

The Effects of Social Security Reforms  
on Retirement Ages and Retirement Incomes

Gary S. Fields

Cornell University

Olivia S. Mitchell

Cornell University

National Bureau of Economic Research

*Journal of Public Economics* (1984), 25, 143-159

Both authors are equally responsible for the contents of this paper; first mention is determined randomly. Invaluable assistance was provided by Vivian Fields. Helpful comments on an earlier draft were provided by Steven Sandell. Financial support from the National Commission for Employment Policy is gratefully acknowledged. The research reported here is part of the NBER's research program in Labor Studies. All opinions are our own.

## Abstract

Recent changes legislated in the U.S. Social Security system have altered the economic incentives to work and retire. Some older workers will respond to these new incentives by retiring at different ages. This paper evaluates the signs and magnitudes of these responses. Four specific changes in the structure of Social Security benefits are examined: raising the normal retirement age, delaying the cost-of-living adjustment, lowering early retirement benefits, and increasing late retirement payments. Behavioral parameters are estimated using an ordered logit model of retirement ages; these are used to predict how retirement behavior might respond to each of the four reforms. Predicted changes in retirement ages will be too small to compensate retirees for reductions in benefit formulas. Thus, the Social Security's financial burden will be eased, but retirees' incomes will fall on average.

## 1. Introduction

In the last decade many countries have come to recognize that people are devoting ever-shorter portions of their lives to work, despite living ever longer. Lengthening retirement periods imply growing financial pressure on both private sector and governmental pensions, giving rise to heated policy debate over what is to be done. The U.S. Congress recently moved beyond debate by legislating a series of changes in Social Security, the U.S. government-sponsored pension program. This paper presents an economic analysis of such reforms. In so doing, we also provide an overview of the determinants of retirement ages and retirement incomes, which should prove useful to economic analysts interested in evaluating other pension reform proposals in different contexts.

The estimates presented below incorporate older workers' budget sets and preferences observed in previous retirement studies. Governmental and private pension schemes are highly complex; see, for instance, Mitchell and Fields (1984b) for the United States, and Zabalza et al. (1980) for Great Britain. Sections 2 and 3 of the present paper detail the form and structure of retirement income options confronting older workers before and after the reforms of interest.

Regarding preferences, earlier research on retirement has shown that workers are heterogeneous [Mitchell and Fields (1984a), Gustman and Steinmeier (1983b)]. Some are work-lovers and some leisure-lovers. Our estimation method, ordered logit, allows for correlation of preferences across retirement ages for the same worker. The estimated parameters are presented in section 4.

The core results appear in sections 5 and 6, predicting changes in retirement ages and retirement incomes, respectively. Of the specific reforms examined, we find that lowering early

retirement benefits has the largest impact on retirement ages, while delaying cost of living adjustments or raising late retirement credits have little effect. Increasing the normal retirement age has an intermediate impact. Retirement incomes are affected most by increasing the normal retirement age, next most by lowering early retirement benefits, and least by delaying cost of living adjustments or raising late retirement credits. The model is partial equilibrium in spirit, examining changes in Social Security holding constant pension and wage structures.

Conclusions appear in section 7.

## **2. Retirement incentives prior to the reforms**

In order to understand how Social Security reforms will affect retirement incomes and retirement behavior, it is first necessary to construct the intertemporal budget set facing older workers prior to the reforms. Unfortunately, there are no publicly available data which can be used to determine income streams or retirement patterns for the current cohort of older workers. Instead, we draw on an earlier data file of workers known as the Longitudinal Retirement History Survey (LRHS) and update this file to reflect the positions of workers currently reaching retirement age.

The LRHS file is a longitudinal data set first fielded by the U.S. government in 1969, covering several thousand older individuals and their spouses. From the group originally surveyed we selected a sample of 1024 white married male employees between the ages of 59 and 61 in 1969. The age group restriction ensures that retirement patterns can actually be observed during the ensuing waves of the survey; data were collected on these individuals through 1979. The sample is also limited to employees since the concept of retirement is poorly

defined for self-employed persons. The bedridden and seriously ill are excluded since economic incentives will probably play a rather different role for this group as compared to the reasonably healthy group of older male employees. Finally, we focus on a sample of private sector workers since we have no data on occupational pensions for government workers.

The LRHS is extremely valuable for analysis of older workers' retirement patterns since it provides a great deal of detailed information on income and work patterns. Retirement is defined here as the age at which a worker left his 1969 job, computed by comparing each individual's job in later years with that held in 1969.<sup>1</sup> Earnings histories are provided in the survey from 1951 onward; these were used to estimate what each individual could have earned if he worked between ages 60 and 68.<sup>2</sup> Earnings histories are also the basis for calculating Social Security benefits, as described in section 3 below. Private pension benefits are somewhat more difficult to obtain, since the LRHS reports only imperfect measures of benefits workers anticipate receiving upon retirement. The survey did indicate when a worker would be eligible for such a pension; this allowed us to proxy benefit amounts for retirement at age 65 using industry-level benefits reported by Kotlikoff and Smith (1983). For retirement at other ages, benefit amounts were adjusted using quasi-actuarial factors reported by Schulz and Leavitt [reported in Burkhauser and Quinn (1980)].

