"DOUBLE DIPPING": THE COMBINED EFFECTS OF SOCIAL
SECURITY AND CIVIL SERVICE PENSIONS
ON EMPLOYEE RETIREMENT

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ABSTRACT

We consider the retirement behavior of civilian employees of the
United States government. Unlike previous studies, this investigation
is based upon a data set containing fairly complete and accurate information
about the Social Security and employer-provided pensions for which employees
are (or ultimately will be) eligible. These data permit us to specify
the financial aspects of individual retirement decisions with a reasonable
degree of precision. A large fraction of civil service pensioners is
eligible to receive Social Security benefits because a part of their working
careers was spent in Social-Security-covered employment. The prevalence
of double pension coverage among government employees has raised serious
equity questions about the treatment of civil servants by Social Security,
and these questions have led to various suggestions for pension reform.
Partly, the reform proposals have been put forward due to the perceived
unfairness of "double dipping" which arises from the double pension coverage
of government employees.

Our analysis finds: (1) Both the amount of a Federal pension entitle-
ment and the expected wait until the pension commences affect the timing
of retirement from the Federal service. (2) The rate of anticipated wage
growth significantly affects individual decisions to remain in Federal
employment. (3) Workers who are eligible to ultimately receive Social
Security in some cases show a different pattern of retirement than do workers
not vested in Social Security. However, our analysis does not reveal any
massive shift of Federal workers into Social-Security-covered employment
in order to benefit from the "tilt" in the Social Security formula.

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1. INTRODUCTION

Employer-provided pension plans have substantial impacts on the timing of employee retirement. In large measure, these impacts are intentional. Pension programs are frequently designed to provide powerful incentives to discourage turnover among experienced personnel, but also to encourage job leaving among older or very senior employees whose productivity may be declining. Among older workers in particular, the characteristics of employer-provided pension plans may have important consequences on the decision to remain employed with a particular employer, find employment elsewhere, or leave market work altogether. While the effect of Social Security on retirement has frequently been the subject of study, the effect of employer-provided pension schemes has received far less scrutiny. Both types of pension programs should be considered in a well specified model of individual retirement decisions. Unfortunately, the difficulties of obtaining reliable survey information about the generosity of individual pension entitlements has hindered any careful study of private pension programs and their impacts on retirement behavior.

In the present paper we consider the retirement behavior of civilian employees of the United States government, an unusually large employer which also provides comparatively generous pension benefits. Unlike previous studies, this investigation is based upon a data set containing fairly complete and accurate information about the Social Security and employer-provided pensions for which employees are (or ultimately will be) eligible. These data will permit us

to specify the financial aspects of individual retirement decisions with a reasonable degree of precision. What is more, the data allow us to distinguish between government "retirees" who merely change employers and ones who leave paid market work completely. The individual's decision to leave government employment can therefore be treated within the context of a more fundamental consumer choice problem, namely, the decision of whether to supply labor to the market.

The government's pension plan deserves attention because of its peculiar relationship to the American Social Security system. Unlike virtually all other forms of paid employment in the U.S., Federal government service does not count in the determination of Social Security Old Age Insurance benefits, nor are wages from such employment subject to Social Security (FICA) taxes. In spite of this feature of government employment, a large fraction of civil service pensioners is eligible to receive Social Security benefits because a part of their working careers was spent in Social-Security-covered employment. The prevalence of double pension coverage among government employees has raised serious equity questions about the treatment of civil servants by Social Security, and these questions have led to various suggestions for pension reform. An important policy reform currently under consideration is to bring all Federal government employees into the Social Security system. Partly, this reform has been put forward due to the perceived unfairness of "double dipping" which arises from the double pension coverage of government employees. But the short-run impact of reform on the efficiency of government operations might be substantial if the reform induced large numbers of experienced workers to leave Federal employment. For that reason, it is of considerable interest to be able to estimate the retirement effects of a variety of possible reforms. The qualitative choice model we estimate in this paper permits us to do so.

Of course, the present peculiar relationship between Social Security and Federal pensions may also induce some civil servants to retire earlier than they they otherwise might . Since Federal workers are not covered by Social Security and hence have typically made only modest contributions to the Social Security system, individuals may reap important benefits from leaving Federal employment to work for an employer who is covered by Social Security. Because of a redistributive "tilt" in the Old Age Insurance benefit formula that favors wage earners who have made only modest contributions to the system, there may be a substantial payoff in Social Security retirement benefits for Federal employees who leave Federal employment to work only a few years in the Social-Security-covered sector. This redistributive tilt has raised serious equity problems which have led to calls for reform of the Social Security system as applied to government employees. Note that an important difference exists with respect to private sector employees who may also have a private pension and will be eligible for Social Security benefits. Since they have worked in covered jobs throughout their career, they do not benefit from the redistributive tilt of Social Security retirement benefits. Only people who have worked in uncovered jobs for the majority of their working years, e.g. civil servants, benefit from this provision in the current Social Security retirement payment schedule.

