase followed a fifteen year period in which the real retirement benefit for a worker with a specific earnings history was virtually constant. It is likely, therefore, that the sudden, sizeable increase was unanticipated by beneficiaries. This paper develops a life-cycle model in which anticipated benefit increases are distinguished from unanticipated changes. The implications for choice of retirement date are explored.

Data Set: 4,193 men selected from the Retirement History Study. Data from all six waves were used. Excluded are farmers and men who reported substantial income from welfare programs, civil service pensions, or railroad retirement benefits.

Definition of Retirement: The first discontinuous drop in annual hours of work not connected to a spell of unemployment that ends in return to full-time work.

Estimation Method: Nonlinear maximum likelihood.

Findings: Central to this paper is an econometric model which accounts for the fact that unanticipated increases in real retirement benefits can cause unretired workers to retire earlier, but cannot affect the retirement dates of those people who have already retired. Choice of retirement date is made within a lifetime utility maximization framework in which Social Security and taxes result in a nonlinear, and sometimes nonconvex, budget set. In addition, unanticipated changes in Social Security benefit levels cause the budget constraint to shift. The likelihood function incorporates these shifts.

The basic behavioral relationship estimated is a retirement demand function that is a function of health, marital status, household size, and financial variables from the budget constraint.¹⁵ Parameters are all very precisely estimated. Poor health, household size, a dummy indicating wealth in excess of \$25,000, and total family wealth in 1969 (i.e., the intercept of the lifetime budget constraint in the econometric model) all tend to lower retirement ages; lower levels of wealth, being married, and the rate at which family wealth increases when retirement is delayed one year (i.e., the slope of the lifetime budget constraint) are positive influences on retirement age. Men reporting bad health retire about 1.1 years earlier. Evaluated at sample mean values, the implicit rate of time preference of retirees appears to be slightly greater than 5 percent. The response of retirement date to changes in the slope of the lifetime budget constraint is modest¹⁶; doubling the slope would increase the retirement age by about .91 years. The response to changes in the lifetime budget constraint intercept is lower; doubling the intercept value leads to a .59 decline in retirement age. The estimated model indicates that the lifetime budget constraint is convex, and sharply so at age 65 due to Social Security.

Finally, the estimated model is used to calculate the effects of the unanticipated benefit increases in 1970 and

¹⁵The retirement demand function is semilogarithmic, and has the convenient property that it can be integrated to produce the underlying indirect utility function via Roy's identity. This latter relationship is used to locate utility-maximizing equilibria on the nonconvex portions of the budget constraint (Burtless & Hausman, Journal of Political Economy, 86 (6), December 1978).

¹⁶The slope measures the change in lifetime income associated with a change in retirement age.

1972. The average retirement age is about .09 years (4.7 weeks) earlier due to these unanticipated increases. Had these been anticipated changes, the long-run effect would have been to reduce the average retirement age by .17 years (8.8 weeks).

Comments: This is a well-executed, sophisticated piece of research in which the econometric model is nicely grounded in a life-cycle planning framework. As is usual in models that impose substantial structural detail at the outset, a number of assumptions are untested with regard to constructing the lifetime budget constraints for individuals, as well as the functional form assumed for underlying preferences. The estimated magnitudes in this paper are consistent with other research that has found that changes in Social Security benefit levels have little effect on retirement.

[21] BURTLESS, GARY AND ROBERT A. MOFFITT: "The Effect of Social Security Benefits on the Labor Supply of the Aged," in Retirement and Economic Behavior, eds. Henry J. Aaron and Gary Burtless, Washington, DC: Brookings Institution, 1984, 135-74.

and:

_____. "The Joint Choice of Retirement Age and Postretirement Hours of Work," Journal of Labor Economics, 3 (2), April 1985, 209-36.

Objective: Estimates of the effects of OASDHI on the work-retirement choices of the elderly are presented. The model assumes that decisions about retirement date and post-retirement hours of work are made jointly. [Both articles discuss the same research, with the JOLE article addressing the theoretical and econometric issues in greater detail.

Data Set: 4,603 men selected from the 1969-77 waves of the Retirement History Study.

Definition of Retirement: The date at which a sudden, discontinuous drop in hours is observed.

Estimation Method: Maximum likelihood.

Findings: This sample consists of men who were aged 58-63 in 1969. A critical feature of the model's structure is that individuals are assumed to have different utility functions in the pre- and post-retirement periods. Prior to retirement, utility is a linear function of the pre-retirement wage and

socio-economic characteristics (health, race, education, private-pension vesting). Utility declines linearly with age until the negative contribution of the age term is such that the person is better off retiring. Post-retirement utility is a nonlinear (logarithmic) function of consumption, hours of work, education, and marital status. Therefore, at the retirement date preferences change, particularly the relative valuation of income and leisure. The model's structure dictates that post-retirement hours of work must remain constant in all periods. Thus, the model permits only one type of labor supply adjustment per person: work to partial retirement, or work to complete retirement.

In the statistical model Burtless and Moffitt estimate equations for choice of retirement age and post-retirement hours of work jointly by the method of maximum likelihood. The estimation explicitly addresses the econometric issues of non-linear budget sets and censored employment spells for non-retirees in the sample.

Comments: This is one of the best empirical pieces on the retirement decision. Social Security affects both retirement age and choice of post-retirement hours, although the magnitude of effect on age of retirement is rather small. Perhaps the greatest weakness of the model is the ad hoc manner in which utility functions are permitted to change at the retirement date; no relationship is imposed between the sets of parameters in each regime. Given the complexity of their model, it is difficult to interpret the published coefficient estimates in a straightforward manner.

[22] BUTLER, J.S., KATHRYN H. ANDERSON, AND RICHARD V. BURKHAUSER: "Testing the Relationship Between Work and Health: A Bivariate Hazard Model," Economic Letters, Vol. 20, 1986, 383-6.

Objective: The paper examines the ways in which older peoples' decisions about work are related to health status. Results indicate that failure to control for simultaneity will introduce bias into the estimation of work-retirement relationships.

Data Set: 5,494 individuals from the Retirement History Study. Analysis is limited to those workers who were in the labor force in 1967, but who were not working and declared themselves retired between 1969 and 1977.

Definition of Retirement: Self-assessment; retirement is said to occur if people declare themselves to be either fully or partially retired.

Estimation Method: Maximum likelihood estimation of a hazard model.

Findings: Retirees are assumed to have two avenues for exiting the retirement state: re-employment and death. The statistical model posits two correlated hazards. The first of these is the probability of leaving the retirement state by either returning to work or dying; the second is a density of time to death, assumed to be partially under the control of the retiree.

In the sample used for estimation, nearly the same number of people die as unretire. Independent variables include measures of a person's employability, determinants of the reservation wage, and past health status. The results indicate that poor health and tastes for work are positively correlated in the sample. Controlling for income and observable personal characteristics, those retirees who continue to work the longest will die earlier than those who consume leisure during retirement.

Comments: The model provides good statistical evidence that ignoring the two-way relationship between employment and health will lead to biased estimates of either relationship.

[23] BUTLER, J.S., KATHRYN H. ANDERSON, AND RICHARD V. BURKHAUSER: "Work and Health After Retirement: A Competing Risks Model With Semiparametric Unobserved Heterogeneity," Review of Economics and Statistics, 71 (1), February 1989, 46-53.

Objective: This paper estimates a competing risks model of exit from the retirement state. In contrast to hazard models that assume only one type of exit from a specific state, the competing risks model permits multiple exits. In this case there are two: re-entering the labor market and death. The estimation procedure controls for both observed and unobserved heterogeneity.

Data Set: 4,558 men and women selected from the Retirement History Study. The sample is limited to people who were in the labor force, but not self-employed, in 1967, and retired between 1969 and 1977. Individuals with severe health conditions that limit work are excluded.

Definition of Retirement: Person indicates that they are either fully or partially retired, and is not currently working.

Estimation Method: Maximum likelihood estimation of a competing risks model.

Findings: Out of the sample of 4,558 individuals, 29.1 percent reenter the labor force and another 8.4 percent die. The longer the person is retired, the less likely it is that reentry occurs, excepting cases where retirement lasts 8 to 10 years. Reentry and time-until-death equations are jointly estimated. Explanatory variables include age at retirement, gender, race, permanent wage, home ownership, Social Security and pension income, marital status, and children supported.

Results show that higher Social Security and pension income discourage reentry. Reentry probability decreases at an increasing rate as duration of retirement increases. In the mortality equation, persons with higher Social Security and pension income, women, and non-whites are less likely to die. The model estimates are compared with those for a competing risks model that does not allow for unobserved heterogeneity. In general, coefficient signs and statistical significance are not changed, but the magnitudes of coefficients do change to some extent; they are most often larger when unobserved heterogeneity is controlled for.

Comments: This paper's contribution is primarily methodological in that it uses a semiparametric estimation procedure to examine exits from retirement through labor-force reentry and death. There is good reason to suppose that unobserved heterogeneity components of the two risks are correlated (very healthy people might return to work while those with health problems are more likely to die). Estimating a model of labor-force reentry on a sample that excludes retirees who die presumably results in selection bias since many of those with the worst health are excluded. In this application of the method, the correlation between the unobserved risk components is found to be statistically insignificant.

[24] CARLINER, GEOFFREY: "Retirement Effects of the Social Security Earnings Test," unpublished manuscript, March 1981.

Objective: The paper examines the effect of changes in the retirement test on the work-retirement decision. The data set is attractive in that there was an important change in the retirement test provision during the period studied. Until the end of 1971, a range of earnings in which a 50percent penalty rate was in effect, was followed by a range in which benefits were reduced by 100 percent of further earnings. The higher rate was eliminated at the end of 1971. In addition,

the annual exempt amount was raised several times in this period.

Data Set: National Longitudinal Survey of Older Men. Three separate samples were drawn: men aged 62-3, 64-5, and 66-7. All individuals were eligible for Social Security retirement benefits. Each sample includes one observation per person, but a person can be included in all three samples. Although not stated in the paper, all observations appear to be drawn from the 1971, 1973, and 1975 interview waves. Potential Social Security benefits were imputed for persons not yet retired. Actual and potential private pension information was imputed, if not observed. The number of observations varies among equations, but is not smaller than 200 or larger than 816.

Definition of Retirement: Retirement is the receipt of partial or full Social Security retirement benefits. The precise definition is not critical in that the empirical work concerns estimating the probability that the individual locates on a specific arm of the budget constraint.

Estimation Method: Conditional logit. Separate regressions are estimated for the probability of locating on each segment of the budget constraint.

Findings: An increase in annual Social Security benefits of \$1000 decreases the probability of working full-time by about .13 for the two older groups. When separate analyses were done on those workers who were receiving some Social Security benefits, changes in the retirement test appeared to have no effect on their labor supply. Increases in the exempt amount decreased fulltime leisure and increased the probability of working with full receipt of benefits for the 62-3 group; the opposite effect was found for the oldest group. Increases in benefits reduced the probability of working for both older groups. Health status and age had predicted significant effects. The study concludes that eliminating the retirement test would increase pension costs to the government, while not appreciably altering the aggregate labor supply of the elderly.

Comments: The estimation procedure partially addresses the econometric problems associated with a convex budget set. It does not, however, fully exploit the information in the data set in that the continuous nature of the hours variable is not used (it is simply noted that a person's hours fall into a given range or budget segment). The probability equations are not estimated jointly, ignoring the fact that the decisions to locate on various budget segments are related. Finally, taxes are not addressed, nor is the downward trend in labor-force

participation rates, which may confound the parameter estimates.

[25] CLARK, ROBERT L. AND STEPHAN F. GOHMANN: "Retirement and the Acceptance of Social Security Benefits," National Tax Journal, 36 (4), December 1983, 529-34.

Objective: The paper extends the analysis of Blinder, Gordon, and Wise [1980] and Burkhauser and Turner [1981]. The previous papers examined the effect of Social Security on lifetime budget constraints of workers. This piece notes that the position and shape of the constraint are determined by the date that Social Security benefits are accepted. Thus, labor supply and the acceptance date are simultaneously determined. The focus is on the interaction between the actuarial adjustment (AA) and the retirement test.

Data Set: None.

Definition of Retirement: None used. Acceptance date for Social Security benefits is the key decision.

Estimation Method: None.

Findings: The AA for acceptors differs from that for non-acceptors in two ways. For an acceptor, if benefits are lost in some month to the retirement test prior to age 65, future benefits are increased by 5/9 of 1 percent of the primary insurance amount (PIA). However, these higher benefits are not payable until age 65. A nonacceptor would be able to collect a higher benefit for postponing acceptance the next month, rather than having to wait until attaining normal retirement age. Second, for acceptors the AA depends on both earnings and the retirement test; for nonacceptors, it is determined solely by the acceptance date.

Benefit acceptance reduces the degree of actuarial adjustment for people who lose all benefits to the retirement test. The difference between the AA for acceptors and nonacceptors declines as age approaches 65, and widens thereafter. The AA prior to acceptance has only an income effect; however, for acceptors who have earnings above the annual exempt amount, there is an implicit tax.

Comments: The benefit acceptance decision and work decision are clearly interdependent, although the extra impact of the differential AA for acceptors is relatively minor.

[26] CLARK, ROBERT L. AND THOMAS JOHNSON: "Retirement in the Dual Career Family," Final Report SSA Grant No. 10-P-90543-4-02, June 1980.

Objective: This project develops a life-cycle family model of labor supply in which husbands and wives jointly select lifetime labor supplies, consumption, savings, and retirement dates. Results are consistent with theoretical predictions. The final report contains: 1) a life-cycle, optimal control model of family decisions regarding home production, market work, and human capital formation; 2) a dual-earner labor-force participation model in which the husband's and wife's decisions are estimated jointly; 3) a discussion of the likely effects of inflation on pension benefits, and the consequences for retirement decisions; and 4) estimates of the macroeconomic determinants of retirement flows among older workers.

Data Set: 4,673 married couples from the 1969-73 waves of the Retirement History Study. Couples with self-employed persons were excluded.

Definition of Retirement: No labor-force participation.

Estimation Method: Multinomial logit.

Findings: This discussion is limited to the section of their report which presents estimated retirement models.¹⁷ Labor-force participation equations for husbands and wives are estimated jointly using multinomial logit analysis for each of the separate years 1969, 1971, and 1973. The labor-force participation decision for each individual is hypothesized to be a function of personal characteristics, financial variables, and the labor-force status of the spouse. Current wage rates are positive influences for both sexes. Generally, wealth and assets are negative influences, as is poor health. There are several anomalies in the findings. Greater Social Security wealth sometimes increases the likelihood of participation, but otherwise discourages it. The finding of a positive effect can be explained by this variable serving as a proxy for unobserved career orientation. Labor-force participation by a spouse appears to be a positive influence on the decision to work. Coefficients did not appear to be stable across periods, perhaps due to the increase in average age within the sample; for men this rose from 60 to 64, for women, 56 to 60.

¹⁷Chapter II, pp. 43-88. It should be noted that this represents only a small portion of the work included in the report.

Comments: The empirical work is not tied closely to the theoretical life-cycle model presented in the first section of the report. Statistical procedures did not exploit panel nature of the RHS data set, say by estimating either fixed or random effect models. While coefficient sign changes are not frequent across periods, their magnitudes vary substantially in many cases across the three years. No formal statistical test of stability is performed.

[27] CLARK, ROBERT L., STEPHAN F. GOHMANN, AND DANIEL SUMNER: "Wages and Hours of Work of Elderly Men," Atlantic Economic Journal, 12 (4), December 1984, 31-40.

Objective: The paper presents a 2-equation, wage-hours model in which wage offers are a function of hours worked. Elderly men earn higher wages the more hours they work.

Data Set: 662 employed, married men, aged 64-69, selected from the 1975 wave of the Retirement History Study.

Definition of Retirement: None used.

Estimation Method: Two-stage least squares (2SLS).

Findings: The wage rate is hypothesized to be dependent on hours of work, tenure, schooling, race, government employment, and labor market size. This equation is estimated using 2SLS. The hours variable has a significant positive effect on the wage level. Sample selection bias is rejected on the basis of the Heckman procedure.¹⁸ Weekly hours worked are hypothesized to be a function of the wage, health status, goods consumption¹⁹, age, and pension eligibility. 2SLS estimates of this relationship imply that the gross wage elasticity is .33, with an income-compensated elasticity equal to .36. The implied total income elasticity is small (-.03) and statistically insignificant. Eligibility for a private pension has a small negative effect on hours of work. There was no evidence of sample selection bias for this equation.

¹⁸The wage equation is estimated on a sample of working men. It is possible that workers face higher wage offers than nonworkers. The results of including the inverse of the Mill's ratio as a regressor in the wage equation indicate that sample selection bias is not a problem in this instance.

¹⁹Goods consumption is measured by the sum of earned income, transfer income, and potential asset income (the interest rate times the estimated value of wealth).

Comments: While the estimated wage elasticity for the hours equation is somewhat higher than that found by other researchers (See Hanoch & Honig [1983]), it is within a plausible range. The paper's major shortcoming is its treatment of the complex, nonlinear budget set faced by older workers. Taxes, transfers, Social Security's earnings test, etc. are all ignored, as well as the econometric issues raised by nonlinear budget constraints.

[28] DIAMOND, PETER A. AND JERRY A. HAUSMAN: "Individual Retirement and Savings Behavior," Journal of Public Economics, 23 (1/2), February/March 1984, 81-114.

Objective: This paper examines the effects of Social Security and private pensions on retirement and savings decisions.

Data Set: 1,335 respondents from National Longitudinal Survey of Mature Men for the years 1965-75. Those with wealth below \$4,000 in 1966 were excluded from the sample (30 percent of the sample was eliminated on this criterion).

Definition of Retirement: Individual stopped working fulltime.

Estimation Method: A retirement model is estimated using a continuous-time hazard model. In addition, a wealth accumulation relationship is estimated by nonlinear two-stage least squares, and a savings function by ordinary least squares (with a Heckit correction for the sample truncation at wealth greater than or equal to \$4,000).

Findings: Life-cycle theory suggests that a rise in future resources, perhaps due to an increase in Social Security benefits, will lead to increased consumption in all periods, including the present. This might not happen for two reasons: 1) individuals might not be able to convert the additional wealth into current consumption, and 2) perhaps people are backward-looking rather than forward-looking when making consumption decisions.

Estimates of permanent income and wealth are constructed from data from eleven years of the NLS data. In the retirement model both pensions and Social Security are shown to have strong positive effects on the probability of retirement, as do permanent income and bad health. The onset of a health problem has the same impact as an increase in yearly pension income of about \$1,600. Social Security has a positive effect on early retirement, but its effects are dominated by the other explanatory factors. Thus, even without Social Security, it is likely that the observed trend

to earlier retirements would have occurred.

In the analyses of savings and wealth accumulation, it is found that the ratio of savings to permanent income rises sharply, in a nonlinear fashion, as permanent income rises. Higher pensions and Social Security lead to decreased savings; a \$1 increase in Social Security benefits is associated with a \$.25 to \$.40 decline in savings.

Comments: This paper models the retirement decision using a hazard model, which has the virtue of utilizing the panel nature of the data set, and conveniently addressing the statistical issues of left and right censoring in the data (i.e., some people retire before the first observation period, other do not retire before the last observation period). The retirement model results are generally consistent with those found by other researchers using regression techniques, and support the view that Social Security has an important effect on the retirement decision.

[29] DIAMOND, PETER A. AND JERRY A. HAUSMAN: "The Retirement and Unemployment Behavior of Older Men," in Retirement and Economic Behavior, eds. Henry J. Aaron and Gary Burtless, Washington, DC: Brookings Institution, 1984, 97-134.

Objective: Although life-cycle models of work and retirement usually assume perfect foresight and information, uncertainty appears to play a considerable role in many peoples' lives. This research investigates the impact of two important sources of uncertainty: physical health and involuntary unemployment.

Data Set: 1,356 respondents for the years 1966-78, selected from the National Longitudinal Survey of Mature Men. 428 of these men, aged 45-71, were fired during the period of observation, and provided sufficient information to estimate the competing-risks model.

Definition of Retirement: A person is retired if he describes himself to be either retired or unable to work.²⁰

Estimation Method: Maximum likelihood estimation of continuous-time hazard and competing risks specifications.

Findings: The paper comprises two related statistical investigations. The main part of this paper presents a

²⁰Since multiple transitions, including unretiring, are possible, this paper restricts analysis to first-time retirements.

continuous-time hazard model of the retirement phenomenon. This statistical framework is particularly suited for the analysis of retirement in panel data in which left and right censoring are prevalent. In addition, at any point in time the probability of retirement is conditional on the probability of not having retired to date.²¹ The probability of retirement is modeled as a function of personal characteristics and financial variables such as permanent income and Social Security payments. The estimated model indicates that both private pensions and Social Security have strong positive effects on the probability of retirement. Larger permanent incomes are associated with a lower probability of retirement. Health also plays a key role, particularly in the decision to retire early; the onset of poor health is equivalent to a \$540 monthly increase in pension entitlement.

The second section of the paper considers the response of older workers to involuntary unemployment.²² In the NLS data, 36 percent of men aged 60-64 who were fired chose to retire. Preliminary estimates of the retirement response were made using probit analysis. Pensions, Social Security benefits, bad health, age, wealth, and a wife's permanent income were positive influences on the decision to retire. The authors then present a competing-risks model in which the unemployed older worker in the sample either retires or accepts another job. If y_1 is the length of time to retirement, and y_2 is the length of time to accepting another job, either y_1 or y_2 will be observed in the data (whichever is shorter), but not both. It is also possible that neither will be observed. Diamond and Hausman model these circumstances as a latent variable problem, similar to a bivariate Tobit model. Results are qualitatively similar to those for the probit analysis. The authors find that higher levels of pensions, Social Security benefits, and wealth tend to cause discharged workers to retire rather than find new jobs. Poor health and age are also contributors to the decision to retire. A curious finding is the size of the delay between retirement date and the onset of retirement income. Nearly one-fourth of retirees waited two or more years for retirement income to begin. These people tended to have low permanent incomes. The effect of age on the probability of retirement is double that found

²¹Regression models of retirement estimated on pooled cross-section, time-series data often suffer from a type of self-selection bias in that they do not specifically address the fact that the probability of retirement in any given year is a conditional probability, and depends on the individual's work history.