To estimate the effects of Social Security reforms in the 1980s, the LRHS data must be brought up to date. This is accomplished in three simple steps.

---

<sup>1</sup> Our analysis with other data sets has indicated that this definition of retirement produces estimates of behavioral responses that are virtually identical to those generated from other definitions of retirement; see Fields and Mitchell (1984).

<sup>2</sup> Reported earnings up to the Social Security taxable earnings maximum were converted to estimated earnings using a procedure reported in Fields and Mitchell (1984).

(1) Earnings. Pre-tax earnings are adjusted upward by assuming that older workers' wage profiles grew at the same pace as did the average worker's wage between the 1970s and 1982. Post-tax earnings for the synthetic cohort are computed using federal income tax formulas and Social Security payroll taxes in effect in 1982.<sup>3</sup>

(2) Social Security. Social Security benefits are updated by using the 1982 rules relating benefits to earnings during the worker's lifetime.<sup>4</sup> During the 1970s, Social Security benefits rose more rapidly than inflation due to inadvertent double-indexing. However, this has been corrected so that real Social Security payments using the 1982 rules rise in proportion to increases in the consumer price index.

(3) Private pensions. Private pension benefits relevant to workers retiring during the 1980s are updated by computing their value in 1982 dollars assuming no real growth. Since the earlier pension profile showed that benefits fell in real terms after retirement, so too does the updated pension profile. Net pension benefits are obtained by reducing each worker's pension amounts by the federal income tax rate relevant to him using the 1982 tax tables.<sup>5</sup>

In all of these computations we develop the intertemporal budget set in a certainty framework. The empirical computations thus answer the question: What income alternatives would the worker anticipate receiving in the future, as viewed from the vantage point of age 60? This approach is consistent with virtually all theoretical studies of the retirement decision, and with all previous empirical work. We are aware that such stochastic events as the onset of ill health or unanticipated inflation render the environment uncertain. Although retirement plans

---

<sup>3</sup> The income tax computations assume that each married worker files jointly with his spouse. Actual taxes paid are not reported in the data file. Data on private pension contributions are likewise not reported. However, most workers do not contribute directly to their company-sponsored pension plan, implying that this omission is not serious.

<sup>4</sup> These rules appear in the Social Security Administration's *Social Security Handbook*.

<sup>5</sup> Again it was assumed that the married retiree filed jointly with his spouse.

may change in reaction to such an unexpected event, these changes have not been incorporated in the development of the intertemporal budget set. To analyze them in a more comprehensive framework would require stochastic dynamic programming, a task beyond the scope of the current literature and the present paper.

The components of the 1982 budget set thus devised appear in the top panel of table 1. Here are displayed the annual real income amounts that a worker with average characteristics (the ‘illustrative worker’) would have anticipated receiving if he retired at the alternative retirement dates depicted. All figures are given in 1982 dollars. Retirement ages between 60 and 68 are the focus of empirical attention since our earlier analysis demonstrated that the overwhelming majority of workers retire between these dates; in fact the average retirement age for our sample is around age 63, with few retiring earlier than 60 or later than 68.

These calculations assume that the covered worker may receive a private pension if he retires at ages 60 or 61, but consistent with Social Security rules, he must wait to file for governmental pension benefits until the age of 62. For other ages, benefits are computed assuming the worker files for Social Security and private pensions in the year he retires. A married woman is assumed to file for spouse’s Social Security benefits when he retires, or when she turns age 62 if she were younger than that.

The bottom panel of table 1 provides the corresponding present discounted values associated with the flow given in the top panel. They are computed incorporating the probability of not surviving to the age in question, and in addition imposing a 2 percent real discount rate. Total lifetime income amounts net of taxes are displayed in the last row of table 1, indicating the real value of working until a specific age, and then accepting the company and Social Security pension after that.

---

Insert Table 1 Here

---

The individual-level data underlying table 1 are used in three ways in what follows. First, they are used as a standard against which several Social Security reforms may be compared. Second, they are used to derive predicted retirement ages using behavioral estimates. Last, they are employed to predict changes in income streams and retirement ages under the various reforms. We take these up in turn.

### **3. Retirement incentives in four reform scenarios**

Four specific reforms are simulated in this paper: increasing the normal retirement age, delaying the cost-of-living adjustment, raising the late retirement credit, and changing the early retirement reduction factor.<sup>6</sup> In order to evaluate how each alters retirement incentives, some explanation is needed on how Social Security benefits in the United States are determined.

A first step in computing benefits is to find each worker's Average Indexed Monthly Earnings (AIME). The AIME is found by: indexing earnings up to the Social Security taxable maximum in each year between 1951 and age 60; comparing these to nominal earnings, if any, after that age; selecting the highest (for example, a worker turning age 60 in 1982 would have his highest 28 years of earnings included); converting to a monthly basis; and averaging.

---

<sup>6</sup> In these calculations, the earnings and private pension elements of the underlying budget set are assumed to be unaffected by changes in Social Security legislation. Accordingly, the estimated effects of the various policy reforms on retirement ages should be thought of as first- round estimates. Future research should consider the responses of pension plans and earnings profiles to Social Security reforms.



The second step in calculating Social Security benefits is to determine the worker's Primary Insurance Amount (PIA). In 1982, PIA was determined from AIME according to the following formula:

90 percent of AIME up to 'BEND POINT 1'  
 plus  
 32 percent of AIME between 'BEND POINT 1'  
 and 'BEND POINT 2'  
 plus  
 15 percent of AIME above 'BEND POINT 2'.

In real 1982 dollars, 'BEND POINT 1' = \$230 and 'BEND POINT 2' = \$1388, both in monthly terms; in future years, the bend points will increase with the Consumer Price Index (thus remaining the same in real terms).

The third step is to compute the worker's Social Security benefit as a multiple of the PIA:

worker's benefit = PIA \* multiple.

This multiple equals 1.00 if the worker is age 65 when he begins to collect benefits; this is the 'age of retirement' from the point of the view of the Social Security system. *Early retirement reduction factors* are applied to workers commencing benefits before age 65, and *delayed retirement credits* awarded to workers waiting until after age 65 to retire. The multiples for retirement ages other than 65 are determined from these early retirement reduction factors and delayed retirement credits.

The final step is to add in spouse's benefits, if any. The wife is eligible to receive benefits based on the worker's PIA. At age 65, she receives a benefit equal to 50 percent of her husband's

PIA, regardless of whether he retired at age 65, earlier, or later. If the wife is 62 or over but not yet 65, she may receive a reduced benefit; the reduction is at the rate of 8.33 percent per year.

The four Social Security reforms examined here operate primarily by affecting the multiples. The 1982 rules and the reforms simulated are explained with the aid of fig. 1. Here 1982 rules are depicted in the top panel and, for ease of comparison, are redrawn as lighter lines in each of the remaining panels.

Under the 1982 rules, the early retirement reduction factor was 6.66 percent per year and the delayed retirement credit 3 percent per year, both figured to the nearest month. So, for example, a worker retiring at age 62 would receive a Social Security benefit that is 20 percent less than his PIA (6.66 percent reduction per year times 3 years under age 65); his multiple at age 62 is thus 0.80. That same worker, if he waited to retire until age 68, would receive a Social Security benefit that is 9 percent greater than his PIA (3 percent credit per year times three years); his multiple at age 68 is thus 1.09.

The four Social Security reforms actually simulated can now be described.

*Experiment A. Increasing the normal retirement age* means that the individual no longer receives his full PIA if he retires at age 65. We simulated the effect of raising this age to age 68, as was widely proposed. (What in fact was legislated was a change to age 66 by the year 2009 and to age 67 by the year 2027.) Under the simulated reform, the multiple becomes 1.00 at age 68 and the early retirement reduction factor remains at 6.66 percent per year. Thus, the multiples under this experiment are 0.60 for retirement at age 62 and 0.80 for retirement at age 65, with corresponding reductions at other ages. (The 1983 legislation set a minimum multiple of 70 percent.)

*Experiment B. Delaying the cost-of-living adjustment.* Rules in effect in 1982 specified that cost-of-living adjustments would take place each 1 July, reflecting increases in the Consumer Price Index during the preceding calendar year. The 1983 Social Security amendments delayed these increases by an additional six months. This six-month delay reduces real benefits by half the rate of inflation, or 2.3 percent. This reduction imposes new multiples, as shown in fig. 1.

---

Insert Figure 1 Here

---

*Experiment C. Raising the late retirement credit* means that benefits are increased faster than 3 percent if retirement is postponed beyond age 65. We simulated a 6.66 percent per year late retirement credit the same as the early retirement reduction factor. The multiple for retirement at age 68 would have risen from 1.09 to 1.20. (As it turned out, in 1983 Congress mandated a gradual increase in the late retirement credit eventually reaching 8 percent per year as of the year 2009.)

*Experiment D. Changing the early retirement reduction factor* simulates a proposal tentatively put forth by the Reagan Administration in 1981. This was to reduce early benefits by 15 percent per year, rather than by 6.66 percent. The multiple for retirement at age 62 would therefore have been 0.55 rather than 0.80, as at present. This proposal was initially rejected as politically unpopular and as of this writing, has not been resurrected. Still, it is interesting to predict what might have happened had it been enacted.

Table 2 presents the effects of the four policy experiments on the Social Security benefits of the illustrative LRHS worker described above, while table 3 reports their effects on total

income (PDVY). In these computations the earnings and private pension elements of the underlying budget set are assumed to be unaffected by the simulated changes in Social Security structures. Hence, the estimated impacts of the various reforms on retirement ages should be thought of as partial equilibrium estimates, leaving aside possible responses of pension plans and earnings profiles to changes in Social Security.