²²Only firings are considered, not layoffs or quits.

in the probit analysis, while the impact of poor health is over ten times as large.

Comments: State-of-the-art econometric methods are used to show that both private pensions and Social Security retirement benefits have strong positive effects on the probability of retirement. The effect of Social Security is especially strong at age 62.

[30] DUGGAN, JAMES E.: "The Labor-Force Participation of Older Workers," Industrial and Labor Relations Review, 37 (3), April 1984, 416-30.

Objective: Labor-force participation rates for persons aged 55 and over are explained using pooled cross-section, time-series data. The contribution of this paper is to examine the roles played by cohort crowding and the availability of Supplemental Security Income (SSI). The increased supply of young workers, who are often substitutes for older workers, would be expected to depress wages. The elderly might choose to increase labor-force participation and hours of work to maintain living standards via an income effect.

Data Set: A data base is constructed from the March Current Population Surveys for the years 1974-80. Data for individuals aged 55-64, and 65 and older, were grouped by 34 SMSAs. Group means for all seven years were pooled, providing a total of 238 observations for each age-gender group.

Definition of Retirement: Group labor-force participation rates are used.

Estimation Method: Variance components models.

Findings: A large increase in the supply of younger workers should depress their wage offers, as well as lower demand for those older workers who are substitutes, especially women. The decline in wage offers is usually expected to decrease the likelihood of labor-force participation through a substitution effect. In addition, the availability of SSI payments should increase elderly reservation wages, thereby lowering their participation rate. However, the desire to maintain living standards would be expected to increase participation by secondary earners.

Labor-force participation equations for men and women are estimated for two age groups, those aged 55-64, and those aged 65 and over. For the younger groups not eligible for SSI payments, regressors include the median real after-tax earnings of fulltime workers aged 55-64, real unearned income,

the proportion of the population that is aged 16-34 (or 16-24), average education level of the group, the proportion of the group that is married, the unemployment rate, and real Social Security benefits.²³ In the case of persons aged 65 and over, the real value of SSI payments is included as a regressor.

The results concerning the cohort effect and SSI are in general accordance with expectations. Increased supply of younger workers raises participation among older women in both age groups, but has no effect on men. SSI has a negative impact on the participation of men over the age of 65. Social Security benefits have a significant negative influence on participation rates for all groups except women aged 65 and over.

Comments: The findings support the view that the availability of income support for the elderly through programs such as Social Security and SSI lowers labor-force participation rates. It is not clear, however, that the ideas in this paper are most powerfully tested using aggregate data, in which a large number of assumptions must be made to impute group averages for the various regressors. Important information such as the availability of private pensions and health status is not available. The estimated coefficients in the participation equations are somewhat suspect in that wage and unearned income variables appear to have no influence on participation in nearly all reported results. The ideas and preliminary results presented here hold some promise for further testing on micro-level data.

²³Social Security benefits were set equal to either the maximum for members of the group, or by applying PIA formulas to individual earnings in the CPS. These procedures overstate potential benefits for many persons.

[31] DYE, RICHARD F.: "Influencing Retirement Behavior: Untangling the Effects of Income Taxation of Social Security Benefits," Journal of Policy Analysis and Management, 5 (1), Fall 1985, 150-54.

Objective: The 1983 amendments to the Social Security Act changed future retirement and work incentives by increasing the normal retirement age, lowering the earnings test withdrawal rate, increasing the delayed retirement credit, and subjecting a portion of Social Security benefits to income taxation. This article examines the effect of these changes on the marginal tax rates on earned income.

Data Set: None used.

Definition of Retirement: None used.

Estimation Method: None used.

Findings: The 1983 amendments called for taxation of some Social Security retirement benefits. The portion of benefits to be taxed is the lesser of: 1) one-half of benefits, or 2) one-half of the excess of adjusted gross income plus interest from tax-exempt bonds over a specified base amount.²⁴ Thus, benefits are taxed only for higher income beneficiaries. For those individuals with benefits partially offset by the earnings test, modest changes in tax rates can imply relatively large percentage changes in the net wage rate.

Define the "phase-in range" to be the person's income range over which an increasing amount of Social Security benefits is taxed. (That is, less than one-half of Social Security benefits are taxed.) The change in net wage can be either positive or negative depending on whether the worker is initially located in the phase-in range of the budget constraint, and whether the person's benefits are partially offset by the earnings test. For example, for someone whose earnings are below the earnings test's annual exempt amount, and who has income within the phase-in range, increased earnings result in more Social Security benefits moving into the taxable range. Thus, taxable income goes up by more than the additional earnings and, given a progressive income tax system, effectively raises the marginal tax rate for these individuals. For workers with earnings partially offset by the earnings test and with incomes above the phase-in range, additional earnings imply lower taxable income than was the case when benefits were not taxed because some retirement benefits are lost as a result of the earnings test. In this case, greater earnings lower taxable benefits, and the

²⁴The base amount is \$25,000 for single returns, \$32,000 for joint returns, and zero for separate returns.

effective marginal tax rate on earned income is lower than it would have been in the absence of benefit taxation. The qualitative results will not change when the earnings test withdrawal rate falls from .50 to .33 in 1990.

Comments: This paper clearly demonstrates the ways in which the 1983 amendments will effectively lower marginal tax rates on earned income for some individuals, while raising it for others. In theory, the net effect is to alter work incentives. Because the law specifies the income thresholds in unindexed nominal dollars, continued inflation will increase the importance of this phenomenon through time.

[32] ESPOSITO, LOUIS AND MICHAEL PACKARD: "Social Security and the Labor Supply of Aged Men: Evidence from the U.S. Time Series," ORS Working Paper No. 21, Office of Research and Statistics, Social Security Administration, December 1980.

Objective: This is primarily an empirical paper that features two innovations in examining the effects of Social Security on work and retirement. First, rather than utilize labor-force participation rates to measure labor supply, the model uses hours of work by men aged 65 years and older. Second, the labor-supply relationship uses a measure of net lifetime Social Security benefits (that is, net of payroll taxes) as an explanatory variable rather than the usual present value of gross benefits.

Data Set: Aggregate U.S. time series, 1947-75.

Definition of Retirement: None used.

Estimation Method: Ordinary Least Squares (OLS).

Findings: The paper presents a 2-period, life-cycle, theoretical model in which workers are eligible for Social Security retirement benefits in the second period. The effects of retirement benefits, payroll taxes, and the earnings test on the allocation of work effort during the two periods is discussed.

In the empirical work, average annual hours of work by males aged 65 and older is regressed against: the current average hourly wage rate, an 18-year moving average of the average hourly wage rate, Social Security lifetime wealth

increment (LWI),²⁵ the annual exempt amount under the earnings test, the average age of males aged 65 and older, and the unemployment rate of males aged 65 and older. LWI has a significant negative effect on annual hours of work. The current wage and annual exempt amount have positive effects on hours, while past wages, the unemployment rate, and the average age of older males are negative influences. The estimated coefficients are sensitive to the specification of the LWI variable.

Comments: These results support the view that increased Social Security wealth has lowered the labor supply of older males; however, the ideas tested in this paper are more appropriately addressed with microdata sets. Nearly all the aggregate variables used here can be criticized as imprecise measures of aspects of the individual's life-cycle optimization problem. The use of OLS to estimate hours equations in which the wage variable is usually taken to be endogenous is suspect.

[33] FIELDS, GARY S. AND OLIVIA S. MITCHELL: "Economic Determinants of the Optimal Retirement Age: An Empirical Investigation," Journal of Human Resources, 19 (2), Spring 1984, 245-62.

Objective: The paper develops a life-cycle retirement model, and presents econometric estimates of how earnings, private pensions, and Social Security affect the age of retirement. The contribution of this paper is to show how age of retirement is influenced in a predictable manner by the net monetary value of continuing to work an additional year. The econometric work is conducted on a new specialized data set on private pension plans collected by the U.S. Department of Labor.

Data Set: The 1978 Benefit Amounts Survey, a survey of private pension plans conducted by the U.S. Department of Labor. A subsample of 390 males aged 68-69 in the survey year was used in the estimation work.

²⁵LWI increment is calculated by two different methods, and separate models are estimated for each case. In the first instance, LWI is computed under the assumption that the ratio of benefits to earnings remains constant at its current level. In the alternative method, individuals consider both past and present benefit ratios to estimate future benefits.

Definition of Retirement: Leaving the principal employer and accepting a pension.

Estimation Method: Ordinary least squares.

Findings: The theoretical model posits that individuals maximize lifetime utility by selecting a consumption path and retirement age subject to a lifetime income constraint. This constraint has as its main components the expected level of earnings at each age and streams of anticipated private pension and Social Security benefits. In choosing a retirement age, individuals weigh the monetary advantage to be gained by postponing retirement another year against the value of foregone retirement leisure.

Fields and Mitchell construct the nonlinear lifetime budget constraints for the individuals in the sample. The critical regressors are YBASE, the present value of total expected income if retirement occurs at age 60, and YSLOPE65 and YSLOPE68, the change in present value of expected income if retirement is postponed until age 65 or age 68. Components of YBASE, YSLOPE65, and YSLOPE68 are included as separate regressors in several specifications. The dependent variable is age of retirement.

Results show that people with greater base period wealth retire earlier, and that the greater the monetary gain to delaying retirement, the later the retirement age, ceteris paribus. Results are robust across specifications.

Comments: This is a straightforward, elegant model in which the empirical work is nicely grounded in an underlying theoretical specification. Estimated coefficients are consistent with a priori expectations. The elasticity of retirement age with respect to the present value of benefits is on the order of 0.1.

The paper does have several limitations. First, the sample is relatively small, and not generally representative of the population at large because all individuals in the sample are covered by the same basic pension plan. Second, the model cannot address the empirically important phenomenon of partial retirement, largely due to the retirement definition adopted. Third, the model assumes that all changes in income streams, including Social Security, are fully anticipated.

[34] FIELDS, GARY S. AND OLIVIA S. MITCHELL: "The Effects of Social Security Reforms on Retirement Ages and Retirement Incomes," Journal of Public Economics, 25 (1/2), November 1984, 143-59.

Objective: This paper evaluates the effects of four changes in Social Security policy on the timing of retirement and retirement incomes: raising the normal retirement age, delaying the cost-of-living adjustment, decreasing early-retirement benefits, and increasing the delayed retirement credit.

Data Set: Data were taken from the 1969-79 waves of the Retirement History Study. The final sample consisted of 1,024 married white male employees who were aged 59-61 in 1969.

Definition of Retirement: The individual leaves his 1969 job.

Estimation Method: Conditional ordered logit.

Findings: The four reforms evaluated in this paper differ from those that actually became part of the 1983 amendments. The effects simulated are: 1) raising the normal retirement age to 68, 2) postponing the cost-of-living adjustments by 6 months, 3) raising the delayed retirement credit (DRC) to 6.66 percent, and 4) increasing the early retirement reduction factor from 6.66 to 15 percent per year.

To do this it was first necessary to project RHS income values forward to the 1980s. Pension information is not good within the RHS. Consequently, Fields and Mitchell are forced to impute industry averages for retirement at age 65 obtained from outside sources. Quasi-actuarial adjustments are made for retirement at ages other than 65. The parameters of a simple utility function were then estimated, with utility assumed to be a function of retirement leisure and the present value of all income flows. The statistical framework is an ordered logit model in which retirement age is explained by years of retirement leisure and the combined present value of Social Security, pension, and earned income streams. The ordered logit procedure has the advantage over an ordinary multinomial logit approach in that the attractiveness of any given retirement age is likely to be correlated with the attractiveness of adjacent years; this technique permits covariance between choice alternatives.

The results are qualitatively in accordance with expectations, but the actual magnitudes are fairly small. Changes in lifetime income in the range of 20 to 30 percent usually lead to delays in retirement date of less than 3 months. Increasing the early retirement reduction factor to 15 percent per year has the largest effect, but causes an average delay in retirement of only 3 months. Postponement of

cost-of-living increases and increasing the DRC delay retirement by about 1.5 months on average.

Comments: This study obtains sensible estimates of the effects of four policy changes on the timing of retirement using a very parsimonious model. In fact, the model presented here is probably over-simplified, given that details such as health, the earnings test, and behavior by spouses are ignored. Results are qualitatively consistent with the theoretical model, but quantitatively small. This is consistent with the findings of other researchers.

[35] FILER, RANDALL K. AND PETER A. PETRI: "A Job-Characteristics Theory of Retirement," Review of Economics and Statistics, 70 (1), February 1988, 123-9.

Objective: Previous research has shown that both pensions and job characteristics influence the retirement decision. This paper examines the proposition that job characteristics affect age of retirement both directly, and indirectly through influencing pension structure.

Data Set: Occupational data from the 1980 Census merged with job characteristics data from the Dictionary of Occupational Titles, 4th ed.

Definition of Retirement: Worker leaves the labor force.

Estimation Method: Ordinary least squares. Reported results are from specifications that maximize the coefficient of determination in a step-wise regression.

Findings: Two relationships are estimated. First, an age-of-retirement equation is estimated where mean age of retirement within 334 occupations is regressed against job characteristics. Generally, jobs with demanding physical requirements, stress, and hot working conditions are associated with earlier retirement. The second equation regresses the pension replacement rate²⁶ on job characteristics and age of retirement. The hypothesis is that if all jobs have the same targeted replacement rate at the expected age of retirement, then holding a worker's age constant, the replacement rate should be higher in jobs where earlier retirement is expected. In a cross-section regression

²⁶The measure used here is the ratio of pensions to lifetime average wage for 303 retired men. The pension income data are taken from the March 1984 CPS.

of replacement rate on job characteristics and age of retirement, the coefficients on job characteristics should have the opposite signs as those in the age-of-retirement equation. The results generally support the hypothesis.

Comments: The second equation results are not nearly as strong as those for the age-of-retirement equation. Nonetheless, the study provides additional support for the view that job characteristics are an important influence in the retirement decision. Further work is needed to determine the importance of the indirect influence operating on pension structure.

[36] GOHMANN, STEPHAN F. AND ROBERT L. CLARK: "Retirement Responses to Social Security Changes," Journal of Gerontology: Social Sciences, 44 (6), November 1989, S218-25.

Objective: For many workers the retirement and Social Security benefit acceptance dates do not coincide. For example, 32 percent of white married males in the RHS claimed benefits but remained in the labor force one year after acceptance. This paper develops a model in which the two decisions are treated jointly.

Data Set: 4,307 married men selected from the Retirement History Study. To be included in the sample, respondents could not be self-employed, and had to have accepted Social Security benefits in the 1968-75 interval.

Definition of Retirement: Complete withdrawal from the labor market.

Estimation Method: A two-equation logit model.

Findings: Casual inspection of the RHS data indicates that the decision to retire partially is linked to the benefit acceptance decision. 83 percent of part-time older workers receive benefits; 88 percent of 62-year-old males who have not accepted benefits are working full-time.

The theoretical model developed here uses a life-cycle utility framework in which individuals jointly choose consumption levels (C), a benefit acceptance date (A), and a retirement date (R). Changes in features of the Social Security system can have different impacts on the timing of benefit acceptance and retirement. This structural feature provides different results from those models in which A is constrained to equal R. Increasing the delayed retirement credit (DRC) has an ambiguous effect on A, but reduces R. If the retirement test (RT) penalty rate increases, A will rise,

but the change in R is ambiguous.

A 2-equation logit model is estimated for three groups: persons aged 62, those aged 63-4, and those aged 65. The two dependent variables are Social Security benefit acceptance, and labor-force participation. Explanatory variables include race, wealth (in 1969), a measure of the change in net income if Social Security benefits are accepted, a measure of the net income (excluding Social Security benefits) of a person who continues to work part-time²⁷, and two measures of health limitations (onset of a health limitation within the past year, and existence of a longer term limitation). In addition, there is a dummy variable for benefit acceptance in the participation equation.

The interaction term (between benefit acceptance and labor-force participation) in the participation equation is significantly negative for the age-62 and 63-4 groups, suggesting that there is a relationship between the acceptance and participation decisions. That is, after controlling for the various independent variables, there remains a statistically significant correlation between accepting benefits and not working. In general, the explanatory variables in the participation equations work better. The change in Social Security benefits and health limitation regressors are negative influences on participation, while the net income associated with part-time work has a positive impact. In the acceptance equation, net income from working part-time is a negative factor, except for the oldest group, for which it is a positive factor. The recent onset of a health limitation increases the likelihood of benefit acceptance for 62-year-olds.

The estimated model is used to predict the impact of the 1983 amendments. Overall, the effects appear to be small. Raising the normal retirement age increases the probability of accepting benefits for each of the three age groups by .008 to .014. It lowers the probability of working at age 65 by .061. Reducing the RT penalty to .33 delays acceptance of benefits for those workers under age 65, and lowers the probability of working slightly (by .001 to .013) for all three groups. The net result of all changes is to delay benefit acceptance, postpone the switch from full-time to part-time work slightly, and increase the probability of complete retirement at age 65.

Comments: These results indicate that the 1983 Social Security amendments are likely to have a small effect on work patterns among the elderly. Their principal effect will be to lower the relative incomes of retirees.

²⁷This is intended to measure the cost of retiring.

[37] GORDON, ROGER AND ALAN BLINDER: "Market Wages, Reservation Wages, and Retirement Decisions," Journal of Public Economics, 14 (2), October 1980, 277-308.

Objective: The article examines the effects of health, declining wage offers, Social Security retired-worker benefits, private pensions, and changing preferences on the retirement decision using a standard labor-force participation framework. Social Security is shown to play a relatively minor role.

Data Set: 5,327 white males who were not self-employed, selected from the 1969-73 waves of the Retirement History Study. Since three waves of information are used for each individual, the total number of observations is 15,981. Ages 58 through 67 are represented in the sample.

Definition of Retirement: Zero hours of work for money.

Estimation Method: Maximum likelihood.

Findings: Two structural equations form the basis of the model. Indifference curves are thought to shift in favor of leisure as the person ages, generating a reservation wage equation that is a function of age, health, Social Security wealth (as a ratio to full income), pension availability, blue collar work status, education, vintage, and the present value of lifetime potential earnings. The market wage equation contains measures of experience, job tenure, pension coverage, occupational group (broadly-defined), age, health, vintage, and education. Market wage offers are expressed (in logarithmic form) as hourly wage rates in terms of 1969 dollars. The individual opts for work if the market wage exceeds the reservation wage. Many of the explanatory variables affect the decision to retire through both relationships.

Pensions are found to have a large positive impact on market wages. Every \$1 contributed to a pension fund is worth approximately \$.52 in direct compensation. Real wages decline with age; poor health has a very large impact on wage offers. In the reservation wage equation, Social Security wealth has no impact on retirement prior to age 62, and afterwards has a statistically significant, but small, effect.

Comments: Age has an important effect on the retirement decision by simultaneously lowering market wage offers and increasing reservation wages. Private pensions provide strong incentives to retire at the onset of eligibility; Social Security's effects are very much weaker, and probably have not contributed significantly to the trend toward earlier retirement. The estimated model predicts retirement behavior

fairly well up to age 64, but less well thereafter.²⁸

This research represents the first attempt to estimate a structural life-cycle model of the retirement decision. Although this paper is one of the seminal pieces of research in the retirement literature, it suffers from a number of shortcomings that cast doubt on the reliability of the quantitative findings. First, the decision to retire at a given age should probably be cast in terms of the relative rewards to another year of work. This paper uses net present values of income streams as explanatory variables in a current-period, labor-force participation model; this formulation appears to weaken the life-cycle nature of the retirement decision. It would be preferable to include the change in present value of these streams associated with working another year. Second, modelling the retirement decision as a dichotomous choice blurs the empirically important distinction between partial and complete retirement by lumping the former and fulltime employment into a single category. Third, information on pension plans is sketchy in the RHS, and the authors can use only crude coverage measures. Fourth, it is not clear from the published article to what extent the instrumental variable constructed for the measure of the ratio of Social Security wealth to full income is successful. A poor quality instrument might explain the relatively small impact of Social Security. Finally, the form of the statistical model cannot address the fact that the probability of retirement at any given age is inherently a conditional probability--that is, conditional on the probability of not having retired earlier.

²⁸The older the cohort, the greater the proportion that claims to be retired. In the oldest age-group analyzed here (65-67), most individuals are retired and correctly classified as such; however, the model also incorrectly classifies many workers as retired. For retirees aged 58-61, the model correctly predicts retirement for 60 percent of the group, and mislabels about 37 percent. For retirees aged 62-64, 49 percent are correctly classified, 33 percent incorrectly; for those aged 65-67, the corresponding figures are 78 and 4 percent. (In all age groups, some individuals were not classified; this is the reason why these percentages do not sum to 100.)

[38] GUSTMAN, ALAN AND THOMAS STEINMEIER: "Minimum Hours Constraints and Retirement Behavior," Contemporary Policy Issues, a Supplement to Economic Inquiry, 21 (3), April 1983, 77-91.

Objective: Several surveys have noted that older workers are often subject to minimum-hours constraints when making retirement decisions. Specifically, they are not permitted to reduce hours on their primary jobs below levels associated with fulltime work. Thus, persons who wish to continue working past the normal retirement age are often forced to change jobs and accept a lower wage. This paper attempts to determine how prevalent this situation is, and discusses the potential biases that result from ignoring this phenomenon in econometric models.

Data Set: Michigan Panel Study of Income Dynamics;²⁹ Retirement Policies and Programs, Survey No. 39, conducted by the American Society of Personnel Administration and the Bureau of National Affairs (ASPA-BNA) in 1979.

Definition of Retirement: Self-reported retirement status is the implicit definition, although the precise definition is not relevant to the study's primary focus.