Increasing the normal retirement age to 68 (Experiment A) lowers retirement benefits substantially as compared to the pre-reform scenario. Annual payments fall by \$1000 or more regardless of when the worker retires. This translates into PDVY streams which are lower by about \$17 000 for people retiring in their early 60s; the reduction is only somewhat smaller for workers deferring retirement until age 65. Another effect of Experiment A is to tilt the Social Security benefit structure. The system becomes actuarially more advantageous until age 65, such that delaying retirement from age 62 to age 65 actually increases the present value of benefits by some \$4000. The experimental benefit structure is also roughly neutral after age 65, in stark contrast to the pre-reform penalty. In overview, then, increasing the normal retirement age as outlined here lowers benefits at any given retirement age and provides new financial incentives to remain on the job longer.

---

Insert Table 2 Here

---

---

Insert Table 3 Here

---

Experiment B, in which the cost-of-living adjustment has been postponed six months, has a relatively small effect. Annual benefits are reduced by \$100-200, which translates into falls in present discounted values of at most \$1600. Since the income amounts involved are small, this reform does not appreciably alter the pattern of discounted benefit gains obtained by deferring retirement.

Experiment C raises the late retirement credit to match the early retirement reduction factor. Benefits are increased after age 65, raising annual benefits by as much as \$800 at age 68. Present value at age 68 increases by \$6000 — still not enough to achieve actuarial neutrality, but substantially reducing the penalty (in PDV terms) for continuing to work beyond age 65.

Experiment D would have lowered early Social Security benefits, holding benefits beyond age 65 the same. For a worker retiring at age 62 or before, the annual benefit would have fallen by \$1700 and present discounted value by some \$21 000. The gain in present discounted value of Social Security benefits for an extra year of work before age 65 would have been \$60009000. This reform would have created a powerful penalty for retiring early and a powerful incentive for continued work. Yet, as we shall see, even those forces would not change retirement ages very much.

#### **4. Preferences for income and leisure**

The next step is to evaluate how workers would be likely to respond to the changes brought by Social Security reforms such as those described above. To do this, it is necessary to obtain behavioral parameters indicating how older individuals weigh income and leisure. An econometric approach that proved fruitful in our earlier study [Mitchell and Fields (1984a)] is to

model retirement in a discrete choice framework. Following McFadden (1974), we posit that the utility of the  $i$ th worker if he retired at age  $j$  is:

$$U_{ij} = [\alpha \ln PDVY_{ij} + \beta \ln RET_{ij}] + e_{ij}^7$$

The term in square brackets is the ‘strict utility’ component for the average person, varying of course with values of income and leisure at different ages. The disturbance term  $e_{ij}$  is independent across people; this assumption is quite conventional in labor supply models. In other contexts it is also conventional to require  $e_{ij}$  to be uncorrelated across different choice alternatives for a given person, as for instance would be the case if the discrete choice model were estimated using a logit technology. However, in the retirement setting, there is strong reason to believe the correlation between unobserved tastes for nearby retirement ages may be important — particularly if individuals are ‘workaholics’ or ‘leisure-lovers’.

Allowing for this sort of correlation is feasible within a conditional ordered logit (OL) setup, where the probability of choosing one specific retirement age is allowed to depend on the attractiveness of immediately adjacent retirement ages.<sup>8</sup> Using that model we obtain estimates of  $\alpha$  and  $\beta$  which are significantly nonzero by conventional levels, and of the anticipated signs: both income and leisure are shown to be important determinants increasing older workers’ utility. In relative terms, the estimated coefficients ( $\alpha/\beta = 1.4/2.3 = 0.61$ ) suggest that a

---

<sup>7</sup> This form for the utility function is consistent with evidence indicating that the substitution elasticity for older workers is very close to  $-1$ ; see Gustman and Steinmeier (1983).

<sup>8</sup> This model, due to Small (1982), is described in more detail in Mitchell and Fields (1984a). Essentially the probability of selecting retirement age  $j$  from among several ordered alternatives is described as:

$$P_j = \frac{\exp(a \ln PDVY_j + b \ln RET_j + N_j)}{\sum^K \exp(a \ln PDVY_k + b \ln RET_k + N_k)}$$

where  $N_k = -1/2 [\ln(1/2) + \ln(1 + P_{j-1}^0/P_j^0) + \ln(1 + P_{j+1}^0/P_j^0)]$  and  $P^0$  = the probability of selecting retirement age  $k$  in a conventional multinomial logit model. As is always the case in logit models, the coefficients are identified up to a factor of proportionality only (e.g. the utility of alternative states relative to one particular state used as the standard of comparison).

percentage increase in leisure would be weighted relatively more "heavily than the same percentage increase in income. We note in passing that the ordered logit model proves to be sensible on statistical grounds, since the data reject the hypothesis that the disturbance terms are uncorrelated across individuals.<sup>9</sup> Thus, all policy evaluations reported below utilize the theoretically and statistically preferable coefficients from the ordered logit model.

### **5. Effects of social security reforms on retirement ages**

Predicting the effects of the Social Security reforms on retirement ages requires three steps. First the OL coefficients are used to predict each sample individual's probability of selecting all available retirement ages, under the pre-reform budget set. Next we predict retirement ages under all four experimental budget sets. Finally we average over individuals. Thus, the results appearing in the first column of table 4 refer to averages over the sample as a whole, not just to the illustrative worker described above.

---

Insert Table 4 Here

---

We find that the estimated retirement age responses vary depending on the experiment performed.

(1) The largest retirement age response is observed for the experiment which cuts benefits at the earliest retirement age while offering a larger reward to continued work before age

---

<sup>9</sup> Both the Small (1981) test and the Hausman-McFadden test (1981) described in Mitchell and Fields (1984a) reject the hypothesis that the ordered logit coefficients are identical to those that would be obtained using an ordinary multinomial logit model.

65 (Experiment D). The likely response to this reform would be about a three-month delay in the retirement age, on average.

(2) Intermediate retirement responses are observed for the experiment which lowers benefits by approximately the same dollar amount at every age but leaves unchanged the incentive to remain working an additional year. This is accomplished by changing the normal retirement age (Experiment A). This would be predicted to delay retirement by about one and a half months, on average.

(3) The smallest responses are obtained in cases where income incentives for early retirement are altered the least. This is true for delaying cost-of-living adjustments (Experiment B), in which benefits at each retirement age are reduced somewhat. It is also true of the experiment to raise the late retirement credit (Experiment C), since early retirement benefits are unaffected and most workers retire prior to age 65. Each of these reforms would be predicted to delay retirement by less than a week, on average.

Overall, the four policies simulated here generate only very small changes in retirement behavior — changes in lifetime income of as much as 20-30 percent at some ages would result in at most a three-month deferral.<sup>10</sup>

Our findings are generically similar to those generated from other empirical models of older workers' labor supply. Burtless and Moffitts (1984) results are of the same order of magnitude as ours; their model indicates that changing Social Security benefits by 10 percent would affect retirement ages by about one month. Hausman and Wise (1983) evaluate how retirement ages would differ if Social Security primary insurance amounts (PIA) had remained

---

<sup>10</sup> Simulations using coefficients from a conventional multinomial logit (MNL) model were also evaluated for three of the four experiments. The two sets of results differed by less than one month in all cases: Experiment A, +1.6 months in OL versus +2.0 in MNL; Experiment C, +0.2 months in OL versus +0.3 months in MNL; Experiment D, +2.9 months in OL versus +3.6 months in MNL.



constant from 1969 onwards instead of increasing as they did until 1975. This counterfactual simulation indicates that retirement at age 62 would not have been affected at all; only 3 percent fewer people would have retired at age 65 and about 4 percent fewer at age 66. Since the actual PIA increase was on the order of 50 percent over that period, these estimated responses prove to be quite small indeed. Finally, Gustman and Steinmeier (1983b) estimate the effects of raising the normal retirement age for Social Security benefits from 65 to 67. This reduces early benefits by 10-13.33 percentage points in each year. They estimate that the two-year increase in the normal retirement age would increase actual retirement by about two months; this is somewhat larger than our prediction that a three-year increase in the normal retirement age would increase actual retirement by about 1.6 months, but both are very small. Likewise, they find, as we do, that the cost-of-living adjustment deferral is expected to raise actual retirement by less than one month.

In sum, the numbers that emerge from our study are very close to others' estimates. We all find very small elasticities of retirement age with respect to changes in Social Security benefits: on the order of 0.1 or less. All of these behavioral estimates are an order of magnitude smaller than actuarial assumptions made by functionaries of the Social Security system. Schieber (1982, p. 190) is particularly clear on the assumptions made by Social Security actuaries. Regarding the reform in which the normal retirement age is raised from 65 to 68 he says: The average age at retirement for men is assumed to rise to 65.5 years at the end of the transition, which contrasts with an average retirement age of 63.2 years at the beginning of the simulation' [emphasis added]. Thus, the Social Security actuaries were assuming a 2.3-year response to a three-year increase in the normal retirement age. Our behavioral evidence suggests that this assumption is unwarranted and that the probable response is no more than a tenth of that.

The small retirement age responses predicted from behavioral models have implications for the financial viability of the Social Security system and of workers. First, looking at the Social Security system, the average worker is predicted to make only a marginal change in response to a downward shift in benefit formulas. This means that the Social Security system will have to pay out less to the worker over his lifetime. Furthermore, during the weeks or months of extra work, the system gains additional revenues. The system therefore comes out ahead from these reforms.