Estimation Method: None. Survey results are tabulated.

Findings: For a number of purposes, the parameters of structural equations are required for an analysis of retirement behavior. If older workers cannot freely select their optimal work hours due to employer-imposed hours constraints, the resulting parameter estimates are likely to be biased. The routing pattern through the PSID questionnaire means that many workers are not asked whether they must work specified minimum hours on their primary job. For persons aged 55-65, 45 percent reported that they could not reduce hours below fulltime; for those who actually responded to this question, the figure was 63 percent. The constraint is also reported for the self-employed, but to a lesser extent. The results of the ASPA-BNA survey indicated a substantially higher percentage of workers were subject to these constraints, approximately 90 percent. The authors deduce that ignoring these constraints leads to an over-estimate of the elasticity of substitution between income and leisure, resulting in unduly large estimates of the responsiveness of labor supply to changes in the social security retirement program.

²⁹The precise wave is unspecified in their paper, but it appears to be the first (1968).

Comments: The existence of a potentially important phenomenon is documented and implications for the direction of bias are deduced. The paper provides no estimate of the magnitude of the bias.

[39] GUSTMAN, ALAN AND THOMAS STEINMEIER: "Partial Retirement and the Analysis of Retirement Behavior," Industrial and Labor Relations Review, 37 (3), April 1984, 403-15.

Objective: Most empirical retirement studies have ignored the phenomenon of partial retirement, even though it is a common transition state for older workers. Many workers are not permitted by employers to reduce hours below fulltime levels on their main jobs, and consequently must change jobs to continue working on a part-time basis. Dichotomous retirement models that permit only work/fully retired options, and omit the third alternative of partial retirement outside the main job, misspecify the true nature of the choice confronting many older workers.

Data Set: Pooled observations from the 1969-75 waves of the Retirement History Study. The sample is restricted to white males who were not self-employed in their main job.

Definition of Retirement: Self-reported measures in which people indicate whether they are retired, partially retired., or not retired.

Estimation Method: Discrete multivariate analysis, estimated by maximum likelihood.

Findings: "Main job" is defined to be the job held at age 55 as a full-time worker. Older workers might choose to retire partially in a job other than their main job due to the existence of mandatory retirement provisions, minimum hours constraints on the main job, or because they find some alternative job more attractive. This paper presents a reduced-form retirement equation that estimates the probabilities of individuals selecting one of four retirement categories: completely retired, partially retired in the main job, partially retired outside the main job, and not retired. Raw data tabulated from the RHS give striking evidence of the importance of partial retirement. Approximately 20 percent of males aged 65-69 reported that they were partially retired; about one-third of the sample indicated that they were partially retired at some point in time. A large majority (on the order of 90 percent for workers aged 65 and over; 80 percent for those aged 62-64) of partial retirements occur

outside the main job.

The statistical model explains retirement status as a function of age, hourly wage rates in full-time and partial retirement jobs (measured categorically), Social Security coverage, private pension coverage in the main job, mandatory retirement provision on main job, health, marital status, and dummies indicating the presence of older and younger dependents. Persons with private pension coverage have lower probabilities of either full-time work or partial retirement on the main job; those people covered by Social Security are less likely to be either retired or working full time. Even among those workers not subject to mandatory retirement, a large number partially retire outside the main job.

Comments: This article presents findings that have important implications for retirement models. Results for dichotomous work-retirement models can be strongly influenced by whether partial retirees are categorized as retired or working. For example, a higher wage in the main job has a negative effect on the probability of retirement when partially-retired persons are counted as retired; when they are not counted as retired, a higher main-job wage has either little effect on, or increases, the probability of retirement. The RHS data indicate that minimum-hours constraints imposed by career jobs might be an important cause of observed retirement patterns.

[40] GUSTMAN, ALAN L. AND THOMAS L. STEINMEIER: "The 1983 Social Security Reforms and Labor Supply Adjustments of Older Individuals in the Long Run," Journal of Labor Economics, 3 (2), April 1985, 237-53.

and:

_____. "A Structural Retirement Model," Econometrica, 54 (3), May 1986, 555-84.

Objective: Most previous empirical studies of retirement have estimated reduced-form equations for labor-force participation or the act of retiring (variously defined). The reduced-form approach makes it difficult to attribute observed choices to differences in budget constraints faced by individuals versus differences in preferences. It is also difficult to use estimated reduced-form equations to predict the consequences of altering specific features of private pension programs or Social Security. This paper estimates a fully specified (life-cycle) structural model of retirement, in which preferences for income and leisure shift with age (in favor of leisure). The model addresses the empirically important phenomenon of partial retirement, in which some workers pass

through a phase of reduced hours at lower wage rates between full-time work and complete retirement.

Data Set: 494 white males; data are drawn from the 1969-75 waves of the Retirement History Study.

Definition of Retirement: Self-assessment. The model permits transitions among three states: not retired, partially retired, and completely retired. Respondents were asked in each survey year whether they considered themselves to be completely retired, partially retired, or not retired at all.

Estimation Method: Maximum likelihood.

Findings: The model assumes that individuals maximize a lifetime constant-elasticity-of-substitution (CES) utility function with consumption and leisure as arguments; utility is intertemporally additive. In the estimation it is assumed that optimization occurs over the period from age 25 to 85. Preferences are permitted to vary--across individuals and over time--with age, health, and vintage. Consumption during a year is measured by the sum of annual compensation from wages, pensions, and Social Security benefits. Taxes are not explicitly treated, although the authors claim that results appear to be relatively insensitive to their inclusion. The pension component of compensation is the estimated change in present value associated with working an additional year; the value of Social Security is the change in accrued value from working an additional year, and takes into account the automatic benefit recomputation (ABR) and retirement test (RT). The individual chooses a lifetime leisure-consumption path in which the person works full time, is partially retired, or is completely retired during each period. Values of leisure are constrained, in theory, to lie on the 0-1 interval (*i.e.*, the fraction of discretionary time devoted to leisure). The amount of leisure associated with full-time work is assumed to be 0.46 here.³⁰

The effect of age on preferences appears to be the dominant influence on the retirement decision. The estimated parameters imply that indifference curves rotate in favor of leisure (become steeper) at a rate of about 23 percent per year. Onset of a long-term health problem causes indifference curves to steepen by 132 percent. Preferences for leisure

³⁰It is assumed that discretionary time is equal to 84 hours per week. Average weekly hours worked by fulltime workers in the sample was reported to be 45.31, or 54 percent of 84 hours.

exhibit a high degree of variation across individuals.³¹ The within-period elasticity of substitution between consumption and leisure is 0.87. The authors conclude that the dichotomous wage model, in which workers partially retire at lower wage rates, best tracks the observed retirement pattern in the data. The model appears to be robust to a number of specification changes.

A number of simulations are reported in both papers. First, Social Security and private pension provisions account for the peaks in the distribution of retirement ages at 62 and 65. Increasing the retirement age to 67 and increasing the delayed retirement credit (DRC) to 8 percent reduce the peak at age 65, and increase the number of people working full time at ages 65 and 66. Increasing the normal retirement age to 67 leads to a peak at age 67, but no increased work thereafter. The increased DRC causes more people to work full time after age 67. Lowering the retirement test (RT) penalty rate from 0.5 to 0.33 leads to a decline in the peak at age 65, and an increase in the number of full-time workers thereafter. Of all the 1983 amendments changes, the one with the largest effect is the increased DRC.

Comments: This is one of the best executed retirement studies. It does, however, impose substantial structure on the model at the outset, and observations in which people unretire must be excluded from the estimation. There are additional reservations. First, the model requires that lifetime compensation paths be imputed for all workers. This must be done via a wage equation estimated from PSID data that excludes the value of nonpension fringe benefits. Second, the model assumes that all changes in potential income streams from various sources are foreseen with certainty. It is unlikely that the large real increases in Social Security benefits that occurred during the early 1970s could have been anticipated by many beneficiaries. Third, the complexity of the model and estimation procedure require that the list of explanatory variables be kept very short. Consequently, explanatory factors that have proved important in other empirical studies are omitted here. Fourth, it is not clear to what extent results are sensitive to the use of self-reported indicators of retirement status.

³¹A 1 standard deviation increase in the stochastic component increases the slope of an indifference curve by 169 percent at any given age.

[41] GUSTMAN, ALAN AND THOMAS STEINMEIER: "The Effects of Partial Retirement on Wage Profiles of Older Workers," Industrial Relations, 24 (2), Spring 1985, 257-65.

Objective: Older workers who are partially retired usually report lower wage rates than those earned on their career jobs. This article estimates the amount of the wage decline that is associated with the transition from full-time to part-time work.

Data Set: Observations selected from the 1969-75 waves of the Retirement History Study for a sample of white males, aged 58-63 in 1969.

Definition of Retirement: Self-assessment. Individuals were asked in each wave whether they considered themselves to be completely retired, partially retired, or not retired at all.

Estimation Method: Ordinary least squares.

Findings: Data from the 1971-75 waves of the Panel Study of Income Dynamics indicate that more than half of prime-age males claimed that they could not work less on their jobs if they wanted to. Individuals approaching retirement often find that employers do not permit workers to retire partially on the job by reducing hours of work below their full-time level. Partial retirement often involves changing jobs and accepting a reduced wage rate. This paper found 466 individuals in the RHS who, in successive survey years, reported in the first year that they were not retired, and then in the second year that they were partially retired. For those remaining in the main job, wage rates declined by 9.9 percent; for those changing jobs there was a 30.4 percent decline.

Wage equations were estimated to determine the reasons for the wage declines. The (natural logarithm of the) wage rate was regressed on tenure, tenure squared, four occupation dummies, a variable measuring the number of years to mandatory retirement, dummy variables for health problems, background and schooling variables, and dummies for partial retirement in the same and different jobs. Partial retirement is shown to have a statistically significant negative effect on wages independent of the other usual wage equation regressors.

Comments: Many wage studies indicate that, for older workers, wage rates decline with age and experience. The results of this study show that if partially retired individuals are included in the sample, the decline may be overstated by 60 percent in comparison with what would have occurred had the person not retired, but had remained in the main job.

[42] GUSTMAN, ALAN AND THOMAS STEINMEIER: "A Disaggregated, Structural Analysis of Retirement by Race, Difficulty of Work and Health," Review of Economics and Statistics, 68 (3), August 1986, 509-12.

Objective: The article presents a structural retirement model in which responsiveness to monetary incentives contained in the 1983 Social Security amendments varies with race, occupation group, and health status. The purpose is to see whether the the scheduled increases in normal retirement age will particularly affect persons in poor health and those in more physically demanding jobs in an adverse way.

Data Set: 1,286 observations (876 white, 410 black) on males who were not self-employed selected from the Retirement History Study. The precise number of individuals that this involves, as well as the actual RHS waves from which the observations are drawn, are not stated.

Definition of Retirement: Self-assessment. People were asked in each wave whether they were completely retired, partially retired, or not retired at all.

Estimation Method: Maximum likelihood.

Findings: RHS data were used to classifiy jobs as "More Physically Demanding" (MPD) and "Less Physically Demanding" (LPD). It was assumed that individuals maximize intertemporally separable CES utility functions, where utility is a function of consumption and leisure. Separate models were estimated for blacks and whites employed in MPD and LPD jobs. Estimated coefficients imply that: 1) different models are appropriate for each of the four groups, and 2) that white males in MPD jobs have the highest elasticity of substitution between leisure and consumption. Thus, for any given compensation path, white males in MPD jobs will be less likely to enter partial retirement.

Simulations suggest that workers with health problems in MPD jobs will tend to increase full-time work at least as much as those in LPD jobs, however the increase is relatively small. Earnings will replace 12 to 14 percent of lost benefits.

Comments: The models reported here are quantitatively similar to those presented in other Gustman-Steinmeier papers. Indifference curves that rotate fairly rapidly with age account for much of the decision to retire completely or partially. Criticisms of their 1986 Econometrica apply here as well. Perhaps the most important additional weakness in this extension of their research is the fact that choice of occupation group is taken to be exogenous. It is likely that health status and compensation streams influence the

individual's decision concerning the physical demands of the job.

[43] GUSTMAN, ALAN AND THOMAS STEINMEIER: "Changing the Social Security Rules for Workers Over 65: Proposed Policies and Their Effects," NBER Working Paper No. 3087, Cambridge, MA: National Bureau of Economic Research, August 1989.

Objective: This paper presents results from a simulation study of the long run effects on work effort, Social Security benefit costs, and Federal tax revenues of several policies that would modify the retirement test (RT) and delayed retirement credit (DRC). The sensitivity of the results to alternative assumptions about the timing of benefit receipt is explored.

Data Set: A sample of males, aged 62 and older in 1983, selected from the 1983 and 1986 waves of the Survey of Consumer Finances (SCF). Omitted from the sample are individuals who report no full-time wages on any job, report only self-employed work for all periods, and those persons who were disabled and receiving Social Security disability benefits by age 55.

Definition of Retirement: Self-assessment. People were asked in each wave whether they were completely retired, partially retired, or not retired at all.

Estimation Method: None used. This is a simulation study based on a slightly modified version of their 1986 Econometrica article model.

Findings: The simulation work uses their earlier life-cycle model estimated on the Retirement History Study data. The intercept term in the leisure-share equation is adjusted so that the simulated retirement pattern more closely matches the pattern observed in the SCF data set. The lifetime opportunity set for each worker-retiree is constructed from data on personal characteristics and earnings contained in the SCF. Detailed information on private pension plan provisions is available for each individual. The model explicitly treats payroll taxes, federal income taxes, and the Catastrophic Health tax. Simulations employ Monte Carlo methods.

A number of policies are investigated, the main one being a combination of complete elimination of the retirement test in 1990 for persons aged 65-69, an immediate rise in the delayed retirement credit to 8 percent, and a restriction of benefit recomputation to periods in which no benefits are received. Other proposals examined represent partial or

phased implementations of this main policy change. Because the retirement benefit application decision is not explicitly modelled, it is necessary to make assumptions about the timing of benefit acceptance. It is assumed that full-time workers delay benefit acceptance until it is actuarially optimal, as long as they continue working. Partial and full retirees apply as soon as possible.

The combined policy is expected to raise the number of full-time workers by approximately 40,000 per year. In main part this increase derives from persons who would be fully retired, rather than from those who would have worked part time. Most of the positive work incentives come in the early years when the rise in the DRC to 8 percent makes it attractive to delay benefit acceptance. Since the DRC is scheduled to increase gradually to 8 percent under current law, the effect of the immediate increase in the DRC to 8 percent dwindles over time. Through most of the 1990s there is a modest savings in Social Security benefit payments due to the new incentives to postpone benefit application to take advantage of the higher DRC and not lose benefit recomputation. In later years these shorter term savings result in larger benefit payouts. If the present value of additional benefits and tax revenues are compared, this policy recoups about 16 percent of costs. Labor-supply responses are judged to be "modest at best."

Various components of the combined policy change are examined in isolation. It is clear that the dominant influence on labor supply is the changed DRC. If the only policy change is an increase in the DRC to 8 percent, the number of full-time workers rises by 45,000. When only the retirement test is eliminated, the number of full-time workers rises by 17,000. Both changes lead to an additional 47,000 full-time workers.

The sensitivity of these results to alternative assumptions about the timing of benefit acceptance is examined. If all insured workers are assumed to apply for benefits as soon as possible, the number of full-time workers falls by 29,000 per year. If all insured workers time benefit acceptance to maximize actuarial value, the number of full-time workers rises by 21,000 per year. Thus, while in all instances labor-supply responses are small, both their magnitude and direction are sensitive to the specific assumption regarding the timing of benefit acceptance.

Comments: The Gustman-Steinmeier work is a unique contribution to this literature in that, because it involves a structural life-cycle model, it can be used to predict the long-run consequences of changes in specific features of the Social Security system such as the earnings test, delayed retirement credit, and automatic benefit recomputation. The authors readily admit that the model's short period forecasts are likely to be less accurate due to potential sluggishness

in behavior to adapt to new circumstances. Given the order of magnitude of the labor-supply responses, the benefit acceptance decision is a critical element that is missing from the model. Both the size and direction of the labor-supply response to elimination of the RT are sensitive to the timing of benefit acceptance. Nonetheless, Gustman and Steinmeier's results provide strong evidence that the long run labor-supply response to elimination of the RT is likely to be modest; solely increasing the DRC to 8 percent increases the number of full-time workers aged 65-69 by nearly 3 times as much as a policy change that simply eliminates the RT.

[44] HALL, ARDEN R. AND TERRY R. JOHNSON: "Social Security, Health and Retirement Plans," in Policy Analysis with Social Security Research Files, Research Report No. 52, Social Security Administration, Office of Research and Statistics, 1978, 469-88.

Objective: This study differs from other retirement models in two significant ways. First, rather than estimate the effects of various explanatory factors on retirement status, it attempts to quantify their relative importance in choosing a retirement age. Second, this study focuses on planned retirement age, not actual retirement age. Planned age of retirement is shown to be a function of health, personal characteristics, and financial variables that include Social Security benefits.

Data Set: 3,557 married men, currently working, selected from the 1969 wave of Retirement History Study.

Definition of Retirement: Planned retirement age is defined to be the age at which an individual plans to stop working at a regular job.

Estimation Method: Multinomial logit. There are four planned retirement age categories: before 62, 62-64, 65 or older, and never.

Findings: The results are the same as those reported for males in their 1980 Industrial and Labor Relations Review article. Social Security provides a strong incentive to retire prior to age 65, and previous studies may have underestimated the size of the incentive to do so. Poor health is an important influence, and government pension benefit amounts have much stronger effects on the probability of early retirement than do private pensions.

Comments: The sample is restricted to those individuals who are currently working, suggesting that the resulting coefficients are biased since those individuals most influenced to retire in the 58 to 63 age group are omitted from the estimation.

[45] HALL, ARDEN R. AND TERRY R. JOHNSON: "The Determinants of Planned Retirement Age," Industrial and Labor Relations Review, 33 (2), January 1980, 241-54.

Objective: This study differs from other retirement studies in three significant ways. First, rather than estimate the effects of various explanatory factors on retirement status, it attempts to quantify their relative importance in choosing a retirement age. Second, this study focuses on planned retirement age, not actual retirement age. Third, the study examines the retirement decisions of single elderly women, as well as those of men.

Data Set: 3,557 married men and 1,054 unmarried women, aged 58-63, selected from the 1969 wave of the Retirement History Study. To be included in the sample it was necessary for respondents to have expressed a specified age for retirement, or the intention to never retire.

Definition of Retirement: Planned retirement age is defined to be the age at which an individual plans to stop working at a regular job.

Estimation Method: Multinomial logit. There are four planned retirement age categories: before 62, 62-64, 65 or older, and never.

Findings: Explanatory variables used in the estimation include a Social Security dummy variable which equals 1 if the person expects to receive benefits when retired, expected annual income from government and private pensions, wage rates, nonwage income, property equity, value of liquid assets, years of schooling, and a measure of health.³² Dummy variables for self-employment, mandatory retirement provisions, and location were also included.

The Social Security variable has its strongest impact on

³²Two versions were used. One was a dummy variable equal to 1 if the person thought his health was worse than that of others his own age. The second was a measure of the total number of nights spent in a health care facility in the year prior to the interview.

choosing to retire between 62 and 64, and its second strongest effect on choosing to retire after age 65. Coefficients on pensions have predicted effects, and indicate that larger pension amounts are associated with earlier retirement. Poor health has the predicted negative effect on work. People with greater education levels tend to retire later.³³ Social Security, pensions, and health have the strongest impacts on choice of retirement age, and their effects are quite similar for both men and women.

Comments: This study suggests that it is possible to categorize retirement influences into those that are anticipated and affect plans, versus those that are surprises and call for revisions in plans.

[46] HANOCH, GIORA AND MARJORIE HONIG: "Retirement, Wages, and Labor Supply of the Elderly," Journal of Labor Economics, 1 (2), April 1983, 131-51.

Objective: This is an econometric study of the determinants of labor-supply behavior of older married men and unmarried women, aged 58 to 69. The study sacrifices theoretical structure to incorporate a large number of variables measuring personal characteristics and financial considerations.

Data Set: Observations on 12,520 white, married men (spouse present in 1969) and 5,436 white, unmarried women from the 1969-75 waves of the Retirement History Study.

Definition of Retirement: Labor-force participation equations are estimated.

Estimation Method: Labor-force participation equations are estimated by ordinary least squares; wage, hours, and weeks equations are jointly estimated by 3SLS, incorporating within-year sample selection corrections using Heckman's method.

Findings: The estimated coefficients in the participation equation for married men and unmarried women are remarkably similar. Age and health limitations have substantial negative effects on the probability of working. The primary insurance amount (PIA) value has a negative effect, particularly for

³³The human capital explanation is that for any educational investment, the return is greater when worklife is prolonged. However, it could be that jobs requiring more education are less demanding physically, and can be held for greater periods of time before retiring.

women, and the effects are larger than for other non-wage income. Other variables such as education, private pension coverage, and time trend have the predicted influences. Workers who indicated that they were self-employed in 2 years prior to the interview were more likely to be working.

The annual hours equations implied a wage elasticity of .17, and compensated wage elasticity of .19 for men, with corresponding measures of .15 and .21 for women. PIA values have no statistically significant effect in the hours equation for either sex.

In general, the results are in accord with prior sign expectations. Males and unmarried females show remarkably similar labor-supply responses, with economic variables explaining surprisingly little of the labor-supply decision. Age, perhaps through sociological and biological factors, appears to be the single most important determinant.

Comments: This paper sacrifices structural detail to estimate labor-supply models that generate readily interpreted measures of income and substitution elasticities. The model is estimated on pooled observations from four different RHS waves, and treats the observations on specific individuals gathered at different points in time as independent. Thus, the panel nature of the data is not exploited. The paper models elderly labor-supply decisions in a manner that parallels the approach commonly used for prime-age workers, therefore blurring the distinction between partial and complete retirement.

[47] HAUSMAN, JERRY A. AND DAVID A. WISE: "Social Security, Health Status, and Retirement," in Pensions, Labor, and Individual Choice, ed. David A. Wise. Chicago: University of Chicago Press, 1985, 159-91.

Objective: The purpose of this paper is to measure the importance of health and Social Security wealth on the retirement decision.

Data Set: Information from all six waves (1969-79) of the Retirement History Study. The sample comprises 2,000 men who were not self-employed.

Definition of Retirement: A self-assessed definition is used; persons are retired if they claim to be either completely or partially retired.

Estimation Method: Primary focus of the article is the maximum likelihood estimation of a hazard model. An alternative continuous time "Brownian motion" model is also estimated by maximum likelihood.

Findings: The graph of the hazard by age computed for the RHS sample shows that the hazard rises to a peak at ages 63-4, declines slightly at age 65, and is relatively constant thereafter. In estimating the hazard model, the following explanatory variables are used: monthly Social Security payments (and their change if retirement is delayed another year), Social Security wealth (and its change if retirement is delayed another year), earnings, value of liquid assets, education, number of completely supported children, age, and dummies for bad health and private pension eligibility. Larger Social Security payments are associated with higher probability of retirement after age 62, while greater increments to monthly payments associated with further work are negative influences. Between the ages of 62 and 64, poor health has the equivalent effect of a \$10,000 increase in Social Security wealth. Most variables have their predicted effects, except for the pension dummy, which is statistically insignificant.

The second empirical model represents an empirical novelty. It shares some of the features of hazard models, but incorporates the information on hours of work. The estimated results are not entirely satisfactory, and their interpretation is not straightforward. The model does not fit the data well, and while the effects of many variables are similar to those reported for the hazard model, increments to Social Security wealth are found to be statistically insignificant.

Comments: Results for both models suggest a substantial effect of Social Security benefits on the probability of

retiring. Benefit increases in the 1969-75 period probably accounted for a 3-5 percent increase in the probability of retirement for men aged 62-66. The performance of the Brownian motion model is marginal. Further work is needed before it is demonstrated that this represents an important alternative tool to the hazard model.

[48] HAVEMAN, ROBERT H. AND BARBARA L. WOLFE: "The Decline in Male Labor Force Participation: Comment," Journal of Political Economy, 92 (4), June 1984, 532-41.

Objective: This paper comments on the conclusion of Parsons [Journal of Political Economy, February 1980] that the expansion of the Social Security disability program is the main reason for the post-war decline in the labor-force participation rate for older men. The conclusion is that Parsons seriously overstates this influence because of a flawed "replacement rate" variable and an over-parsimonious model specification.

Data Set: 741 males aged 45-62 selected from the 1978 wave of the Panel Study of Income Dynamics.

Definition of Retirement: No labor-force participation.

Estimation Method: Probit analysis.

Findings: Parsons's earlier model is criticized on several grounds. First, the variable giving the ratio of monthly Social Security disability payment to monthly wage confounds the separate effects of the transfer program and the wage offer. It is also flawed because the numerator is constructed as a simple function of the monthly wage (in the denominator). In this paper the numerator is replaced by a measure of the benefits that would be paid to both the primary and dependent family members if disability status is approved. In addition, new regressors for family structure, occupation, and other sources of household income are included. Second, Parsons's model potentially suffers from sample selection bias; persons with no wages are excluded from the estimation.

When various specifications that incorporate these features are estimated, the coefficient on the replacement rate variable becomes insignificant, and the computed elasticity falls to approximately one-quarter of its previously reported value.

Comments: Results from the Parsons model appear quite sensitive to model specification and the procedure used for constructing key explanatory variables. The authors report

that elsewhere they find that the generosity of Social Security disability transfers has had a negative and statistically significant effect on male participation rates, but that this effect is much smaller than the one reported by Parsons here.

[49] HAVEMAN, ROBERT, BARBARA WOLFE, AND JENNIFER WARLICK:
"Labor Market Behavior of Older Men: Estimates from a
Trichotomous Choice Model," Journal of Public Economics,
36 (2), July 1988, 153-75.

Objective: Individuals choose among three categories:
continued work, early retirement, and disabled-worker status.
This paper measures the extent to which the relative
attractiveness of the three options changes in response to two
sources of income, expected earnings and anticipated transfer
income.

Data Set: 561 males aged 62 to 64 from the 1978 Survey of
Disabled and Nondisabled Adults. In the sample used for
estimation, 11 percent were working, 12 percent had retired,
and 77 percent were receiving disability payments.

Definition of Retirement: Individual receives Social Security
retirement benefits.

Estimation Method: Conditional logit, correcting for sample
selection.

Findings: In the statistical model it is assumed that men
aged 62 to 64 face a three-way choice: working, accepting
Social Security early retirement benefits and private
pensions, and seeking and accepting Social Security disability
payments. For each individual six income figures must be
computed: expected transfer income and expected nontransfer
income (primarily earnings) for each of the three categories.
The model also incorporates personal characteristics such as
race, marital status, schooling, location, and health
variables. In the first stage of the analysis, each of the
six income measures is regressed on the personal
characteristics and the inverse of the Mill's ratio.

In the second stage, a trichotomous logit model is
estimated in which work status is a function of the fitted
income values, health status, occupation, and age. The income
variables are statistically insignificant, although
occupational status and indicators of poor health are
significant predictors. While the model predicts 87 percent
of the choices correctly, this is largely due to the fact that
77 percent of the sample is disabled; 98 percent of those in

this category are correctly assigned by the model. For the work and retirement categories, 59 and 38 percent of observations are correctly predicted.

The estimated model is used to predict the effects of two policy changes: a 20 percent reduction in transfer income for early retirement, and an income-related earnings supplement.³⁴ The effect of reducing early retirement benefits is small. A 40 percent reduction reduces the population of early retirees by 2.8 percent. Implementing the subsidy significantly raises the reward for work and increases the working population in this age group by 2.2 percent.

Comments: The first-stage income regressions for disability status do not perform well (poor R-squared values and low t-statistics). This may be an important reason for the insignificant coefficients on all income variables in the second stage analysis, which predicts choice of work-retirement-disability status. Overall, the paper's methodological contribution is more useful than the actual estimated behavioral magnitudes that are presented.

[50] HEMMING, R.C.L.: "The Effect of State and Private Pensions on Retirement Behavior and Personal Capital Accumulation," Review of Economic Studies, 44 (1), 1977, 169-72.

Objective: Feldstein [1974] argued that Social Security could affect the level of savings via two channels. First, people might save less as they substitute planned benefits for personal savings. Second, if Social Security induces early retirement, it increases the need for savings to finance retirement consumption. This paper demonstrates that when private pension schemes are available in which the individual can begin collecting benefits before the acceptance of the public pension, there can be an effect on both the savings replacement and induced retirement effects of Social Security.

Data Set: None used.

Definition of Retirement: The individual leaves his main job and accepts a private pension.

Estimation Method: None used.

³⁴A worker would have earnings subsidized at a 50 percent rate, up to a supplement of \$1,500. Beyond that, the rate would be 25 percent, up to an earnings maximum of \$9,000, at which point the subsidy ceases.

Findings: The model's assumptions reduce the utility maximization problem to one of maximizing the present value of lifetime income. Income derives from three sources: public pensions, private pensions, and earnings. Private pension payments depend on the final salary level; wages grow through time. The private pension can be accepted prior to the receipt of the public pension. The public pension provides a fixed amount of income each year beginning at normal retirement age.

The basic result is that changes in either the individual's pension contribution rate or benefit levels influence consumption and the choice of retirement date. If benefits rise or the employee's contribution rate falls, lifetime income and consumption increase. Ceteris paribus, increases in either private or public pension benefit levels leave wage income unchanged, and savings during the worklife will fall. A decrease in the employee contribution rate to the private pension scheme will lead to greater saving during the work years, but greater dissaving during retirement. This makes work more attractive, leading to retirement at later ages.

Comments: A strictly theoretical argument is presented here. Although leisure demand is omitted from the analysis by the assumption of separable preferences for consumption goods and leisure, its explicit inclusion would not alter the model's qualitative results.

[51] HENRETTA, JOHN C. AND ANGELA M. O'RAND: "Joint Retirement in the Dual-Worker Family," Social Forces, 62 (2), December 1983, 504-20.

Objective: What factors influence the retirement decisions in 2-career families? With the increase in married women's labor-force participation, knowledge about the extent to which retirement decisions are made jointly is likely to provide valuable information for predicting future retirement patterns.

Data Set: 1,868 married couples selected from the 1969-75 waves of the Retirement History Study. To be included in the sample, both partners must be working during one of the four waves.

Definition of Retirement: Individuals are retired if they are not in the labor force.

Estimation Method: Logit.

Findings: The unit of analysis in this paper is the married couple. Three retirement patterns are defined: (1) joint retirement, in which both the husband and wife retire at the same time; (2) substitute retirement, where the wife continues to work after the husband retires; and (3) secondary retirement, where the husband continues working after the wife stops. Two equations are estimated. The first is a logit model in which substitute (1) versus joint (0) retirement is estimated. The other equation estimates a secondary (1) versus joint (0) retirement relationship.

Regressors in both equations are: a dummy for the husband having a health limitation, husband's and wife's ages, dummies for husband's and wife's pension coverage, the couple's earned Social Security benefits, a set of dummies indicating worker class, husband's and wife's hourly wage rates, a dummy indicating a child is supported by the couple, and a set of dummies indicating household composition.

The estimated results provide mixed evidence that couples retire jointly. Age variables, wage, and pension coverage appear to influence joint retirement symmetrically. A higher age for either spouse raises the probability of retiring jointly. Higher wages for husbands increase the likelihood of retiring jointly compared with a substitute retirement pattern; similarly, a higher wife's wage increases the probability of joint retirement relative to a secondary pattern. Similar results are found for pension coverage.

A number of asymmetries are found as well. These primarily reflect the predominance of husbands' careers in household economic decisions. If a wife has an unpaid job in a family business, the likelihood of joint retirement is much greater; however, no such effect could be estimated for husbands, who rarely were observed in similar work circumstances.

Comments: The paper underscores the importance of husband-wife interactions in a family work-retirement model.

[52] HENRETTA, JOHN C. AND ANGELA M. O'RAND: "Labor Force Participation of Older Married Women," Social Security Bulletin, 43 (8), August 1980, 10-16.

Objective: This paper examines the timing of the reduction of labor-force activity by older married women. The rate of decline in their labor-force participation during the 1969-73 interval is estimated, along with the determinants of the individual decision to retire.

Data Set: 2,630 working wives from the 1969-73 waves of the Retirement History Study.

Definition of Retirement: No labor-force participation during the year.

Estimation Method: Multivariate logit.

Findings: This paper considers the extent to which family characteristics influence the labor-force participation decision of older married women. The results are contrasted with those for men.

Data on the work patterns of 5,833 RHS wives were first examined. Among the 3,294 wives under age 58, 53 percent participated in the labor force during at least one of the survey waves; for the 2,539 aged 58 and over, the corresponding rate was 35 percent. Older working wives were far more likely to stop working during the 1969-73 period; of the younger wives who reported working at all, 57.3 percent worked in all three waves.

Logit models of work stopping were estimated for the older and younger groups. Three sets of explanatory variables were used: husband's characteristics (labor-force participation in 1969, earnings in 1968, age, and health), wife's characteristics (age, quarters of coverage, and 1969 hourly wage), and family economic resources and needs (Social Security benefits, private pension benefits, presence of other dependents). Most coefficients are not significant in most models, and where significant, the effects appear to be small. The most significant determinants of continued work tend to be the wife's age, her quarters of coverage under Social Security, the availability of a private pension (for older wives), and support required for dependents.

Comments: This well-executed paper has three key findings. First, support of an aged parent or child is associated with continued presence in the labor force. Second, private pension entitlement for the wife is a strong negative influence on participation. Third, among older wives, a husband in poor health lowers the probability of continued work. This confirms the view of retirement occurring jointly among married couples.

Some of the paper's curious effects probably arise from sample selection problems. Specifically, for each age group, separate equations are estimated for women who work for a given number of years within the sample, comparing them with those who work longer. Thus, for younger women, one equation estimates determinants of working only in 1969, versus working longer. Another equation considers working in 1969 and 1971, versus working longer. This second relationship is estimated on a sample that omits those working wives with the least work experience. This initial screening of the estimating sample helps account for findings such as the latter group showing

three times as large an effect of dependents on the probability of continued work.

[53] HOGARTH, JEANNE M.: "Accepting An Early Retirement Bonus: An Empirical Study," Journal of Human Resources, 23 (1), Winter 1988, 21-33.

Objective: In 1983 the New York state government implemented an early retirement plan to induce state employees to retire. Vested workers aged 55 and older were given an additional 3 years' service credit if they retired by May 31, 1983. Thirty percent of eligible employees retired early. This article estimates the determinants of the decision to accept the pension bonus and retire.

Data Set: A 1983 sample of 4,000 (1,720 women, 2,280 men) New York state government employees.

Definition of Retirement: Accepting a pension.

Estimation Method: Probit analysis.

Findings: In 1983 New York state employees aged 55 and older were offered a 3-year service credit bonus to retire early. This paper estimates a pension-acceptance equation in which economic, sociological, and psychological factors play a role. Regressors include the present value of earnings, health status, missed workdays, home ownership, race, age, marital status, sex, the county unemployment rate, employment status of spouse, perceived threat of a future layoff, perceived life expectancy, and perceived adequacy of retirement income. Also included was a DIFFERENCE measure of the change in value of the pension (measured in thousands of dollars) associated with retiring now versus waiting until the planned retirement date. DIFFERENCE had a range of -\$106,000 to +\$90,000, with a mean of -\$7,400. The DIFFERENCE variable was statistically significant, and raised the probability of acceptance by .03 above its mean of .30. Most variables performed in a predictable manner, with bad health and age increasing the probability of early retirement, and the present value of earnings decreasing the probability. A notable finding is the importance of expectation variables in the decision. An expectation of a layoff increased the probability of accepting the pension offer by .15, while an expectation that retirement income would not be adequate lowered the probability of acceptance by .06.

Comments: This article provides additional evidence that retirement decisions are responsive to monetary incentives

associated with additional years of work, although these effects appear to be relatively modest, consistent with findings by Burkhauser [1979] and Fields-Mitchell [1984]. Of course, small effects, when applied to large numbers of individuals, can have sizeable impacts on the pool of workers. Measures of worker expectations about job security and adequacy of future income appear to be more important determinants of the decision outcome. The author concludes that employers concerned with retirement decisions might usefully attempt to gain greater understanding of worker expectations and perceptions.

[54] HONIG, MARJORIE: "Partial Retirement Among Women," Journal of Human Resources, 20 (4), Fall 1985, 613-21.

Objective: This study replicates the analysis of Hanoch and Honig [1985] on a sample of older women. The aim is to determine whether partial retirement is a distinct mode of retirement behavior.

Data Set: 1,270 white, unmarried women, aged 58 to 63 in 1973, from the 1969-73 waves of the Retirement History Study.

Definition of Retirement: Full retirement constitutes zero annual earnings. Partial retirement occurs when annual earnings are less than half of maximum earnings during the 1951-72 period.

Estimation Method: Computed transition probabilities; logit analysis.

Findings: The results are very similar to those reported for males in the earlier Honig-Hanoch [1985] study. While Social Security and private pensions appear to be less important in the retirement decisions of women, partial retirement appears to be best modeled as a decision conditional on the labor-force participation decision.

Comments: There is little evidence to support the notion that partial retirement lies on a continuum between the polar cases of full-time work and complete retirement. It should be modeled as a separate phenomenon.

[55] HONIG, MARJORIE AND GIORA HANOCH: "Partial Retirement as a Separate Mode of Retirement Behavior," Journal of Human Resources, 20 (1), Winter 1985, 21-46.

Objective: Retirement or participation models that permit only two categories for work behavior (in or out of the labor force) are misspecified insofar as they ignore a behaviorally distinct third state: partial retirement. This study examines several specifications for statistical models, and concludes that the superior version is one where hours of work (full-time or part-time) are conditional on the participation decision.

Data Set: 3,550 white males, aged 58 to 63 in 1969, from the 1969-73 waves of the Retirement History Study. The sample is restricted to wage earners with a spouse present.

Definition of Retirement: A person is fully retired if he has zero earnings. Partial retirement occurs when earnings fall to less than half of their peak earnings in the 1951-72 period.

Estimation Method: Calculated transition probabilities; logit analysis.

Findings: There are a number of ways in which complete and partial retirement can be defined. The method proposed here depends solely on annual earnings (zero, and less than 50 percent of peak earnings, respectively). While self-assessed and income-defined indicators of partial retirement are positively correlated, fewer than half of those classified partially retired by the income definition actually labeled themselves as such. The primary cause of the decline in annual earnings was a fall in hours worked per week, not a decline in the wage rate.

Simple transition probabilities between states were computed. These indicate that the expected duration of partial retirement is approximately 4 years. There are many irregular transitions; that is, people increasing their number of hours worked. Many people unretire and move from complete to partial retirement, or from partial retirement to full-time work.

The main part of this paper concerns whether partial retirement reflects a distinct mode of retirement behavior, and whether it should be treated separately in estimation. That is, should 3-state models be estimated, or should partially retired persons be lumped together with those individuals who are fully retired? A tabulation of the characteristics of those who are partially retired reveals: 1) they are more likely to be in a new job, 2) they are eligible for smaller Social Security benefits, 3) they are more likely to have breaks in their Social Security earnings

records, 4) they are less likely to have pension coverage, and 5) they are more likely to have a health problem that limits work. Three specifications are examined. The first views retirement as a labor-force participation decision, and then conditionally, a choice between part-time or full-time employment. The second model sees the primary choice as one of retirement, and then conditionally, a choice between full and partial retirement. The third views the three options as unordered alternatives. The authors conclude that the first model is superior on both theoretical and empirical grounds.

Comments: This paper presents strong evidence for modelling partial retirement as a separate state from full-time work and complete retirement. It is noted that Social Security entitlement values are likely to be endogenous in this model, and are not adequately treated in these models.

[56] HONIG, MARJORIE AND CORDELIA REIMERS: "Is It Worth Eliminating the Retirement Test?", American Economic Review, Papers and Proceedings, 79 (2), May 1989, 103-7.

Objective: This article presents both short- and long-run cost estimates of eliminating the earnings test for all Social Security beneficiaries.

Data Set: 1987 Current Population Survey.

Definition of Retirement: None used.

Estimation Method: None used.

Findings: Honig and Reimers simulate both the short- and long-run labor supply effects of eliminating the earnings test for beneficiaries aged 62-69. The authors estimate that 22 percent of people in this age range would be directly affected by the change. The 4 percent with earnings at the annual limit or with benefits partially offset by the test, would increase hours worked by 13 to 20 percent. The remaining 18 percent, whose earnings are sufficiently high that no benefits are paid, would decrease their hours of work by 1 percent. These numbers are based on the labor supply elasticity estimates presented in Hanoch and Honig [1983].

Elimination of the test would result in a first-year increase of \$23.5 billion in annual benefits paid (Short-run estimates are for 1986). The concomitant increase in payroll tax revenue amounts to \$65 million. In the long run the predicted earlier acceptance of benefits leads to actuarial reductions in future amounts paid out, lowering the annual

cost to \$3.2 billion. No estimates are made for any induced changes in income tax revenues.

Comments: The authors conclude that the net increase in labor supply would be negligible. Care should be taken in comparing the figures contained in this paper with those found in other sources.³⁵ Note that in calculating their estimates, Honig and Reimers assume: 1) the test is eliminated for all persons aged 62 to 69; 2) the effective date of elimination is 1986; 3) people are myopic in their retirement planning (that is, in deciding how much to work, people consider only the current year's income and wage offer); 4) Social Security rules that were in effect in 1986 remain unchanged over time.

[57] HURD, MICHAEL D.: "Issues and Results from Research on the Elderly II: Retirement," (Part II of III Parts), NBER Working Paper No. 3018, Cambridge, MA: National Bureau of Economic Research, June 1989.

Objective: This is one of a set of three papers that review the economic research on the elderly population. The three areas surveyed are economic status, retirement, and consumption and saving. In this paper the primary focus is the literature on the causes for the decline in labor-force participation among older males. The chief factors are thought to be Social Security, private pensions, and private wealth.

Data Set: None used.

Definition of Retirement: Leaving the labor force at older ages, and not returning. The paper reviews the work of various researchers who have used other definitions.

Estimation Method: None used.

Findings: This paper focuses on the econometric studies of the retirement decisions of older men. The trend to earlier retirement is possibly the result of changes in Social Security and private pensions. Real average Social Security

³⁵ For example, "Simulating Aggregate and Distributional Effects of Various Plans for Modifying the Retirement Earnings Test," by David Pattison, Benjamin Bridges, Jr., Michael V. Leonesio, and Bernard Wixon, Division of Economic Research, Office of Research and Statistics, Social Security Administration, January 5, 1989.

benefits rose by 51 percent between 1968 and 1977. Moffitt [1987] argues that this increase was no greater than occurred in earlier periods, and therefore concludes that large benefit increases cannot be the cause of the trend to earlier retirement in the 1970s. Hurd rejects this by noting that the same percentage increase can have a different effect if wealth levels have changed over time. Social Security became a larger fraction of total wealth.

Estimated retirement hazards show pronounced peaks at ages 62 and 65. Since there was no peak at age 62 prior to the availability of early retirement benefits in 1961, it is very hard to explain this pattern aside from the availability of Social Security benefits (coupled with a liquidity constraint). The best studies indicate that, holding other factors constant, higher benefit amounts are associated with a larger probability of retirement at any given age. Given the differences in retirement definitions, models, and statistical procedures, it is difficult to compare estimated magnitudes across studies.