Does the financial gain to the Social Security system necessarily imply a corresponding financial loss to Social Security recipients? Not necessarily, if workers respond as the actuaries assume and extend their worklives by enough to retain their old benefit levels. However, the behavioral evidence from several models, including ours, suggests otherwise. Older workers will not give up much leisure. Consequently, the models predict that workers will be rendered poorer. We turn now to estimates of the changes in incomes of retirees.

## **6. Effects of Social Security reforms on retirement incomes**

Table 4 also indicates how each of the four experiments would alter a retiree's Social Security benefits (PDVSS) and total income (PDVY). Two sets of calculations are presented: one assumes the worker is employed until the average retirement age prior to the reforms, and the other allows the retirement age to respond to benefit changes.

At the mean retirement age we find that the present value of Social Security benefits would be reduced by as much as 22 percent. A reduction in PDVSS of this magnitude occurs in Experiment A, which increases the normal retirement age, leaves the early retirement age

unchanged, and maintains the gain for working an extra year (hereafter, the 'tilt') at 6.66 percent per annum.

At the mean retirement age, the present value of remaining lifetime income would be reduced by as much as 10 percent. Once again, the largest reduction is found for Experiment A. The PDVY reductions are smaller than the corresponding PDVSS reductions because PDVSS is just one component of PDVY.

After allowing for the average retirement age to respond to changes in the Social Security benefit structure, PDVSS would still fall by as much as 22 percent and PDVY by 9 percent under Experiment A. The effects are largest under this experiment for two reasons: (i) Experiment A reduces early retirement benefits a great deal, and (ii) Experiment A retains a small incentive for prolonged work.

For the experiment which lowers early retirement benefits while keeping normal benefits the same (Experiment C) the percentage reduction in PDVY is less after allowing for retirement age endogeneity than when retirement ages are held constant. This experiment increases the tilt in the benefit structure as well as reducing Social Security benefits at any given age. The consequent labor supply response would offset about half of the lifetime income reduction that would otherwise take place.

In the other experiments, retirement ages do not change appreciably, so that the effects on PDVSS and PDVY are the same when the retirement age is allowed to vary as when it is taken as exogenously determined.

## 7. Conclusions

This paper evaluated the likely responses of older workers to four reforms in the Social Security benefit formulas: increasing the normal retirement age, delaying the cost-of-living adjustment, raising the late retirement credit, and changing the early retirement reduction factor. We first developed workers' intertemporal budget sets prior to and after the reforms. Next, we evaluated how retirement behavior might respond to these new economic incentives. Finally, new retirement ages and retirement incomes were compared with pre-reform levels. Clearly this approach is readily adaptable to other reform proposals and even other retirement income systems.

For the particular reforms examined here, the largest response is observed for the experiment which cuts benefits at the earliest ages, while offering larger rewards to continued work. The likely response for this change would be about a three month delay in the average retirement age. An intermediate change, of about one and a half months, was predicted in response to increasing the normal retirement age. Very small responses, of less than one week, were obtained for delays in the cost-of-living adjustment or raising the late retirement credit, both of which altered income incentives the least.

Responses of these magnitudes will be too small to compensate retirees for reductions in benefit formulas. Thus, smaller Social Security benefits will be paid to workers. The cut is largest for increases in the normal retirement age, next largest for decreases in early retirement benefits. The Social Security system's financial burden will be eased, but retirees' incomes will fall on average.

Table 1

Table 1  
Components of the 1982 pre-reform budget set for the LRHS illustrative worker<sup>a</sup> (in 1982 dollars).

	If retirement is at age:								
	60	61	62	63	64	65	66	67	68
<b>Annual amounts</b>									
1. Net earnings	16 424	16 265	16 330	16 012	15 882	15 952	15 877	15 845	15 752
2. Net private pension benefits	837	962	1 356	1 875	1 817	1 896	2 128	2 129	2 069
3. Social Security benefit.									
Husband	5 378	5 401	5 456	5 964	6 481	7 017	7 307	7 605	7 610
Wife	2 549	2 579	2 636	2 720	2 823	2 948	3 069	3 190	3 301
<b>Present discounted values</b>									
4. PDVE	0	15 793	30 803	45 238	58 770	71 580	83 836	95 432	106 406
5. PDVPP	4 272	4 697	6 315	8 318	7 657	7 573	8 036	7 575	6 914
6. PDVSS:									
Husband	67 402	67 697	68 387	69 242	69 515	69 341	66 311	63 173	59 928
Wife	25 126	25 245	25 482	25 696	25 836	25 819	25 429	24 782	23 842
Total lifetime income <sup>b</sup> [PDVY = (4) + (5) + (6)]	96 800	113 433	130 988	148 495	161 790	174 315	183 613	190 963	197 092

<sup>a</sup>Computations use 1982 Social Security rules; see text.

<sup>b</sup>Totals may differ from column sums due to rounding.

Table 2

Table 2

Effects of the four experiments on annual and present discounted values of Social Security benefits for the illustrative worker<sup>a</sup> (in 1982 dollars).