The effects of pensions have been harder to measure since the relevant data have been lacking, particularly in the RHS. The best pension research uses data for specific employers, which leads to results that are very difficult to generalize. Hurd believes that past declines in labor-force participation have been more likely to have been affected by Social Security. In 1980, 68 percent of the elderly had no income from public or private pensions, and only 6 percent had more than half their income from these sources. Although this is changing for more recent retirees, private pensions would not appear to be a plausible explanation for observed behavior in the past.

Comments: The evidence indicates that Social Security, private pensions, and wealth have contributed to declining labor-force participation rates among older males, but the contribution uniquely attributable to each factor is not known with a great deal of precision.

[58] HURD, MICHAEL D. AND MICHAEL J. BOSKIN: "The Effect of Social Security on Retirement in the Early 1970s," Quarterly Journal of Economics, 99 (4), November 1984, 767-90.

Objective: The article measures the effect of Social Security wealth on the probability of retirement at a given age. There has been a long-term decline in the labor-force participation rates of older men, and this trend appeared to accelerate in the early 1970s. There was a concomitant large unanticipated increase in real Social Security benefit levels at that time [i.e., a 28 percent rise in real benefits for husbands and

wives during the 1970-2 period]. It is hypothesized that the changes in Social Security were a primary cause of the decline in labor-force participation. The research also attempts to discern the presence of a "liquidity constraint" effect at age 62. That is, since individuals cannot borrow against Social Security wealth, a pronounced increase in the retirement rate might occur at age 62 when benefits first become available.

Data Set: Data are selected from the 1969-73 waves of the Retirement History Study, supplemented by SSA earnings history data. The sample was restricted to white, married men with non-working wives. Only current and former private sector wage workers were included. The final sample included approximately 11,000 heads of household who were between the ages of 58 and 63 (inclusive) in 1969.

Definition of Retirement: A person is retired if they leave the labor force and do not reenter during the sample period.

Estimation Method: Cross-tabulations and conditional probabilities for retirement age. Cohort retirement equations are estimated by conditional logit for ages 59-65.

Findings: A simple plot of conditional retirement probabilities (number of retirements divided by total number of cohort members not retired until that year) versus age provides persuasive evidence of the effect of the Social Security system on the retirement decision. The graph is double-peaked, at ages 62 and 65, with the higher peak occurring at the later age. This supports the view that some workers are subject to important liquidity constraints prior to Social Security's early retirement age. In cross-tabulations, the value of Social Security wealth shows a strong, positive association with retirement probability.

In the logit estimates of retirement equations, the financial reward for delaying retirement through Automatic Benefit Recomputation is treated as a wage subsidy. Cohort-specific equations include a set of dummies representing quartile of the asset distribution, dummies for health status and the existence of mandatory overtime provisions, and measures of Social Security wealth and wife's age. Specifications with and without interaction terms are presented. Although poor health is usually the strongest single influence on the retirement probability, increased Social Security wealth is also typically a positive influence. The sign of the Social Security wealth coefficient is nearly always positive, but its magnitude and significance are sensitive to the model's specification. On average, a \$10,000 real increase in Social Security wealth is associated with a .078 decline in labor-force participation.

Comments: This paper uses straightforward statistical methods to test for a relationship between Social Security and the retirement decision. There is no explicit theoretical model, and no reliable estimates of key behavioral parameters are provided. Nonetheless, this paper presents some of the most convincing evidence of the qualitative effect of Social Security on the retirement decision.

[59] IPPOLITO, RICHARD A.: "Towards Explaining Earlier Retirement After 1970," unpublished manuscript, Pension Benefit Guaranty Corporation, March 1989.

Objective: Labor-force participation rates for men aged 55-64 remained roughly unchanged (about 83 percent) from 1950 to 1970, and dropped precipitously during the 1970-85 interval. Half of the 15.1 percent decline came in the 5-year period 1970-75. This sudden, pronounced decline in participation rates appears to rule out popular explanations such as increasing wealth and more two-earner households. This paper focuses on two specific factors: changes in the Social Security system and the evolution of private pensions.

Data Set: Aggregate time series data; Bankers Trust pension data; U.S. Department of Labor's data on pension plan provisions.

Definition of Retirement: Labor-force participation rates are examined.

Estimation Method: Ordinary least squares.

Findings: This paper uses simple statistical procedures on data from several sources to verify the role of Social Security and private pensions in the notable decline in labor-force participation among men aged 55-64 after 1970. An elementary time series analysis shows that increases in Social Security primary insurance amount (PIA) values explain about 40 percent of the decline in labor-force participation rates. This particular model is probably seriously misspecified due to omitted variables.

There was a trend in 1960-80 for private pension plans to lower the normal retirement age as well as to lower the age for collecting early retirement benefits. The latter was often associated with increased actuarial subsidies for early retirement. In 1963 about 75 percent of covered workers could retire early with reduced benefits; by 1983 this had risen to 97 percent. It appears that private pension rules favoring earlier retirement have significantly changed during this time period. Since previous research has demonstrated the

importance of private pensions in retirement decisions, it is useful to estimate the size of the impact of these changes on average retirement ages. A simple regression analysis of BLS pension characteristics data shows that a one-year decrease in the age at which full or early retirement benefits are first available reduces the average age of retirement by .159 and .116 years, respectively.

Why did pension plan provisions change in these ways? Ippolito suggests several reasons. First, the baby boomers swelled the ranks of the labor force, providing cheaper sources of labor. Second, the Age Discrimination in Employment Act (1965) made it illegal to discriminate overtly against older workers. If the firm wanted to replace an older worker, it would have to induce a voluntary withdrawal. Third, higher inflation rates meant that many pension plans experienced actuarial subsidies for early retirement.³⁶ Fourth, the enactment of ERISA in 1974 lowered the cost of leaving a firm earlier than the normal retirement age.

Comments: This paper argues for the likely importance of changes in the generosity of Social Security benefits (and the introduction of early retirement benefits) and changes in private pension plans in the decline in labor-force participation among men aged 55-64.

[60] KAHN, JAMES A.: "Social Security, Liquidity, and Early Retirement," Journal of Public Economics, 35 (1), February 1988, 97-117.

Objective: Does Social Security cause people to retire early, particularly at age 62, primarily through liquidity constraints on that component of wealth. Blinder, Gordon, and Wise [1980] (BGW) have argued that actuarially fair adjustments for delaying retirement between ages 62 and 65, in conjunction with automatic benefit recomputation (ABR), mean that on net, Social Security subsidizes work for that age group. This article examines the extent to which liquidity constraints can cause potential beneficiaries to evaluate pension income flows at higher than market discount rates. Actuarially fair early retirement benefits are shown to discourage work when this feature is taken into account.

³⁶The extent to which this occurs depends on the rate of inflation, nominal interest rates, and the extent to which pensions are indexed.

Data Set: 1,581 males from the Retirement History Study. The sample omits people who are self-employed, or in receipt of other pension income.

Definition of Retirement: Self-reported retirement status.

Estimation Method: 2-stage Heckit.

Findings: A primary conjecture of this paper is that, contrary to the assertions of Blinder, Gordon, and Wise [1980], work is not subsidized for many older workers by the Social Security system. In fact, work may be penalized to a greater extent among those who are observed retiring at earlier ages. Social Security wealth-age profiles are estimated for a sample of men. A comparison is made between Social Security wealth if the individual retires now, versus its value if retirement is delayed another year. To avoid sample selection bias, these are estimated for both workers and early retirees.

Striking evidence of Social Security's influence is provided by several graphs. When the distribution of retirement ages is plotted, it is double-peaked, with the higher peak at age 62-3. When the sample is divided into high-wealth and low-wealth subgroups, the distribution for the low-wealth group is also double-peaked, with a very pronounced spike at age 62. For the high-wealth group the distribution is single-peaked at age 65. This is consistent with the view that the liquidity constraint argument may be powerful among those with fewer liquid assets. Note, however, that this pattern can also be partially explained if low-wealth individuals have lower wage offers and less agreeable job characteristics.

Earnings equations are then estimated, and the results used to construct Social Security wealth profiles. Discount rates of 3 and 12 percent are used. When using the lower rate, Social Security seems to neither encourage nor discourage work for persons aged 62-4. At the higher rate it is a clear disincentive; Social Security wealth falls 2.5 to 5 percent each year.

Comments: The BGW conclusion depends critically on the discount rate used. This paper, although based on a sample that is probably not generally representative, demonstrates that using higher discount rates undermines the basic BGW result that Social Security subsidizes work between the ages of 62 and 65. The higher discount rate is consistent with the view that many workers face liquidity constraints in their life-cycle work-consumption plans.

[61] KOTLIKOFF, LAURENCE J.: "Testing the Theory of Social Security and Life Cycle Accumulation," American Economic Review, 69 (3), June 1979, 369-410.

Objective: This article investigates the extent to which Social Security influences household private wealth accumulation prior to retirement. Because it is also possible that Social Security affects the age of retirement, an expected age of retirement relationship is estimated as well.

Data Set: 2,124 male household heads selected from the 1966 wave of the National Longitudinal Survey of Mature Men. To be included in the sample, individuals had to have labor earnings during both 1965 and 1966, and could not be self-employed.

Definition of Retirement: The expected age of retirement as reported by the household head.

Estimation Method: Ordinary least squares.

Findings: The article describes an expected-age-of-retirement equation. Regressors include the ratio of Social Security benefits lost at fulltime work to fulltime earnings (presumably a negative influence), the present value of net Social Security wealth, the present value of household lifetime gross labor income, dummies for private and government pension coverage, and a vector of personal characteristics.

Neither Social Security variable is significant; the Social Security ratio regressor has the wrong sign as well. The pension dummies indicate that retirement ages are lowered by 1-2 years for covered workers.

The estimated accumulation equation indicated that Social Security taxes reduced private savings by \$.66 per dollar of tax. This was judged to be insignificantly different from either the simple Keynesian prediction of -.2 to -.3, or from a life-cycle prediction of -1.

Comments: The model specification does not permit measurement of the way retirement age is likely to depend on the net reward to an additional year of work at any given age. The expected age reported in the data set is simply regressed on the predictor variables. Thus, it is not surprising that Social Security is found to play no role in the expected retirement age. Subsequent studies have modeled this more convincingly. The stronger aspect of this research lies with the estimated accumulation relationship.

[62] KOTLIKOFF, LAURENCE J. AND DAVID A. WISE: "The Incentive Effects of Private Pension Plans," in Issues in Pension Economics, eds. Zvi Bodie, John B. Shoven, and David A. Wise, Chicago: University of Chicago Press, 1987, 283-336.

Objective: The retirement incentives implicit in private pension plans are examined. Pension wealth accrual rates provide incentives to terminate work upon reaching the early retirement age, and even greater incentives at normal retirement age.

Data Set: 2,342 private pension plans selected from The Bureau of Labor Statistics' Level of Benefits Survey.

Definition of Retirement: Terminating employment with the employer providing the pension.

Estimation Method: None used.

Findings: This paper examines the features of 2,342 pension plans in the LBS. Pension age-accrual profiles show large discontinuities at vesting, early retirement, and normal retirement dates. There is a large degree of variation among plans, indicating that workers enrolled in different pension plans can face strikingly different retirement incentives. Typically, continued employment after the normal retirement age results in substantial reductions in pension wealth. These findings contradict the view that labor markets adjust to spot equilibria each period.

There is substantial variation in pension value accrual rates even among plans with the same early and normal retirement dates. Many plans have Social Security offset provisions, and these also vary widely among firms. Some plans eliminate payments when Social Security payments commence. Private pension amounts and accrual rates are usually higher when no offset provision exists.

Workers face greater pension incentives to retire early in some industries. For example, retail and service industries are likely to specify 65 as the normal retirement age, and often have no early retirement date; in contrast, nearly 62 percent of plans in the transportation industry have early and normal retirement dates at age 55. Within an industry or occupation, plans with the same early and normal retirement ages exhibit very similar age-accrual profiles.

Estimates are made of the amount of lost pension wealth associated with changing jobs. Losses vary widely when the change is to a no-pension job, and vary (positively) with the age of hire on the initial job, (positively) with the age at which the change is made, and (negatively) with the normal retirement age associated with the original job.

Comments: The paper provides a comprehensive survey of salient pension plan features.

[63] KOTLIKOFF, LAURENCE J. AND DAVID A. WISE: "Employee Retirement and a Firm's Pension Plan," in The Economics of Aging, ed. David A. Wise, Chicago, IL: University of Chicago Press, 1989, 279-330.

Objective: The retirement incentives generated by the private pension plan of a single, large American firm are examined.

Data Set: Detailed earnings histories and pension plan information for the employees of a large Fortune 500 corporation engaged in sales.

Definition of Retirement: Permanently leaving the employer.

Estimation Method: Earnings equations are estimated using a random effects model.

Findings: The firm studied here has a defined benefit pension plan. Vesting occurs at 10 years' service, with early retirement at age 55, and normal retirement at age 65. For early retirees, pension reduction is less than actuarially fair. There is a supplemental benefit equal to the Social Security offset for retirement before age 65.

For the typical worker there is a pronounced spike in the age-pension accrual profile at age 55 (equal to about \$72,000), which then falls off to about 10 percent of the annual wage up until age 60. Beginning at age 61, the pension accrual rate is negative, and equal to about 20 percent of wages.

Favorable early retirement benefits have strong effects on retirement. Only 58 percent of workers present at age 54 are still employed at age 59, and only 29 percent of those working at age 59 are still employed by the firm at age 64; half of those retire at 65. The combination of negative pension accrual after age 60, and negative Social Security wealth accrual after age 65, appear to induce nearly everyone to leave by age 65. Departure rate patterns at various ages are entirely consistent with the age-accrual profiles.

Comments: The effects of the private plan appear to be much stronger than those of Social Security on the retirement decisions of this firm's employees. While it is difficult to generalize on the basis of data from a single employer, these results strongly suggest that private pensions might be the

focus of further research on the determinants of retirement trends.

[64] MCELWAIN, A.M. AND J.L. SWOFFORD: "The Social Security Payroll Tax and the Life-Cycle Work Pattern," Journal of Human Resources, 21 (2), Spring 1986, 279-87.

Objective: A life-cycle model is used to demonstrate that a combination of the payroll tax and annual maximum taxable income changes the optimal lifetime work path. It is posited that prime-aged men increase their work effort during periods in which it is easier to earn income that falls beyond the taxable maximum and, therefore, beyond the reach of the tax.

Data Set: Aggregate time-series data for the U.S. for the period 1929-76, excluding 1943-5.

Definition of Retirement: None used.

Estimation Method: Ordinary least squares.

Findings: Social Security can lower lifetime work effort if it provides an increment to wealth via an intergenerational transfer. Its tax structure may, however, cause a substitution effect in which work effort is reallocated from relatively low wage to high wage periods. Individuals who expect to have earnings above the annual limit have an incentive to concentrate work during the middle years of their worklives. The substitution effect is likely to be moderated to some extent by the progressivity of the income tax schedule. In aggregate, because most earners are not above the annual cap, the effects might also be small.

A measure is constructed for the annual number of hours needed to reach the taxable maximum by dividing the annual earnings maximum by the average annual wage. The natural logarithm of hours worked per week by men is regressed on this variable, as well as on Social Security wealth, Social Security wealth interacted with a time trend, the previous year's private capital stock, the real wage rate, the percentage of the male labor force that is 25-44, and family size. The coefficient on the annual hours to reach the taxable maximum is significantly negative, as predicted by the theoretical model.

Comments: The model predicts that hours worked will be higher when it is easier to reach the level of maximum taxable earnings. The estimated coefficient in this paper implies that if the payroll tax maximum had been \$3,000 higher in

1971³⁷, then weekly hours of work would have been 1 hour lower.

[65] MITCHELL, OLIVIA S. AND GARY S. FIELDS: "The Economics of Retirement Behavior, " Journal of Labor Economics, 2 (1), January 1984, 84-105.

Objective: Estimates of both continuous and discrete choice life-cycle retirement models are presented. Variations in retirement date are shown to depend on differences in worker preferences as well as differences in income opportunities.

Data Set: 8,733 males selected from the U.S. Department of Labor's 1978 Benefit Amounts Survey (BAS). Respondents retired between the ages of 60 and 68, and were employed by 10 firms offering defined benefit retirement plans. Files for individuals were matched with Social Security earnings records and the Labor Department's data on private pension plans.

Definition of Retirement: Receipt of a private pension.

Estimation Method: Ordinary least squares; conditional ordered logit.

Findings: Mitchell and Fields present a life-cycle model of work and retirement in which the optimal date of retirement is that which equates the marginal utility of income associated with another year's work with the marginal utility of another year's leisure. The monetary gain associated with further work is the sum of the present values of future earnings, private pension, and Social Security payments that can be expected if the individual works to a specific age. Neither private nor public pensions are actuarially neutral with respect to the timing of retirement.

In the first econometric model, the age of retirement is regressed against: 1) the present value of wealth (YBASE) if the person retires at age 62, the base period, and 2) the gain in present value of income associated with working another year (YSLOPE). YBASE should have a negative effect on retirement age; the effect of YSLOPE is ambiguous due to opposing income and substitution effects. Both variables are found to be statistically significant and signed in accordance with economic theory. The positive coefficient on YSLOPE indicates a dominant substitution effect. When dummy variables for specific firms are included to shift slopes and intercepts, results are robust. Generally, a \$1,000 increase

³⁷The maximum was \$7,800 in 1971.

in present value of income from delaying retirement is associated with a .03 to .05 year increase in age of retirement.

Separate ordered conditional logit models are estimated for employees in each of the ten firms. Results are consistent with those of the simpler OLS models. The coefficient on the present value of income associated with retirement at each age is significant in all 10 models; the coefficient on retirement leisure is significant in 8 out of 10 cases. Workers in all plans studied react to changes in income and leisure opportunities, but there is substantial variation in the degree of response across firms. A 10 percent increase in retirement benefits lowers the retirement age by about 1 month, on average.

Wage opportunities and private pension rules cause the anticipated income streams of older workers to vary with the timing of retirement. The timing of retirement is sensitive to these differences in income opportunities. There is some evidence that workers sort themselves among firms according to their preferences for work.

Comments: This is a well executed study that uses a data set that contains good information on both private pensions and earnings records. The major shortcoming is that there is little information on the relevant personal characteristics of the individual workers included in the estimates. Variables such as health status, work experience, and tenure were not available.

[66] MOFFITT, ROBERT A.: "Life-Cycle Labor Supply and Social Security: A Time-Series Analysis," in Work, Health, and Income Among the Elderly, ed. Gary Burtless. Washington, DC: Brookings Institution, 1987, 183-220.

Objective: This study examines to what extent the Social Security system has caused a decline in work by men aged 55 and older since the 1950s. Existing studies using microdata do not usually capture the effect of changes in the Social Security retirement system over time, because over a period of a few years the system itself generally remains stable. This study uses time series data constructed for the period 1955-81 to examine the effect of unanticipated changes in the system on the earnings of older men.

Data Set: 108 aggregate observations calculated from the Current Population Surveys for the period 1955-81.

Definition of Retirement: None used.

Estimation Method: Ordinary least squares.

Findings: This study examines post-war time series data on earnings and Social Security benefits for four ages groups: 25-34, 35-44, 45-64, and 65-84. The time series permits analysis of the effects of variation in the Social Security system on cohort labor supply.

The theoretical life-cycle model assumes labor supply in any given year is a function of exogenous wealth (initial period value) and the vector of annual wage rates. The model is then extended to permit unanticipated increments to wealth via Social Security. If these occur after the first period, individuals must re-optimize, with the previous values of consumption and work fixed at their already chosen levels.³⁸ The theoretical model yields 3 testable hypotheses: 1) wealth effects on labor supply are negative, 2) labor supply is reduced more when a wealth shock comes later than when one is anticipated at the outset of the planning period,³⁹ and 3) the reduction in labor supply caused by an unanticipated increase in wealth is larger the later it occurs in the worklife.

³⁸This formulation is amenable to a conditional demand formulation in which certain arguments in the utility function are fixed.

³⁹The intuition for this is that if the change in wealth were known at the outset, the entire labor-supply path would be altered. When it is known only after the first period, there are fewer remaining periods in which to re-adjust the workpath. Hence the changes in annual hours are larger.

The empirical work regresses annual earnings on the wage rate, a cohort trend, a deviation in cohort trend after 1937, age, and a weighted Social Security wealth variable. The model is estimated both in level and first-difference form. Coefficients on Social Security shock variables are statistically insignificant in the first-difference model.

Comments: This paper shows that Social Security wealth grew at a faster rate in the 1950s than in later periods, and was thus likely to be less anticipated than the increments in the early 1970s. The paper's strong points are its theoretical model and suggested econometric strategy. Unfortunately, the data problems are so severe that a number of compromises in specification must be made that serve to cumulatively weaken the paper's conclusions. Coefficients on shock variables are often insignificant and incorrectly signed. The hypothesis that Social Security wealth shocks have had no impact on the labor supply of older workers cannot be rejected on the basis of these results. The model does not explain the accelerated decline in the labor supply of older workers in the 1970s.

[67] PACKARD, MICHAEL: "The Effects of Removing 70- and 71-Year-Olds from Coverage Under the Social Security Earnings Test," ORS Working Paper No. 44, Office of Research and Statistics, Social Security Administration, July 1990.

Objective: As of 1983, Social Security beneficiaries aged 70 and 71 were no longer subject to the retirement earnings test. This paper examines evidence on labor-force participation and earnings of the affected group both before and after 1983 to determine whether individuals responded to this change by altering their work effort.

Data Set: Aggregate labor-force participation rates were constructed from unpublished BLS data and from SSA's Continuous Work History Sample (CWHs). Other aggregate data were drawn from the 1987 Economic Report of the President and the 1987 Social Security Bulletin, Annual Statistical Supplement.

Definition of Retirement: No labor-force participation.

Estimation Method: Ordinary least squares.

Findings: This paper attempts to measure the impact of eliminating the retirement test (RT) for 70- and 71-year-olds in 1983. This rule change provides the researcher with an excellent opportunity to compare the labor market activity of this group before and after elimination of the test. Packard

examines labor-force participation rates for 70- and 71-year-olds before and after 1983, looks for evidence of increases in earnings among those who do choose to work, and checks for increased labor-force re-entry rates. If the test were a strong disincentive to work for 65 to 71-year-olds prior to 1983, its elimination might cause a number of fully retired workers to return to work.

Labor-force participation rates for detailed age-sex cohorts are not available on a regular basis, so Packard constructs them from unpublished Bureau of Labor Statistics (BLS) data and SSA's CWS. He finds no observed response to removal of the RT for 70- and 71-year-olds, excepting one model which shows a 2 percent increase in the BLS participation rates among males.⁴⁰ There is some evidence that the number of men and women returning to the labor force increased slightly, but fell back to former rates in 1985, which suggests that removing RT might have some short term favorable effect. Unfortunately, the available CWS data ended in 1985, ruling out the opportunity to determine whether the effect has a longer duration. A curious anomaly is, however, that most of the reentrants reported earnings that were below the annual exempt amount, and would not have lost benefits to the test in any case. Finally, there is evidence that a substantial number of workers increased earnings from below to above the earnings limit when they were no longer subject to the test. This was especially true for men where the proportion of men increasing their earnings in this way more than doubled when compared with the 5-year average prior to 1983.

Comments: Previous research suggests that the effect of the RT on work incentives is of an order of magnitude that makes any labor-supply adjustment very difficult to detect using aggregate data. To the extent that an effect is present, it is more likely to be detected by analyzing data that are person-specific; the use of broad, population averages is likely to mask subtle variations in behavior.

Given the marked declines in work observed as age increases, the 70- and 71-year-old cohorts are not the ideal age groups to be observing the effect of the earnings test; workers who are aged 65-69 may be substantially more responsive. This study provides substantial evidence that the labor-supply effect of removing the RT for 70- and 71-year-olds was relatively small.

⁴⁰This latter result is, however, sensitive to the model's particular specification, and points to the usefulness of further, more detailed, analysis of the data.

[68] PALMORE, ERDMAN B., LINDA K. GEORGE, AND GERDA G. FILLINBAUM: "Predictors of Retirement," Journal of Gerontology, 37 (6), November 1982, 733-42.

Objective: This research investigates the leading predictors of retirement on several data sets, and examines the sensitivity of results to changes in retirement definition.

Data Set: National Longitudinal Survey of Mature Men, Retirement History Study, and the Panel Study of Income Dynamics, along with four smaller regional data sets. All samples were restricted to older men; sample sizes used in the analyses varied.

Definition of Retirement: Several are examined: objective retirement, in which a person aged 65 or older works less than 35 hours per week and receives a public or private pension; early retirement, in which a person objectively retires before age 65; age at retirement, a continuous indicator of the timing of labor market withdrawal; and amount of employment, a continuous measure of hours worked per period.

Estimation Method: Ordinary least squares and logit analysis.

Findings: Previous research indicates that five sets of factors are key retirement determinants: demographic characteristics (e.g., age, sex), socioeconomic status (e.g., education, occupation), health, job characteristics, and attitudes toward work and retirement. Each of these, except for the last, has both direct and indirect (that is, a factor might influence retirement through its effect on another retirement factor) effects on retirement. Two types of analyses were performed to assess the relative explanatory power of the sets of predictors. First, models explaining the age of retirement and amount of employment were estimated using a stepwise regression procedure. Second, models of objective retirement and early retirement were estimated with logit analysis.

What predicts objective retirement? Education, the poverty ratio, occupation, experience, and tenure with employer were significant factors. These objective measures were stronger predictors than subjective indicators such as health and attitudes toward work and retirement. Age showed a strong independent effect in the RHS sample, but not in the NLS.

Early retirement models gave different results. Health emerges as a much more significant predictor. In the NLS sample, attitudes were shown to be important. Age-of-retirement models gave approximately equal importance to socioeconomic factors, health, job, and attitude variables.

In the amount-of-employment models, the most consistent predictors across data sets were job characteristics such as

self-employed status, not being subject to mandatory retirement, and not being employed in a core industry (construction or production). Other factors performed with varying degrees of success depending on the data set. Generally, it was observed that structural features of employment played a more important role than the combined effects of individual and subjective factors.

Comments: This study points out the sensitivity of regression results to retirement definition and an apparent lack of robustness of results across data sets. The majority of men retire early because of expressed health limitations, or because they can afford to do so.

[69] PARNES, HERBERT S. AND LAWRENCE LESS: "From Work to Retirement: The Experience of a National Sample of Men," Final Report to the U.S. Department of Labor, Center for Human Resource Research, The Ohio State University, February 1983.

Objective: This report explores the effect of alternative retirement definitions on the number and characteristics of retirees. It also examines post-retirement employment and income levels, as well as other aspects of retirement lifestyles.

Data Set: 1966-80 data from the National Longitudinal Surveys of the Labor Market Experience of Older Men.

Definition of Retirement: Various definitions are used including respondents' subjective views of their retirement status, the receipt of Social Security or pension income, or partial or complete withdrawal from the labor force.

Estimation Method: Multiple Classification Analysis (MCA).⁴¹

Findings: The analysis begins by examining the sensitivity of the size of the retired population to changes in definition of retirement. In 1978 the number of "retired" men aged 57-71 varied from 5.4 to 8.9 million. The number diminished when multiple criteria had to be met (e.g., meeting all three of the definitions). About 70 percent of the men who were designated retired by any one criteria, were retired by all three. There appears to be no "best" definition of retirement; the appropriate definition depends on the purpose of the analysis.

⁴¹This amounts to a multiple regression analysis when all independent variables are dummies.

Retirement causes are divided into three categories: persons who were involuntarily retired under a mandatory system, those who have retired due to poor health, and persons who retire voluntarily. Using a self-assessed definition of retirement, the respective percentages for each category of causes were 4, 36, and 61 percent. At the most, only 2/5 of retirees were available for work; the remainder either indicated health problems that discourage work, or simply preferred complete retirement.

Those retirees who work are significantly different from complete retirees in a number of ways. The probability of working declines sharply with age, and with the severity of health problems. Men with professional and managerial jobs prior to retirement, and those who expressed unfavorable attitudes toward retirement, had above-average participation rates. Other things equal, retirees with more nonlabor income were less likely to participate.

Comments: This is a very thorough descriptive piece that explores retirement behavior as documented in a rich data source. While no retirement or labor-supply models are estimated, the monograph provides an excellent description of the personal and economic circumstances that influence these decisions among older men.

[70] PARSONS, DONALD O.: "The Decline in Labor Force Participation," Journal of Political Economy, 88 (1), February 1980, 117-34.

Objective: Labor-force participation rates for virtually all male age groups have fallen persistently during the post-war era. This paper examines the extent to which this has been caused by an expansion of welfare programs that provide substantial unearned income, and in particular, the Social Security disability program.

Data Set: 3,219 men selected from the 1969 wave of the National Longitudinal Survey of Mature Men. These men were aged 45-59 in 1966.

Definition of Retirement: A labor-force participation equation is estimated.

Estimation Method: Probit analysis.

Findings: The labor-force participation rate for U.S. males aged 55-64 fell from 89.5 to 74.5 percent during the period 1948-76. Large declines were evident for other age groups as well. This flies in the face of secular increases in the

proportion of men who are married, higher levels of education, and presumed improvements in health. The likely sources of this trend are: 1) a substitution of women's market work for men's labor-force participation within families, and 2) a dramatic increase in welfare programs.

Male nonparticipants tend to have low earnings potential, primarily indicated by their low levels of education. How can families afford to have a prime-aged male out of the labor force? Those families with nonworking men do not appear to have large amounts of pension, rent, dividend, or interest income, the usual sources of retirement income. These sources represent 13 and 6 percent, respectively, of total family income for white and black families with a nonparticipating male head. Thus, the decline in labor-force participation is not primarily an early retirement phenomenon. In contrast, welfare programs account for 33 and 59 percent of their respective family incomes. Because most general welfare programs disallow aid to households headed by men who are capable of working, it should come as no surprise that disability programs account for the bulk of the transfer income to these families (29 and 48 percent of family income for whites and blacks, respectively).⁴²

A probit model of labor-force participation in 1969 is estimated using financial variables, age, and a mortality index as regressors. The key hypothesized explanatory factors are: 1) the ratio of potential monthly Social Security disability benefits to monthly wages, 2) the interaction of (1) with a mortality index, 3) an index of local welfare generosity normalized by the monthly wage, 4) the interaction of (3) with a mortality index, and 5) the fraction of the year unemployed in 1966. Two specifications are estimated, one with and one without the interaction terms. In the former, all regressors are significant and have the expected signs; when interactions are included, it is these particular terms that appear with significant coefficients, suggesting that it is persons with health problems who are sensitive to the alternative sources of income. The second model tracks observed labor-force participation rates over the 1948-76 period well.

Comments: The falling labor-force participation rate for older men is explained largely by the increased generosity of welfare transfers, especially Social Security disability payments. The elasticity of nonparticipation with respect to the Social Security disability "replacement ratio" is $-.63$, controlling for health. Low-wage workers are particularly

⁴²Most of the disability income is from Social Security. Also included is Veteran's Compensation, Workmen's Compensation, and Aid to the Blind.

affected. These conclusions have been disputed by Haveman and Wolfe [1984].

[71] PARSONS, DONALD O.: "Racial Trends in Male Labor Force Participation," American Economic Review, 70 (5), December 1980, 911-20.

Objective: Over the period 1954-76, male labor-force participation rates fell in virtually all age groups. The decline was substantially greater for black men. This article examines the hypothesis that the relatively greater decline for blacks is due to the differentially large effects that the Social Security disability program has had on low-wage workers, who are disproportionately represented among blacks.

Data Set: 4,831 males aged 45-59 selected from the 1966 wave of the National Longitudinal Survey of Mature Men.

Definition of Retirement: Labor-force participation.

Estimation Method: Probit analysis.

Findings: For white men aged 45-54, the labor-force participation rate fell from 96.8 to 92.5 percent during the period 1954-76; the corresponding decline for same-aged black men was from 93.2 to 83.4 percent. This decline coincided with a large expansion of Social Security's disability program. If the average health of workers did not decline appreciably over the period, to what extent can expansion of the program be linked with the large labor-force withdrawal? By 1977 more than 3 million disabled workers were collecting benefits under the program.

A probit model is estimated using economic factors and demographic characteristics as regressors. Key variables include: a Social Security "replacement ratio," (monthly benefit divided by monthly wage), the ratio of monthly general welfare benefit to monthly wage, fraction of weeks unemployed in the prior year (1965), a set of subsequent period mortality indicators, age, schooling, marital status, occupational status, and a dummy variable indicating race is black.

The results show that all economic variables are statistically significant and have the expected signs. When all economic variables and mortality measures are included in the specification, the coefficient on race is small and statistically insignificant. When separate models are estimated for whites and blacks, coefficients are strikingly similar, particularly for the economic regressors.

Comments: The decline in labor-force participation is the consequence of increasingly attractive alternatives to work. Because effects are more pronounced for workers with low earnings potential, black male participation rates have fallen more precipitously.

[72] PARSONS, DONALD O.: "Disability Insurance and Male Labor Force Participation: A Response to Haveman and Wolfe," Journal of Political Economy, 92 (3), June 1984, 542-49.

Objective: This article constitutes a reply to the criticisms of his February 1980 JPE article.

Data Set: None used.

Definition of Retirement: Labor-force participation.

Estimation Method: None used.

Findings: The primary defense of the earlier article consists of claiming that the numerical magnitudes are consistent with findings of other researchers, and that the PSID does not generate large enough sample sizes to estimate the model with any precision. Parsons also draws attention to the differences in the way explanatory factors are measured in the two papers. A potentially important problem with the Haveman-Wolfe alternative is their use of a self-reported measure of health.⁴³ Previous research indicates that this can be used to "justify" non-participation.

Comments: It would be helpful to replicate the Haveman-Wolfe model using Parsons's mortality index to gauge the extent to which differences in the findings result from this source. Nonetheless, given that Haveman and Wolfe generate quantitatively similar results before proceeding with additional modifications, their criticisms appear to be valid.

⁴³Parsons used an objective mortality index constructed from observations from subsequent periods.

[73] PARSONS, DONALD O.: "The Male Labor Force Participation Decision: Health, Reported Health and Economic Incentives," Economica, 49 (193), 1982, 81-91.

Objective: This article suggests that self-reported health status is an economically determined variable, with the choice dependent on the unobserved true health status and the potential financial gain to be had from indicating the existence of bad health. A model of self-rated health is developed and estimated.

Data Set: 3,216 men aged 48-62 selected from the 1969 wave of the National Longitudinal Survey of Mature Men.

Definition of Retirement: Labor-force participation.

Estimation Method: Probit analysis.

Findings: Parsons's earlier work argued that the decline in labor-force participation among older men is largely a result of the expansion of the Social Security disability program. Statistical analyses of labor-force participation appear to attribute too much explanatory power to self-reported indicators of health limitations. This article estimates a model of the decision to declare the existence of poor health.

A 2-equation model of labor-force participation and self-reported health status is estimated. Labor-force participation depends on objective mortality measures, financial incentives, and personal characteristics. The mortality measures are constructed from observed mortality in subsequent years of the NLS panel. The structure of the model and statistical results are similar to those presented in Parsons's 1980 JPE article. In the second relationship, a self-rated health problem is a function of true health and labor-force participation, their interaction, and economic incentives, particularly the ratio of the potential monthly disability payment to the monthly wage. True health is modeled as a linear function of an objective mortality index.⁴⁴ The fitted values from the participation equation are used as an instrument for the participation variable in the health status equation. Results show that self-reported health is significantly influenced in a predictable manner by economic incentives.

Comments: When objective measures of health are used as regressors to predict labor-force participation, the model shows a statistically significant independent effect of the

⁴⁴The mortality index is a weighted average of a set of dummies indicating observed mortality in subsequent panel waves.

potential reward to nonparticipation made available through Social Security's disability program.

[74] PELLECHIO, ANTHONY J.: "The Effect of Social Security on Retirement," NBER Working Paper 260, Cambridge, MA: National Bureau of Economic Research, July 1978.

Objective: The paper examines how Social Security affects the retirement behavior of a cross-section of men aged 60-70. It develops and estimates a reservation-wage retirement model.

Data Set: Married men aged 60-70 selected from the 1973 CPS-IRS-SSA Exact Match File.

Definition of Retirement: No labor-force participation during the year.

Estimation Method: Two-step probit analysis.

Findings: The empirical work implements a basic labor-force participation model consisting of a market wage equation and a shadow-price-of-time equation. The individual participates if the market wage offer exceeds the shadow price of time evaluated at zero hours of work. A Social Security wealth (SSW) variable enters into the shadow price of time relationship. It is computed by adding the present value of the husband's primary insurance amount (PIA) to an estimate of the wife's highest Social Security payment (retired-worker vs spousal benefit). Although there is some theoretical discussion of the manner in which the retirement earnings test alters the net wage rate over a range of hours of work, producing a non-convex budget set, the econometric work finesses the problem by assuming that the basic labor-force participation decision is not affected by the test.⁴⁵

Separate models are estimated for the 60-61, 62-64, and 65-70 age groups. The SSW variable is statistically insignificant for the youngest group, but has significant negative effects on participation for the two older groups. Social Security's impact on retirement is measured primarily through its contribution to wealth at retirement. When SSW increases from \$35,000 to \$55,000, the probability of retirement for a married man aged 62-64 rises by .15 (from .41

⁴⁵In 1982 the annual exempt amount was \$1,680. Between \$1,680 and \$2,880 the benefit reduction rate was 50 percent; beyond \$2,880 the rate was 100 percent until all benefits were exhausted.

to .56). For persons aged 65-70, the probability of retirement increases by .22 (relative to .78).

Comments: This paper presents some of the early evidence that the OASI program influences the retirement decision. Several basic problems limit the reliability of these results. First, the model contains no information on health status or private pensions. Second, it fails to look at the extent to which the value of SSW changes if retirement is delayed. A life-cycle model should consider the extent to which delaying retirement another year will augment wealth. Finally, no distinction is made between complete and partial retirement.

[75] PELLECHIO, ANTHONY J.: "The Social Security Earnings Test, Labor Supply Distortions, and Foregone Payroll Tax Revenue," NBER Working Paper 272, Cambridge, MA: National Bureau of Economic Research, August 1978.

Objective: This paper is the first sophisticated econometric analysis of the effects of the earnings test on the labor supply of older workers.

Data Set: 593 married men, aged 65 to 70, selected from the 1973 CPS-IRS-SSA Exact Match File. Two observations were used per subject: one each for 1972 and 1973. To be included in the sample it was necessary to have performed some work during 1972, be eligible for Social Security retirement benefits, and have received no other public transfer income. Most importantly, the sample was restricted to individuals with wages sufficiently low to not lose all Social Security benefits to the retirement test when employed full time.

Definition of Retirement: Receipt of Social Security benefits.

Estimation Method: 2-step probit-OLS.

Findings: The major contribution of this paper is econometric; the unrepresentative nature of the sample makes generalization of the empirical findings dubious. Furthermore, the 1972 version of the earnings test imposed a 50 percent benefit reduction rate on annual earnings in the \$1,680-2,880 range, and a 100 percent rate on earnings in excess of \$2,880. The higher rate was eliminated after 1972.

The retirement test (RT) imposes a non-convexity in the current-period budget constraint (at the break-even level of earnings). Pellechio addresses this problem by restricting the sample to those individuals who would not lose their entire benefits even when working full time (2,080 hours per

year). Thus, the sample is restricted to individuals with strictly convex budget sets. The 2-step estimation permits individuals to choose the segment of the budget constraint as well as the income-hours combination within segments.

In a preliminary step, a wage equation is estimated on the subsample of full-time workers. A fitted wage and Social Security wealth measure are then used in the first-step probit estimate of the probability that the individual earns more than the exempt amount. The coefficients from the probit analysis are then used to construct a measure of the expected tax rate, which, with other variables from the probit equation, is used in the second step, an ordinary least squares (OLS) estimation of a linear labor-supply function. The estimated probit and labor-supply equations are then used to simulate the impact of removing or altering the earnings test. The effect of the earnings test (as well as income and payroll taxes) on hours worked is channelled through a single summary measure that Pellechio constructs for inclusion in the labor-supply function, ETAX, the expected value of the combined tax rate.⁴⁶ Eliminating the RT is predicted to increase average annual hours of work for 65-70 year-old by 151 hours. Lowering the benefit reduction rate was predicted to decrease labor supply, probably due to wages being taxed over a now larger partial-offset segment of the budget constraint.

Comments: The primary contribution of this paper is methodological. The author cautions against drawing firm conclusions on the basis of this study. The model can be criticized on a number of grounds. First, the wage equation coefficients estimated in the first stage are likely to be biased because the equation is estimated on a sample of full-time workers.⁴⁷ Second, to surmount the econometric problems associated with a nonconvex budget set, the sample is restricted to low wage earners. Third, there is no information available in the data set on private pensions.

⁴⁶The use of a summary indicator is technically correct, but seemingly discards available information on the precise shape of the individual's budget set. Given an individual's preferences, an infinite number of budget constraints can generate the same expected tax rate measure, and yet not all tax structures would be expected to generate the same work incentives.

⁴⁷Wage rates for part-time work are generally lower than those for full-time employment.

[76] POZZEBON, SILVANA AND OLIVIA S. MITCHELL: "Married Women's Retirement Behavior," NBER Working Paper 2104 (forthcoming in the Journal of Population Economics), Cambridge, MA: National Bureau of Economic Research, December 1986

Objective: The paper estimates the extent to which financial incentives influence the choice of retirement age for married women. Results are compared with those for older men estimated with a similar econometric model.

Data Set: 139 wives of white, married men. Observations are selected from the 1969-79 waves of the Retirement History Study. Women in the sample were aged 54 to 62, and were working in 1969.

Definition of Retirement: Self-assessed. Retirement occurs when a woman describes herself as without a job, and not looking for one.

Estimation Method: Ordinary least squares and conditional logit.

Findings: This paper re-estimates the earlier model of Mitchell and Fields (JLE, 1984) on a sample of older working women. Retirement age is regressed against the present value of retirement income associated with retirement at ages 60, 62, 65, and 67 (earnings streams, Social Security and pension benefit streams), the difference between the present values of retirement at ages 65 and 60, the present value of the husband's expected income stream, the difference between the woman's life expectancy and retirement age⁴⁸, and several variables measuring the level of family responsibilities (e.g., husband's health, presence of dependent children).

The model is first estimated by OLS. Most coefficients are statistically insignificant in the various specifications, suggesting that the wife's retirement decision is very weakly affected by life-cycle income prospects. These results are generally confirmed by the logit estimation.

Comments: In contrast to the Fields-Mitchell results using RHS data on older men, the retirement decisions of married women appear to be insensitive to financial incentives such as Social Security. Working married women value retirement leisure highly, and there appears to be complementarity with their husbands' retirement leisure. In general, family considerations such as the husband's health status and income,

⁴⁸This measures the value placed on years out of the labor force.

as well as the difference between the husband and wife's ages appear to be stronger influences.⁴⁹

[77] QUINN, JOSEPH F.: "Microeconomic Determinants of Early Retirement: A Cross-Sectional View of White Married Men," Journal of Human Resources, 12 (3), Summer 1977, 329-46.

Objective: This article investigates the relative impact of three sets of factors in explaining individual labor-force participation decisions: 1) personal and financial characteristics, 2) local labor market conditions, and 3) job attributes.

Data Set: 4,354 white, married men, aged 58-63, selected from the 1969 wave of the Retirement History Study.

Definition of Retirement: Retirement is complete labor-force withdrawal. The model is essentially a reduced form, participation equation.

Estimation Method: Ordinary least squares.

Findings: Labor-force participation is regressed against health status⁵⁰, dummies for current eligibility for Social Security and private pension benefits, both the husband's and wife's hourly wage rates, asset income (from rents, interest, and dividends), the presence of dependents, the local unemployment rate, the most recent annual rate of local employment growth, and dummy variables for the existence of three job characteristics (low job autonomy, physical or mental strain, and bad physical working conditions).