	Retirement age								
	60 <sup>b</sup>	61 <sup>b</sup>	62	63	64	65	66	67	68
<b>Annual SS benefits</b>									
Status quo	5 378	5 401	5 456	5 964	6 481	7 017	7 307	7 605	7 910
Experiment A	4 034	4 052	4 093	4 588	5 092	5 614	6 148	6 696	7 256
Experiment B	5 255	5 278	5 331	5 827	6 332	6 856	7 139	7 430	7 728
Experiment C	5 378	5 401	5 456	5 964	6 481	7 017	7 567	8 131	8 707
Experiment D	3 698	3 714	3 752	4 818	5 903	7 017	7 307	7 605	7 910
<b>PVD of SS benefits</b>									
Status quo	67 402	67 697	68 387	69 242	69 515	69 341	66 311	63 173	59 928
Experiment A	50 566	50 783	51 300	53 275	54 624	55 474	55 798	55 621	54 974
Experiment B	65 852	66 140	66 814	67 649	67 916	67 746	64 786	61 720	58 550
Experiment C	67 402	67 697	68 387	69 242	69 515	69 342	68 674	67 540	65 969
Experiment D	46 352	46 551	47 025	55 936	63 316	69 342	66 311	63 173	59 928

<sup>a</sup>The figures reported in this table are husbands' benefits. Wives' benefits remain constant, since they are calculated from their husband's PIA, which does not change in these experiments.

<sup>b</sup>These are the benefits the illustrative individual would receive if he filed for benefits at age 62 but retired at the age indicated.

Table 3

Table 3  
Effects of the four experiments on the present value of total lifetime income.

	Age of retirement								
	60	61	62	63	64	65	66	67	68
Current system	96 801	113 433	130 988	148 495	161 780	174 315	183 613	190 963	197 092
Experiment A: Increasing the normal retirement age	77 964	96 519	113 900	132 528	146 888	160 447	173 100	183 411	192 138
Experiment B: Delaying cost-of- living adjustments	95 251	111 870	129 415	146 902	160 181	172 720	182 088	189 510	195 714
Experiment C: Raising the late retirement credit	96 801	113 433	130 988	148 495	161 780	174 315	185 976	195 330	203 132
Experiment D: Changing the early retirement reduction factor	75 750	92 287	109 625	135 189	155 580	174 315	183 613	190 963	197 092

Table 4

Table 4

Effects of the four experiments on retirement ages and present discounted values of Social Security benefits (PDVSS) and total lifetime income (PDVY).

	Change in retirement age in months ( $\Delta R$ )	Effect of Social Security benefits		Effects on total lifetime income	
		% $\Delta$ PDVSS at mean retirement age	% $\Delta$ PDVSS with retirement age endogenous	% $\Delta$ PDVY at mean retirement age	% $\Delta$ PDVY with retirement age endogenous
Experiment A: Increasing the normal retirement age	+1.6	-22	-22	-10	-9
Experiment B: Delaying cost-of-living adjustments	+0.1	-2	-2	-1	-1
Experiment C: Raising the late retirement credit	+0.2	0	0	0	0
Experiment D: Changing the early retirement reduction factor	+2.9	-13	-11	-6	-3