The health variable is the single most influential variable, lowering the probability of participating by .2. Social Security, pension, and asset income variables had predictably negative effects.

It was conjectured that the influence of economic variables might differ by health status. Separate models were estimated for those with and without a health limitation. A Chow test indicated that separate models are appropriate for

⁴⁹A husband with health problems tends to delay the wife's retirement, perhaps in order to qualify for employer-provided health insurance. The greater the age gap between wives and their older husbands, the earlier the wife retires.

⁵⁰The dummy variable is set equal to 1 if the respondent claims that health limits the kind or amount of work or housework that can be performed.

the two subsamples. The effect of Social Security is 8 times as large for those with poor health; private pension and asset income effects are 3 times as large.

Comments: The message of this paper is that 1) both health and the availability of financial support are important influences in the early retirement decision, and 2) persons in poor health are more likely to respond to financial incentives to retire.

This paper has a number of problems that call its conclusions into question. First, Social Security and pension eligibility are modeled in a manner that examines neither their asset value nor the increase in their value that is attributable to delaying retirement another year. It is very likely that the effects of eligibility are confounded with age effects in the sample, which appear to be pronounced. Second, taxes and transfers are ignored. Third, the wage is treated as an exogenous variable. Fourth, the health status variable is likely to be endogenous, and suffers from the usual battery of criticisms.

[78] QUINN, JOSEPH F.: "Job Characteristics and Early Retirement," Industrial Relations, 17 (3), October 1978, 315-323.

Objective: This study investigates the importance of job characteristics in the decision to retire early. It is hypothesized that, other things equal, people tend to retire earlier from jobs with undesirable attributes.

Data Set: 4,845 white, married males, aged 58 to 63, selected from the 1969 wave of the Retirement History Study.

Definition of Retirement: The individual is retired if he has completely withdrawn from the labor force.

Estimation Method: Cross-tabulation.

Findings: The RHS contains Census 3-digit occupation and industry codes for each man's current or last job. These codes can be used in conjunction with DOL's Dictionary of Occupational Titles (DOT) to assign the probability of an individual holding each of the 14,000 DOT occupations. Because the DOT gives a description of the job characteristics in each occupation, it is possible to calculate the expected job characteristics for each RHS subject. The 7 characteristics used in this analysis are: whether the worker is engaged in the whole production activity, repetitiveness of tasks, specificity of instructions for

completing tasks, stress, strength, the physical nature of work, and the existence of bad working conditions. The first of these is a favorable characteristic; the last six are undesirable.

When the presence of the seven characteristics is tabulated against retirement-work status, there is clear support for the view that people with bad jobs are more likely to retire. When a similar analysis is done for separate groups of men categorized by health status, those with bad health are more sensitive to bad job characteristics. Further subgroups are identified and analyzed. Persons with poor health are consistently more sensitive to job characteristics, especially those who are also eligible for Social Security retirement benefits.

Comments: A maintained hypothesis throughout the paper is that job characteristics are secondary in importance to health and financial influences in the labor-force participation decision. This paper provides support for the view that health status interacts with other retirement influences, particularly job characteristics and Social Security eligibility, in determining retirement status.

[79] QUINN, JOSEPH F. AND RICHARD V. BURKHAUSER:
"Influencing Retirement Behavior: A Key Issue for Social Security," Journal of Policy Analysis and Management, 3 (1), Fall 1983, 1-13.

Objective: There has been much concern over the long term viability of the Social Security retirement system. Two types of remedies have been proposed. The first involves changing the tax and benefit structure of OASI to balance long term revenues and expenditures. The second is concerned with the ways in which we might encourage later retirement, and reverse the long term trend to earlier retirement. This paper examines the economic incentives that influence the retirement decision, and draws conclusions about potentially useful policies to stimulate work by the elderly.

Data Set: 1,048 men, aged 62 to 64 in 1973; data are selected from the 1973 and 1975 waves of the Retirement History Study.

Definition of Retirement: Retirement is said to occur when an individual leaves his 1973 job before the 1975 interview.

Estimation Method: Cross-tabulation and logit analysis.

Findings: This paper draws policy implications from the econometric results contained in Burkhauser and Quinn [1983]. Early retirement was found to be closely related to mandatory retirement provisions, Social Security eligibility, and the availability of private pensions. The statistical work indicates that health deterioration, full-time job earnings, and changes in private pension and Social Security wealth in response to further work are statistically significant determinants of retirement dates.

When the sample is divided into those workers who faced mandatory retirement by age 65, and those who did not, 83 percent of those who did face the constraint retired by 1975, while only 40 percent of those not so constrained retired. However, the gross difference is not entirely due to mandatory retirement. The estimated participation equation for the unconstrained group indicates that 63 percent of those workers facing mandatory retirement would have retired by 1975 anyway, even in the absence of the provision.

Comments: If a policy goal is to encourage later retirement, this paper suggests that people will respond to changes in the costs and benefits associated with further work.

[80] REIMERS, CORDELIA W.: "Is the Average Age at Retirement Changing?" Journal of the American Statistical Association, 71 (355), September 1976, 552-8.

Objective: The article demonstrates that it is possible for a birth cohort's labor-force participation rate to be declining while its average retirement age is rising. The source of this peculiarity is that death has been an important reason for job exits by older men, and the death rate affects the retirement rate at any age. Reimers calculates the expected age at exit from the labor force under the assumption that retirement is the only cause of exit, separating out the trend in retirement from the trend in mortality.

Data Set: BLS aggregate male labor-force participation data for 5-year age cohorts, every ten years for the period 1920-50.

Definition of Retirement: Permanent withdrawal from the labor force for any reason other than emigration or death.

Estimation Method: None used.

Findings: Reimers begins by deriving the mathematical relationship between labor-force participation rate, mortality rate, emigration rate, temporary withdrawal rate, and the

retirement rate for a given age cohort. It is possible for the labor-force participation rate to be falling, and yet the average age of retirement to be rising, for a specific cohort, especially if there are significant declines in mortality rates over time.

To demonstrate the empirical importance of this possibility, Reimers estimates temporary withdrawal, emigration, and retirement flows for cohorts born in 1866-1900. She finds that the mean age of retirement did not fall among these cohorts, but the labor-force participation rates at older ages declined. The primary reasons are improved mortality rates and lower emigration rates over time for persons aged 52-72.

Comments: The study raises an important cautionary point to consider when evaluating "retirement" studies that use labor-force participation rates as a dependent variable. The major problem with the Reimers paper is the lack of appropriate data to carry out her analysis. To surmount this problem she is forced to use data for longer intervals (10-year periods) and larger age cohorts (5 years) than is desirable. It is also unclear to what extent that the results for men born in the last half of the 19th century would carry forward to retirement behavior since 1950. The analysis presented in this paper might be usefully extended to later periods given appropriate data.

[81] REINSDORF, MARSHALL B.: "Implications of Structural Retirement Models," Bureau of Labor Statistics Working Paper 162, U.S. Department of Labor, June 1987.

Objective: This paper estimates a retirement model that is very similar to the one presented by Gustman and Steinmeier (*Econometrica*, 1986). The paper's main objective is to demonstrate that a computationally simpler estimation procedure can be used to estimate structural life-cycle retirement models. The paper's results also provide an opportunity to examine the robustness of the Gustman-Steinmeier model.

Data Set: Observations for 472 white males, aged 58-63 in 1969, selected from the 1969-77 waves of the Retirement History Study. Note that the characteristics and size of Reinsdorf's sample differ from those of the sample used in the Gustman-Steinmeier [1986] work.

Definition of Retirement: Retirement status is defined on the basis of self-reported average weekly hours of work. Workers are considered full-time if reported hours are greater than

35 hours per week; those working less than 35 hours per week are considered partially retired.⁵¹ Persons are fully retired if they perform zero hours of work.

Estimation Method: Maximum likelihood.

Findings: The behavioral model parallels that used by Gustman and Steinmeier (GS), although the specific implementation differs in several key aspects. Individuals are assumed to maximize an intertemporally separable constant elasticity of substitution (CES) utility function that has consumption and leisure as its arguments. Preferences shift in favor of leisure with age, and vary across individuals.

It is important to understand some of the differences between Reinsdorf's model and the GS specification in light of the somewhat conflicting results. First, partial retirement is defined in a different manner, resulting in substantially less of it being observed in the sample (15 percent versus the 33 percent in the GS work). Second, although GS permit variable hours of work in partial retirement in their main model, this paper fixes their level at the sample mean value of 20.5. Third, Reinsdorf uses two health variables in the utility function, while GS use only one. Fourth, the stochastic term in the substitution elasticity is assumed to follow a different distribution. Fifth, the likelihood function has a somewhat different form. These and other differences in specification and procedure make a direct comparison of the results problematic.

The timing of retirement is shown to be insensitive to financial incentives, and is far more influenced by changing tastes and health status. A 10 percent increase in net wages would delay the retirement date by less than 2 months (GS found the effect to be 5 months). Indifference curves become about 99 percent steeper each year, compared with the GS result of 23 percent, while the elasticity of substitution is nearly 80 percent larger (1.08 versus .60).

Comments: The paper serves the useful purpose of demonstrating that the numerical results of complex econometric retirement models are sensitive to retirement definitions, model specification, and estimation procedure. Unfortunately, it is not possible in this case to determine the relative importance of each (when compared with the GS work) because Reinsdorf changes numerous features simultaneously. Note, however, that this paper reports a

⁵¹Although this classification scheme has the advantage of using an objective indicator of work effort, it fails to distinguish situations where individuals work full time for part of a year, or those in which people are switching to less demanding full-time jobs.

substantially smaller number of partial retirements than do other researchers using the same data set. This draws attention to the potentially important implications of selecting operational definitions for complete and partial retirement.

Because this model shares many of the characteristics of the GS life-cycle retirement model, many of the same criticisms apply. However, there are two features of this analysis which cast some doubt on the reliability of the numerical results, and suggest that the GS findings may be preferred. First, given the different retirement definitions employed, Reinsdorf's model tracks the RHS's observed work-retirement patterns less closely than the GS model. The simulated peak at age 65 is about half the height as the one observed. Second, Reinsdorf assumes the level of asset wealth in 1970 to be exogenous when it logically is a function of previous earnings and tastes for work. Because his econometric procedure does not account for this endogeneity, coefficient estimates are likely to be biased.

[82] RUHM, CHRISTOPHER J.: "Bridge Jobs and Partial Retirement," unpublished manuscript, Boston University, October 1989.

Objective: RHS data indicate that less than two-fifths of household heads fully retire directly from career jobs. Over half retire partially at some stage, and one-fourth reenter the labor market after retiring. This paper documents the importance of "bridge" jobs (those jobs that are held in the period between career jobs and complete retirement), and examines their correlates as well as the characteristics of older workers who engage in these employment relationships.

Data Set: Data for 6,633 household heads (Men = 5,179, Women = 1,454) selected from the 1969-79 waves of the Retirement History Study

Definition of Retirement: Self-assessment. Respondents classified themselves as "not retired," "partially retired," or "retired."

Estimation Method: Ordinary least squares; multivariate logit; maximum likelihood estimation of a proportional hazard model.

Findings: More than half of household heads leave career jobs before age 60. Because these departures occur at relatively early ages, only 36 percent of individuals leaving career jobs fully retire immediately. 47.6 percent remain in the labor

force for at least another 5 years. In general, earlier departures from career jobs tend to be associated with longer post-career labor-force participation.

The post-career employment of older workers is very stable. More than 2/3 of respondents who remain in the labor force did not change employers during the ten-year observation period of the RHS. Bridge jobs are rarely located in the same occupation and industry as the career job (23.9 percent). Partial retirement is rare before age 62, is very common in the 62-7 range, and declines gradually thereafter. At least half of all workers partially retire at some point. The expected duration of partial retirement is 5.2 years.

24.9 percent of household heads return to the labor force from complete retirement; two-thirds of these are into partial retirement. These reversals tend to be more common for nonwhites, younger workers, and those retirees without private pension coverage.

Regression results show that workers covered by private pensions hold career jobs longer, are less likely to work at bridge jobs, less likely to partially retire, and rarely unretire. Career jobs for women tend to last until later ages than for men.

Although results reported in the body of the paper rely on self-assessed definitions of retirement, an appendix reports that most of the paper's results hold when alternative, income-based, retirement definitions are used. Classifications differed substantially when objective retirement measures were substituted for self-reported indicators.⁵² Under the objective definition, the number of persons retiring directly from career jobs falls from 35.9 to 21.6 percent. The most important difference is that the partial retirement state is more common but lasts for a shorter duration when the objective definitions are used. 58.9 percent of respondents claim to be partially retired during at least one wave under the objective definition, as compared with 45.2 percent using the subjective indicator.

Comments: The paper persuasively documents the importance of bridge jobs and partial retirement for older workers, as well as a strikingly large number of reverse retirements--certainly larger than suggested by previous RHS analysts.

⁵²For example, 25.0 and 41.1 percent of persons designating themselves as "not retired" and "partially retired," respectively, in 1975, were reclassified when an annual income criterion was used.

[83] RUHM, CHRISTOPHER J.: "Career Employment and Job Stopping," forthcoming in Industrial Relations, 1990.

Objective: For most household heads, exits from career jobs are followed by another employment spell that usually involves a change in occupation or industry. This article examines the nature and characteristics of bridge jobs that serve as transitions from career employment to complete retirement.

Data Set: Data for 8,736 household heads selected from the 1969-79 waves of the Retirement History Study.

Definition of Retirement: Self-assessment. Respondents classified themselves as "not retired," "partially retired," or "retired."

Estimation Method: None. A number of tabulations are presented.

Findings: Even for the most advantaged workers (white, male, highly educated professionals), career jobs do not imply lifetime employment. Almost half of workers with private pensions continue to work in some capacity after leaving a covered job. The bridge job likely requires a change in occupation or industry, and usually entails a substantial pay cut.

In the RHS data, two-thirds of household heads indicating some post-1949 work experience reported holding career jobs (those lasting at least 15 years) at some stage. More educated workers are more likely to report longer durations on career jobs. 58.2 percent of workers with career jobs reported that they terminated these positions before age 60, but only 18.8 percent of these workers fully retired at that time. Post-career job earnings are much lower; more than 60 percent 35 of job changers earned less than 75 percent of their former earnings levels.

Early retirement is often thought to be largely voluntary, and frequently induced through the structure of private pension plans. Pension plans tend to reduce labor mobility and appear to reduce early retirements as well as late retirements (that is, they decrease the variation in retirement ages). Pension-covered employees are significantly less likely to have a bridge job, and those pensioners who do so are likely to hold those transitional jobs for shorter durations.

Comments: The frequency of significant earnings declines for individuals leaving career jobs suggests that many terminations are involuntary, particularly for younger job changers. The factors associated with early departures from career jobs, particularly for persons who continue some form

of employment, merit further examination. To what extent are these voluntary transitions?

[84] SAMMARTINO, FRANK J.: "The Effect of Health on Retirement," Social Security Bulletin, 50 (2), February 1987, 31-47.

Objective: This article examines the effect of health on the timing of retirement. The existing literature on the effects of health on the retirement decision is reviewed.

Data Set: None used.

Definition of Retirement: Various.

Estimation Method: None.

Findings: Numerous studies have demonstrated the important role played by poor health in the decision to retire early. Workers with poor health are likely to retire 1 to 3 years earlier than persons with similar economic and personal characteristics.

The measurement of health poses problems for retirement researchers. Many of the early studies on the impact of health probably overstated its impact on the timing of retirement. It is not clear, however, that self-reported measures lead to biased estimates of wage and income retirement elasticities. The evidence on the extent to which self-reported health limitations are inferior to more objective indicators is mixed, and requires further investigation.

Comments: This article is primarily a literature survey. Results presented by previous authors are summarized, with little attempt to evaluate the credibility of specific studies.

[85] SANDER, KENNETH G. "The Retirement Test: Its Effect on Older Workers' Earnings," Social Security Bulletin, 31 (6), June 1968, 3-6.

Objective: This article investigates the sensitivity of annual earnings to the retirement test by examining the extent to which the distribution of earnings exhibits a clustering pattern at or below the annual limit.

Data Set: Data for 1963 from the Social Security Administration's Continuous Work History Sample

Definition of Retirement: None used.

Estimation Method: None used. Simple tabulation.

Findings: The retirement test provision for 1963 stated that: 1) for annual earnings between \$1,200 and \$1,700, \$1 in benefits is withheld for each \$2 in earnings over the lower bound; and 2) for earnings in excess of \$1,700 per year, a \$1 for \$1 reduction occurs. The test applied to beneficiaries under age 72. If the retirement test is a deterrent to work, the distribution of earnings should reveal an earnings cluster at or below the earnings limit for beneficiaries subject to the test. There should be no such clustering for those aged 72 and older.

Sander found that workers did not appear to distinguish between the 50 and 100 percent reduction rates. Earnings tended to cluster just below the \$1,200 limit, with no such pattern at the \$1,700 limit where the higher reduction rate took effect. There appeared to be no clustering of earnings at the limit for workers aged 73 and older; however, labor-force participation rates are low for this age group.

Comments: This simple tabulation of the distribution of earnings suggests that the more stringent form of the retirement test operating in 1963 probably deterred work for many of the elderly who wanted to work. The low annual limit was apparently more critical than the specific amount of the implicit tax. The paper raises the question of whether the clustering of earnings reflects a true reduction in work or, rather, a tendency to keep reported earnings below the limit. It is unclear to what extent increases in the annual limit have weakened the retirement test's adverse impact on work incentives.

[86] SICKLES, ROBIN C. AND PAUL TAUBMAN: "An Analysis of the Health and Retirement Status of the Elderly," Econometrica, 54 (6), November 1986, 1339-56.

Objective: The article examines the manner in which endogenously determined health status influences retirement, and the ways in which financial factors such as Social Security benefit amounts influence both health and retirement status. Retirement and health status equations are jointly estimated using panel data.

Data Set: Approximately 8500 male heads of households selected from the 1969-77 waves of the Retirement History Study.

Definition of Retirement: Individuals who were not working full time are considered retired. Thus, retirees include part-time workers.

Estimation Method: A random-effects model estimated by maximum likelihood.

Findings: Health and retirement equations are jointly estimated. The health status relationship is an ordered probit model with four states: health better, the same, or worse than others the same age, and dead. Health is hypothesized to be a function of age, race, marital status, number of dependents, education, job type, and various income sources. The retirement equation is a binary probit model. Explanatory variables include age, race, marital status, number of dependents, job type, various income sources, the gain from postponing retirement, and health. Although health is assumed to influence retirement, the model does not permit retirement status to affect health.

The most important of the income variables in the retirement equation is the monetary gain from postponing retirement. A transition from good to poor health increases the probability of retirement by .21. Social Security benefits and pension payments have positive effects on health that partially offset their direct influence on retirement. There is a large amount of heterogeneity in both the retirement and health equations.

Comments: Social Security benefits are shown to have direct effects on the retirement decision, and indirect effects through health status. Men not yet eligible for Social Security benefits are far less likely to retire. The authors conclude that an effective way to increase work among the elderly is to raise the age at which early retirement benefits are paid.

[87] SLADE, FREDERIC P.: "Labor Force Entry and Exit of Older Men: A Longitudinal Study," NBER Working Paper No. 1029, Cambridge, MA: National Bureau of Economic Research, November 1982.

Objective: Panel data from the RHS are used to estimate labor-market entry and exit equations for older men under age 65. Of particular interest is the degree of state dependence in the participation decision.

Data Set: Observations on 2,991 males, aged 58-62 in 1969, selected from the 1969 and 1971 waves of the Retirement History Study.

Definition of Retirement: None. A labor-force exit relationship is estimated.

Estimation Method: Probit analysis.

Findings: Previous econometric estimates of participation and retirement equations using cross-section data display several shortcomings. First, it is not possible to examine the impact of changes in Social Security rules or policies. Second, it is not possible to model behavior that occurs with a lag. Third, if the decision to participate in a given period depends on labor-force status in earlier periods, this temporal dependence cannot be observed in cross section. In this study, two waves of the RHS are used to overcome these problems.

A 2-equation model is developed in which the dependent variables are ENTRY (a dummy equal to 1 if the person was not working in 1968, but was working in 1970) and EXIT (a dummy equal to 1 if the person was working in 1968, but was not working in 1970). Independent variables included education, assets, change in assets, the 1968 wage, the change in wage, potential monthly disability insurance (DI) benefits, the change in monthly DI benefits, retirement benefits, the change in retirement benefits, a pension eligibility dummy, race, health, change in health, change of address, and marital status. Wages were imputed for nonworkers with a selectivity-corrected wage regression. The extent of temporal dependence is examined by looking at whether the "change" variables (wage, assets, DI benefits, retirement benefits) have symmetric effects in the entry and exit equations. If these effects are not symmetric, or if they are statistically insignificant, there is an indication of temporal dependence. In addition, the values of the 1968 variables should affect entry and exit only if there is temporal dependence.

The results indicate that there is substantial temporal dependence. The asset, health, and eligibility variables were significant in both equations, while the "change" variables, typically found to be significant in cross-section studies, were insignificant here. All Social Security variables were insignificant.

Comments: This is a relatively simple study that demonstrates the potential importance of state dependence in work and retirement models. The results are suggestive, but must be viewed with caution due to the absence of any life-cycle

underpinning, the use of a very short panel, and the lack of rigorous treatment of the state dependence phenomenon.⁵³

[88] SLADE, FREDERIC P.: "Older Men: Disability Insurance and the Incentive to Work," Industrial Relations, 23 (2), Spring 1984, 260-69.

Objective: The impact of the Social Security Disability Insurance program on work incentives is examined. A model of labor-force participation is developed and estimated which incorporates the program's structure and application procedure.

Data Set: 5,403 men aged 58-63 selected from the 1969 wave of the Retirement History Study.

Definition of Retirement: No labor-force participation.

Estimation Method: Probit analysis.

Findings: The large decline in labor-force participation rates among older men has coincided with a major expansion of the Social Security Disability Insurance (DI) program. The decision to work is likely to depend on the decision to apply for benefits, and the administrative disposition of the application.

A probit model of labor-force participation is estimated in which the independent variables are: education, age, assets, gross hourly wage, race, potential monthly disability benefit, potential monthly reduced retirement benefit under Social Security, existence of a health limitation on mobility, household size, marital status, private pension eligibility, and a rural dummy. The DI and retirement benefits are entered in the form of their ratio to the wage. Wage rates for nonparticipants are estimated using a selectivity-corrected wage regression.

Results show the potential Social Security benefit variable to be insignificant, while the coefficient on the ratio of potential DI benefit to wage is negative and statistically significant. The implied elasticity of nonparticipation with respect to the Social Security disability "replacement ratio" is $-.81$, consistent with the $-.63$ value reported by Parsons (JPE, 1980).

Comments: Several problems cast serious doubt on the validity of this paper's conclusions. First, is the manner in which

⁵³However, see Slade [1987] for a variance-components model.

potential DI and retirement benefits are entered into the model in the form of their ratio to gross wage. The estimated coefficient confounds the effect of DI and retired worker benefits (presumed negative) and the current wage offer (presumed positive) on participation. Second, the empirical model lacks a satisfactory life-cycle framework. For instance, it does not consider the financial reward to delaying retirement another year. Third, the potential endogeneity of the self-reported health limitation is not explicitly treated.

[89] SLADE, FREDERIC P.: "Retirement Status and State Dependence: A Longitudinal Study of Older Men," Journal of Labor Economics, 5 (1), January 1987, 90-105.

Objective: This article investigates the extent to which retirement status at a point in time is dependent on retirement status in previous periods. A dynamic retirement model is estimated which distinguishes between apparent and true state dependence.

Data Set: Data on 3,543 men from the 1969 and 1971 waves of the Retirement History Study. Respondents were aged 58-62 in 1969.

Definition of Retirement: No paid work during the survey year.

Estimation Method: Variance components model; probit analysis.

Findings: The major contribution of this paper is to investigate the importance of "apparent" and "true" state dependence in retirement models. State dependence is said to occur when observed status in period t is not independent of status in period $t-1$. Apparent state dependence is caused by unobserved differences among workers that persist over time. True state dependence occurs when past decisions influence current decisions.⁵⁴

A variance-components model is estimated in which the error term comprises a fixed component unique to each individual, and a serially independent, transitory component with zero mean and constant variance. The dependent variable is labor-force participation. Regressors include education level, race, marital status, a health limitation dummy, a

⁵⁴In this case an experience alters preferences or constraints that condition future choices.

private pension eligibility dummy, assets, annual earnings, and the present value of Social Security retirement benefits. Earnings values for nonparticipants were calculated with a selectivity-corrected auxiliary wage equation. The inclusion of a term to account for the correlation between error terms across the two periods substantially increases the value of the model's estimated log-likelihood, providing evidence of apparent state dependence.

A second probit model is estimated in which labor-force "exits" are a function of education, race, marital status, a health limitation, pension coverage, and three variables entered in both their level and change form: assets, earnings, and Social Security retirement benefits. True state dependence arises when the 1969 survey values affect exit behavior in 1971. If this dependence did not exist, then only the change in the values of these explanatory factors should affect the probability of an exit, not their prior period values. Strong evidence of state dependence is found. The prior level of assets and a self-reported health limitation increase the probability of early retirement, while the level of earnings has a negative impact. The change in assets and change in Social Security benefits variables have no significant effect.

Comments: This is a well-executed study that produces two important results. First, approximately one-half of the unexplained variation in the retirement decision is explained by unobserved permanent differences among workers. Second, if true state dependence is not controlled for in the estimation procedure, the effects of "change" variables on exits are overstated, while the effects of "levels" variables are understated.

An important limitation in this analysis is the manner in which life-cycle considerations are addressed. Retirement at a given age is likely to be a function of the financial rewards to delaying exit another year. This type of variable is not included in the estimated models.

[90] SUEYOSHI, GLENN T.: "Social Security and the Determinants of Full and Partial Retirement: A Competing Risks Analysis," NBER Working Paper No. 3113, Cambridge, MA: National Bureau of Economic Research, September 1989.

Objective: This paper examines the factors that influenced retirement patterns during the 1970s. It seeks to identify and measure the factors that determine the timing of retirement, as well as whether the initial transition is to partial or complete retirement.

Data Set: 1,633 males selected from the 1971-79 waves of the Retirement History Study.

Definition of Retirement: Complete retirement is denoted by withdrawal from the labor market. A person is "partially retired" if he works less than 35 hours per week or less than 46 weeks per year.

Estimation Method: Maximum likelihood estimation of competing-risks, hazard models.

Findings: Sueyoshi documents the importance of partial retirement by noting that approximately one-third of the RHS sample reports partial retirement at some point during the 10-year survey period. For those persons who first partially retire, and then later make the transition to complete retirement, the mean duration of the partial retirement state is 5.5 years. Median work effort for this group is about 20 hours per week. Graphs of the simple hazards for the two types of retirements show that the "risk" for partial retirement is nearly constant with age, but the risk of complete retirement has a sharp spike at age 65.

Most duration retirement studies assume a single type of retirement. This paper permits competing risks to be analyzed, and allows for potential correlation between the two risks. The variables used in the analysis include controls for individual differences as well as economic factors. These include the number of persons in the household, education, poor health, spouse-present, non-white, the presence of mandatory retirement provisions, occupation indicators, earnings, wealth, pension eligibility, and Social Security benefits. The Social Security benefits are entered in two ways. First, the real value of benefits that would be received if retirement occurred at age 62 was calculated from individual earnings records. The benefits that would be received at age 65 (including adjustments for the automatic benefit recomputation provision as well as the increases in generosity of the OASI system) were then computed; the difference between the age-62 value and age-65 value is then used to measure the incentive to delay retirement.

Social Security has a differential impact on the two risks. It increases the probability of complete retirement primarily as the size of benefits available at age 62 increases; however, this has little impact on the likelihood of partial retirement. The change in benefit amounts available when retirement is delayed between age 62 and age 65 has little effect on the decision to retire completely, but lowers the probability of partial retirement.

Sueyoshi reports one unusual result. The level of earnings has a negative effect on the partial retirement risk, and virtually no effect on complete retirement. The prior expectation was that the effect on both probabilities would be

negative. This finding is consistent with the view that only people with high earnings are subject to the earnings test penalty. Thus, the Social Security system may lower the probability of part-time employment for those with high earnings. The paper does not explore this possibility.

Effects are larger when the two competing risks are assumed to be uncorrelated. The results support the view that the correlation between risks is associated with unobserved individual preferences for leisure.

The results indicate that partial retirement is a behaviorally distinct mode. Changes in Social Security during the 1970s contributed to the decline in labor-force participation among the elderly only modestly. Early full retirement probabilities increased less than 5 percent, while the probability of partial retirement fell by about 1 percent.

Comments: These results imply that policies that increase benefits levels and increase the amount by which benefits increase when retirement is postponed between ages 62 and 65 will prompt people who might otherwise partially retire to fully retire.

[91] VROMAN, WAYNE: Older Worker Earnings and the 1965 Social Security Amendments. Social Security Administration, U.S. Department of Health, Education, and Welfare, Office of Research and Statistics Research Report No. 38, 1971.

Objective: This study examines three components of the 1965 amendments that were likely to influence the earnings of older workers: an increase in monthly benefits, liberalization of the retirement earnings test, and the advent of Medicare. The effects on earnings and retirement rates are investigated using data for the 1962-67 period.

Data Set: The Social Security Administration's Continuous Work History Sample. Excluded from the sample were persons who died before the end of 1967, two groups who experienced major income changes because of the 1965 amendments (physicians and persons made eligible for retirement benefits under the 1965 amendments), disability beneficiaries, and anyone with no reported earnings over the entire 1937-67 period.

Definition of Retirement: Two definitions are used: a person is retired if he receives one or four consecutive months of Social Security retirement benefits.

Estimation Method: Ordinary least squares.

Findings: The 1965 amendments to the Social Security Act contained three features that could conceivably influence retirement and work decisions. First, the amendments liberalized the earnings test. Immediately prior to 1965 the annual exempt amount was \$1,200. Earnings between \$1,200 and \$1,700 were taxed at a 50 percent marginal rate; earnings above \$1,700 per year were taxed at a 100 percent marginal rate until benefits were exhausted. These two limits were raised to \$1,500 and \$2,700 starting in 1966. Second, the Medicare program was enacted, requiring eligible parties to enroll for program coverage. At enrollment, the Social Security retirement program would also be explained. Third, retirement benefits would be raised by 7 percent, effective retroactively to January 1, 1965.

CWHS data for the years 1962-67 were used to test the effect of the amendments on labor-force activity among retirees. The proportion of beneficiaries with earnings was regressed on age and year-of-birth dummies, an age/sex-specific unemployment rate, and a 1966-67 dummy. Separate regressions were estimated for men and women, and beneficiaries and nonbeneficiaries. Presumably, if there is an effect, it should not be present in the nonbeneficiary groups. In fact, the 1966-67 dummy was statistically insignificant for all groups.

The response of earnings to the amendments was explored using year-to-year earnings-changes and simple regression methods. There was evidence of bunching near the lower earnings threshold both before and after the amendments. No clustering was observed near the higher limit where the 100 percent marginal rate takes effect. Using a simple statistical method, it was estimated that the amendments "caused" men's annual incomes to rise by \$80, and women's by \$65 in 1966.

Retirement rates were regressed on a set of age dummies, age/sex-specific unemployment rates, and a dummy variable for 1965-66. Observations were weighted to correct for heteroskedasticity. Coefficients on unemployment rates were positive and significant only for women using either retirement definition. Prominent peaks in retirement rates occurred at ages 62, 65 and 72, as expected. There was mixed evidence on whether retirement rates were slightly higher in 1965-66, with the strongest effect measured among women aged 62-64, where rates were approximately 5 percentage points higher.

The most striking finding is that over 10 percent of working male and female beneficiaries raised their earnings from about \$1,200 in 1965 to about \$1,500 in 1966 and 1967, apparently in response to the earnings test. Other weaker findings were that the labor-force participation rates among beneficiaries aged 63-72 increased modestly, and that retirement rates increased slightly in 1965 and 1966. It was

not possible to discern which component of the amendments was responsible for this phenomenon.

Comments: This study carefully examines CWS data at both individual and aggregated levels to measure the impact of the 1965 amendments on beneficiaries' labor-force participation, earnings, and retirement rates. Recent research in this area suggests that this data source and the simple statistical procedures used are not sufficiently detailed and precise to measure the effects of specific Social Security provisions accurately. Keeping in mind that the many relevant aspects of the problem are now substantially different, this study does suggest that modifications of an earlier, and more strict, version of the earnings test did not lead to large labor-supply responses.

[92] VROMAN, WAYNE: "Some Economic Effects of the Social Security Retirement Test," in Research in Labor Economics, Vol. 7, ed. Ronald G. Ehrenberg, Greenwich, CT: JAI Press, 1985, 31-89.

Objective: The retirement earnings test was substantially liberalized during the 1970s. This paper investigates the test's effects on earnings, labor supply, and poverty among Social Security beneficiaries.

Data Set: U.S. Department of Labor's Monthly Labor Force Survey (various); 1978 CPS-SER-MBR Exact Match file.⁵⁵

Definition of Retirement: None used directly in the author's calculations.

Estimation Method: None.

Findings: During the 1970s the annual exempt amount of earnings permitted under the earnings test increased each year. There was always a concentration of working beneficiaries with earnings at or just below this limit. When the limit moved upward, the clustering adjusted as well. After 1977, when a lower annual exempt amount was instituted for retirees aged 62-64, there was some clustering of their earnings at the lower limit. There was no clustering observed in the earnings of beneficiaries younger than 60 or older than

⁵⁵This source merges records from the Census Bureau's Current Population Survey (CPS), with the Social Security Administration's Summary Earnings Record (SER) and Master Beneficiary Record (MBR).

72. Most beneficiaries aged 62-71 do not work, but the earnings of those who do appear sensitive to the RET.

During the 1970s the annual exempt amount increased at a faster rate than average beneficiary earnings. The clustering phenomenon has become less pronounced over this period, suggesting that the large increases in allowable earnings have made the test less restrictive for many retirees who would like to work. Labor-force re-entry rates appeared to be insensitive to changes in the annual limit. Finally, the test appears to have a negligible impact on poverty among the aged because most poor beneficiaries have no earnings.

Comments: Simple statistical methods are used on a rich data source in one of the best analyses of the retirement earnings test. Vroman's conclusions appear to be well supported by the evidence cited.

[93] WOLFE, J.R.: "Perceived Longevity and Early Retirement," Review of Economics and Statistics, 65 (4), November 1983, 544-51.

Objective: Studies of early retirement might be classified into two groups: those that see poor health as the primary determinant, and those that view the decision to retire early as determined primarily by economic factors that influence life-cycle work plans. This paper examines the link between the financial attractiveness of early retirement and life expectancy.

Data Set: Men born between 1900 and 1912, fully insured by age 62, selected from the Social Security Administration's Continuous Work History Sample. The sample used in the estimation excludes anyone receiving disability benefits after age 62, those never claiming retirement benefits, and those claiming retirement benefits after age 65.

Definition of Retirement: Receipt of Social Security benefits.

Estimation Method: Weighted least squares estimation of a logit regression on grouped data. Each worker is treated as a separate observation for each year, but workers with identical values of the independent variables are grouped.

Findings: When the early retirement option was introduced (1956 for women, 1961 for men), it was thought that the actuarial adjustment was fair, on average, and that the expected value of lifetime benefits was invariant to the timing of retirement between ages 62-65. This, however, is

true only for persons with average life expectancies. Persons with low life expectancies can increase the value of expected benefits by claiming them as early as possible, while those with long life expectancies have an incentive to delay acceptance until age 65. Adverse selection should cause the trust fund liabilities to rise due to the early retirement option.

This paper estimates a mortality equation in which age of entitlement is an explanatory factor. The fraction of a group dying during a specific calendar year (transformed) is regressed on current age, a set of dummies for the age at which initially entitled, birth year, and two dummies that indicate whether a person had very low or high Social Security earnings. The age of entitlement dummies are statistically significant in predicting mortality, but the effects appear to be of minor importance. The present value of total benefits for men who claimed benefits at age 62 are 5.3 percent greater than they would have received had they delayed receipt until age 65. The model predicts that men who began collecting benefits at age 65 could have increased their present value by 1.2 percent if they had applied at age 62.

Comments: The results support the view that perceived longevity affects the timing of benefit receipt.

[94] ZABALZA, A. AND D. PIACHAUD: "Social Security and the Elderly: A Simulation of Policy Changes," Journal of Public Economics, 16 (2), October 1981, 145-69.

Objective: This paper simulates the labor-supply response to several policy changes in the UK social security system. These include increasing benefit levels, abolishing the earnings test, changing the normal retirement age, and introducing a system of flexible retirement.

Data Set: Cross-section data on 1,479 men and 1,198 women collected for 1977 by the British Office of Population Censuses and Surveys.

Definition of Retirement: No labor-force participation.

Estimation Method: None used.

Findings: At the time these data were collected, the normal retirement ages for men and women were 65 and 60, respectively. Men aged 65-69 and women aged 60-64 were subject to an earnings test. The exempt amount was 35 pounds per week. Between 35 and 39 pounds, the benefit reduction rate was 50 percent; earnings in excess of 39 pounds were

subject to a 100 percent penalty rate until benefits were exhausted. A delayed retirement credit (DRC) of 6.5 percent was available for deferred pensions.

The basis for the simulation model is a previously-estimated econometric specification in which workers select among three levels of work activity: full-time work (30 or more hours per week), part-time work (less than 30 hours of work per week), and retirement (no work). Utility in each state depends on both income levels and leisure. The fixed number of hours associated with each regime is given by the average number of hours worked in each category. People select the state that produces the highest utility level. The model generates a set of three probabilities that measure the likelihood that the individual chooses each of the work regimes. Policy changes alter both the net income associated with each work state, and the probability of choosing each state. The effects of policy changes are predicted by comparing the aggregated expected values of variables of interest (e.g., work hours, income taxes, social security payments, and the like) both before and after the change. The model predicts that a 20 percent increase in benefit levels would increase the number of retired persons by about 2 percent, and that abolition of the earnings test would have a negligible impact on work and retirement patterns.

Comments: The usefulness of this study for understanding the U.S. Social Security system is primarily methodological. The paper provides a solid theoretical basis for developing simulation models of labor supply and retirement behavior that recognize that many labor-supply responses to policy changes are not likely involve adjustments at the intensive margin, but rather discrete switches between different work regimes.

[95] ZABALZA, A., C. PISSARIDES, AND M. BARTON: "Social Security and the Choice between Full-Time, Part-Time Work, and Retirement," Journal of Public Economics, 14 (2), October 1980, 245-76.

Objective: The determinants of retirement decisions in Great Britain are investigated using a discrete-choice labor-supply model in which older workers choose among three work-states: full-time work, part-time work, and complete retirement. The article provides a convenient econometric methodology for summarizing complex, nonlinear budget constraints with a small set of points.

Data Set: Cross-section data on 1,483 men and 1,207 women collected for 1977 by the British Office of Population Censuses and Surveys.

Definition of Retirement: No labor-force participation.

Estimation Method: Maximum likelihood.

Findings: Choice of work state is assumed to be determined by maximizing a constant elasticity of substitution (CES) utility function that depends on leisure, net income, a vector of personal characteristics, and an unobserved stochastic taste component. The budget constraint is approximated by a set of three net income-leisure pairs. Economic policies change the net income associated with different levels of work, perhaps resulting in a switch to a new work regime that maximizes utility under the changed circumstances. The equilibrium conditions for utility maximization provide a natural basis for constructing the likelihood function for the sample observations.

The individual's net income position, inclusive of taxes, pensions, and social security payments, is calculated for each of the three possible work states. Personal characteristics included in the model are a dummy variable for poor health, age, a dummy indicating whether a person is old enough to receive social security payments, a dummy for a "waiting wife,"⁵⁶ marital status, a dummy for a working spouse, and a dummy for involuntary loss of main job.

The estimated elasticity of substitution for men was 0.25, and 1.30 for women, indicating that indifference curves are more convex for males. Greater convexity of the indifference curves for males implies that women are more responsive to financial incentives. Old age and poor health were strong indicators of retirement. There was evidence of a discrete shift in the marginal rate of substitution in favor of leisure at the normal retirement age for both sexes.

In general the model does a fairly good job of assigning people to their correct work states; however, it was least accurate at assigning people to the part-time work category.

Comments: This article presents a tractable retirement model that provides a simplified framework for analyzing the work-retirement decision while addressing a number of the complexities suggested by modern theoretical treatments.

⁵⁶Women older than 60 whose husbands are not yet 65 cannot receive a state pension.

DATA SOURCES USED IN THE STUDIES
(Numbers refer to the study number in the text)

<u>Source</u>	<u>Study Number</u>
Aggregate U.S. Time Series	17, 19, 32, 59, 64, 67, 80
Anonymous employer	63
Bankers Trust Pension Data	59
Benefits Amounts Survey	33, 65
BLS Level of Benefits Survey	62
Current Population Survey (CPS)	30, 56, 66, 92
CPS-IRS-SSA Exact Match, 1973	14, 74-75, 92
Continuous Work History Sample	67, 85, 91, 93
Decennial Census of the U.S., 1980	35
Michigan Study of Auto Workers	13
National Longitudinal Survey of Mature Men	5, 24, 28-29, 61, 68-71, 73
New York State Employee Personnel files	53
Panel Study of Income Dynamics	10, 38, 48
Retirement History Study	1-4, 6-9, 11, 15-16, 18, 20-23, 26-27, 34, 36-37, 39-42, 44-47, 51-52, 54-55, 58, 60, 68, 76-79, 81-83, 86-90
Survey of Consumer Finances	43
Survey of Disabled and Nondisabled Adults, 1978	49
UK Population Survey, 1977	94-95

RETIREMENT DEFINITIONS USED
(Numbers refer to the study number in the text)

<u>Definition</u>	<u>Study Number</u>
Accepting a private pension	13, 33, 50, 53, 62, 65, 68-69
Accepting Social Security retired-worker benefits	14, 24, 49, 68-69, 75, 91, 93
No labor-force participation	1-5, 11-12, 26, 30, 35-37, 44-46, 48, 51-52, 58-59, 67, 69-74, 77-78, 80, 87-89, 94-95
Leaving a full-time job	15-16, 28, 34, 62-62, 79
Reduction in earnings	54-55
Reduction in hours worked	4, 10, 20-21, 68-69, 81, 86, 90
Self-assessed (person claims to be retired)	6-7, 22-23, 29, 38-43, 47, 60-61, 69, 76, 82-83

STATISTICAL PROCEDURES USED
(Numbers refer to the study number in the text)

<u>Method</u>	<u>Study Number</u>
Competing risks, hazard	23, 29, 90
Conditional ordered logit	34, 65
Discrete multivariate analysis	39
Hazard model	22, 28-29, 47, 82
Instrumental variable estimation	6
Maximum likelihood	20-21, 37, 40, 42, 81, 95
Multiple Classification Analysis	69
Multinomial logit	3, 5, 26, 44-45, 93
Multivariate logit	1-2, 13, 15-16, 36, 51-52, 54-55, 68, 79, 82
Nonlinear two-stage least squares	11
Ordinary least squares	6-7, 13, 15-17, 19, 32-33, 35, 41, 46, 59, 61, 64, 66-68, 76-77, 82, 91
Probit Analysis	4, 14, 48, 53, 70-71, 73, 87-89
Random Effects	63, 86
Three-stage least squares	46
Two-step probit-OLS	60, 74-75
Variance-components	30, 89