Figure 1

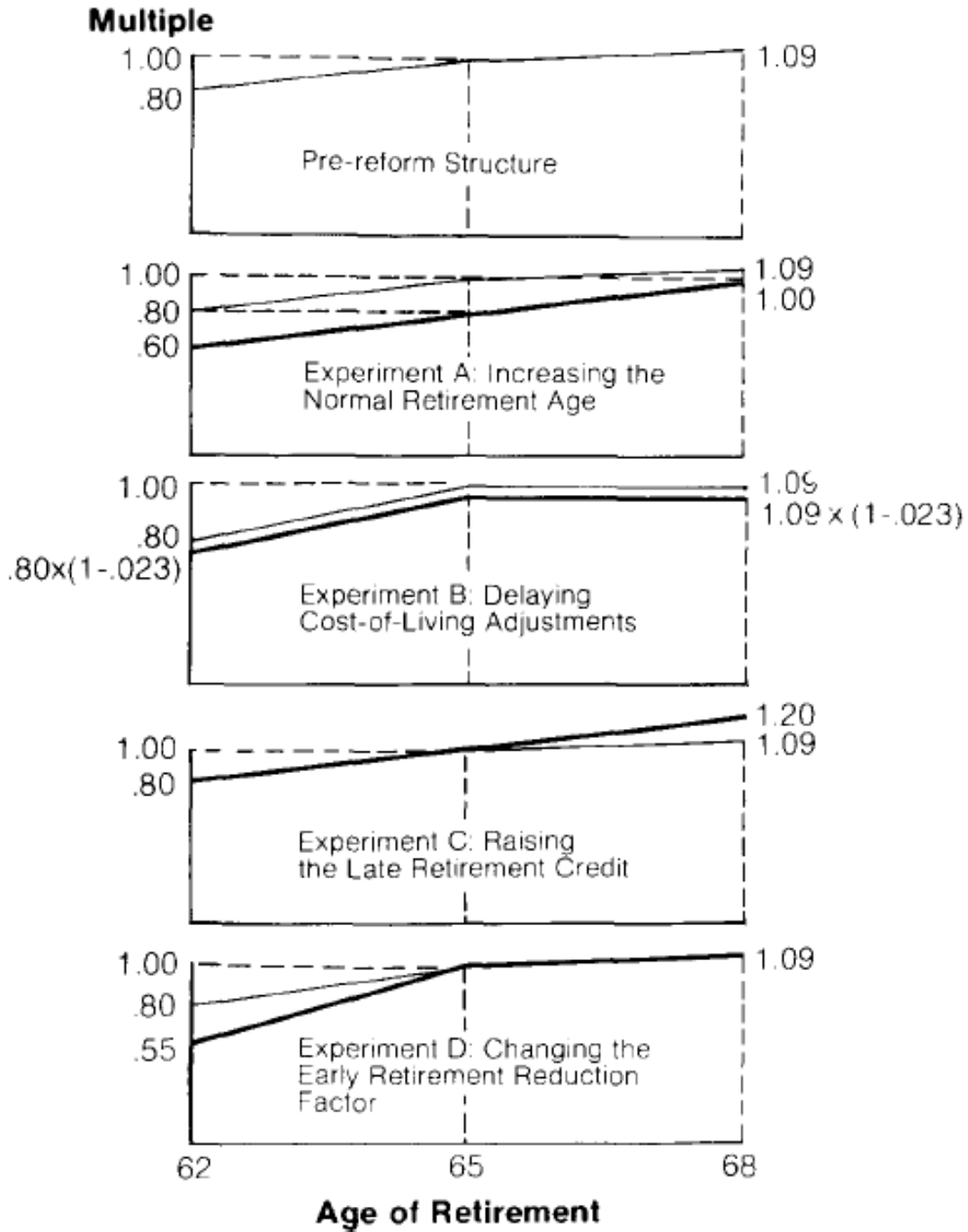


Fig. 1. Restructuring Social Security benefits: Four experiments.

## References

- Burkhauser, Richard V. and Joseph E. Quinn, 1980, Task completion report on the relationship between mandatory retirement age limits and pension rules in the retirement decision, Final Report of the Urban Institute to the U.S. Department of Labor Under Contract J-9-E-9- 0065, June.
- Burtless, Gary and Robert Moffitt, 1984, The effect of Social Security benefits on the labor supply of the aged, in: Henry J. Aaron and Gary Burtless, eds., Retirement and economic behavior (Brookings Institution, Washington) 135-171.
- Fields, Gary S. and Olivia S. Mitchell, 1984, Economic determinants of the optimal retirement age: An empirical investigation, *Journal of Human Resources* 19, Winter, 245-262.
- Gustman, Alan L. and Thomas L. Steinmeier, 1983a, Social Security reform and labor supply, NBER Working Paper No. 1212, October.
- Gustman, Alan L. and Thomas L. Steinmeier, 1983b, A structural retirement model, NBER Working Paper No. 1237, November.
- Hausman, Jerry A. and Daniel McFadden, 1981, Specification tests for the multinomial logit model, MIT Department of Economics Working Paper No. 292, October.
- Hausman, Jerry A. and David A. Wise, 1983, Retirement and subsequent work, Paper presented at the National Bureau of Economic Research, Conference on Pensions, Labor, and Individual Choice, Dorado Beach, Puerto Rico, March.
- Kotlikoff, Laurence, and Daniel E. Smith, 1983, Pensions and the American economy (University of Chicago Press).

- McFadden, Daniel, 1974, Conditional logit analysis of qualitative choice behavior, in: P. Zarembka, ed., *Frontiers in econometrics* (Academic Press, New York) 105-142.
- Mitchell, Olivia S. and Gary S. Fields, 1984a, The economics of retirement behavior, *Journal of Labor Economics* 2, January, 84-105.
- Mitchell, Olivia S. and Gary S. Fields, 1984b, Rewards to continued work: The economic incentives for postponing retirement, in: M. David and T. Smeeding, eds., *Horizontal equity, uncertainty and measures of well being* (University of Chicago Press, forthcoming).
- Schieber, Sylvester, 1982, *Social Security: Perspectives on preserving the system* (Employee Benefit Research Institute, Washington, DC).
- Small, Kenneth A., 1981, Ordered logit: A discrete choice model with proximate covariance among alternatives, Princeton University Econometric Research Program Memorandum No. 292, December.
- Small, Kenneth A., 1982, The scheduling of consumer activities: Work trips, *American Economic Review* 72, June, 467-479.
- Social Security Administration, various dates, *Social Security handbook* (U.S. Government Printing Office, Washington DC).
- Zabalza, Anthony, Christopher Pissarides and M. Barton, 1980, Social Security and the choice between full-time work, part-time work, and retirement. *Journal of Public Economics* 14, October, 245-276.