The plan of the paper is as follows. In Section 2 we consider financial details of the Federal retirment and Social Security Old Age Insurance programs and describe the inducements for government employees to remain in Federal employment, to seek employment in the Social-Security-covered sector, or to retire from gainful employment altogether. In the third section we discuss our data set and specify the econometric model used in estimation. The information for this study comes from a large administrative data file containing Federal

employment records, Federal pension records, and Social Security earnings and benefits records for one percent of all Federal employees who were over the age of 54 and under 62 during 1976. The empirical results are based on the retirement decisions of these individuals during 1977. Because of data limitations it is not now possible to embed the retirement decision in a complete life-cycle model of savings and labor supply, and our results must be interpreted with this limitation in mind. The statistical model used in estimation is the conditional probit model for qualitative choice proposed by Hausman and Wise (1978). Section 4 contains a discussion of empirical results. In the following section we consider the impact of reforming the existing Federal pension and Social Security programs. The paper ends with a summary of our conclusions.

2. FINANCIAL INCENTIVES TO LEAVE FEDERAL EMPLOYMENT

Federal workers aged 55 and older who have 30 years of Federal service are currently eligible for Federal pensions upon retirement from Federal service; workers aged 60 and older are currently eligible with 20 years' service; and workers older than 62 are currently eligible with only 5 years' service. The worker's pension entitlement upon retireement is a multiple (less than 0.80 and greater than 0.075) of his average salary in his three years of highest wages. This multiple, which we refer to here as the "replacement rate," is determined on the basis of years of Federal service.[1] Most older Federal workers have worked many years in Federal service, and consequently may anticipate a Federal pension that nominally replaces a large fraction of current wage earnings, either immediately or within a few years. For example, among the 3,116 male Federal employees in our sample, the average replacement--even without additional years of service--was close to 50 percent in 1977. Among the 1,040 female employees, the average replacement rate was over 35 percent.[2]

Although the prospect of a generous Federal pension may encourage retirement among older workers, several features of the pension computation may induce workers to remain in Federal service. First, CSRS-vested workers with fewer than 30 years of service must wait until age 60 before their pensions commence; workers with fewer than 20 years service must wait until age 62. Even without any complications arising from wage and price inflation, this delay before the commencement of pension payments must necessarily reduce the present discounted value of any given stream of pension payments. As the delay lengthens, the valueof any particular replacement rate declines, and the likelihood of retirement presumably decreases.

Second, an additional year of Federal service increases the replacement rate by 2 percentage points.[3] This form of deferred compensation should encourage workers to remain in Federal service, even if they are entitled to receive a pension immediately upon leaving service. Also, the fact that the wage base for computing the pension rises with an additional year's service (because nominal Federal wages rise from year to year) should encourage individuals to remain in Federal service.

Third, the failure to index the wage base used in computing Federal pension entitlements may encourage vested Federal workers who are not currently entitled to receive pensions to remain employed in the Government.[4] For example, an employee aged 55 with 27 years' service is eligible to receive a pension equal to 50 percent of his average, high three years' nominal salary. However, since he has not yet attained 30 years' service, he must wait five years before his pension will commence. As mentioned earlier, the five years' wait reduces the present value of the pension, even ignoring problems due to inflation. If in addition price inflation is 10 percent per year between the age of retirement (55) and the age of annuity commencement (60), prices will have risen by 61 percent over the period while the nominal amount of the pension will have remained constant. The real value of the pension will have fallen by 38 percent. The worker can protect himself against this loss in real pension benefits by remaining in Federal service.

Federal pensioners are protected against rises in the cost of living because pension payments--as soon as they commence--are indexed to the CPI. For certain Federal workers, this indexing scheme may provide a perverse incentive to take early retirement. Consider a Federal worker whose high three years of salary are W, $W(1 + \dot{w})$, and $W(1 + \dot{w})^2$, respectively. (Thus, $\dot{w}$ is the rate of growth of

the worker's wage.) Suppose his replacement rate, based on current years of Federal service, is r. Suppose also that he anticipates future wage growth equal to past wage growth, namely, $\dot{w}$. If he retires immediately, his first-year Federal annuity, A_1, will be:

$$(1) \qquad A_1 = \frac{W + W(1 + \dot{w}) + W(1 + \dot{w})^2}{3} \cdot r.$$

Because his pension is indexed, he can anticipate that after one year it would rise by $\dot{p}$, the rate of change of prices. Hence, his second-year annuity, A_2, would be $A_1 \cdot (1 + \dot{p})$. On the other hand, if he deferred his retirement for one year, his second-year annuity, A_2', would be:

$$(2) \qquad A_2' = \frac{W(1 + \dot{w}) + W(1 + \dot{w})^2 + W(1 + \dot{w})^3}{3}(r + 0.02)$$

It can be shown that under certain circumstances, defined in (3) below, the second-year annuity (and all subsequent years' annuities) will actually be higher for the worker who chooses to retire rather than work in year 1. Some algebraic manipulation shows that:

$$(3) \qquad A_2 > A_2' \quad \text{IFF} \quad \dot{p} > \dot{w} + \frac{0.02(1 + \dot{w})}{r}$$

Thus, if the rate of price inflation substantially exceeds the expected rate of wage change in the Government, the potential retiree may be assured of a higher nominal (and real) pension if he accepts early retirement rather than if he defers his retirement for one year.

To see whether the condition defined in (3) above is ever likely to be encountered, consider some typical values of $\dot{w}$ and $\dot{p}$ in recent years. Federal workers who are not eligible to receive merit pay increases are typically limited to a "wage comparability" pay increase of 4.5 to 7 percent.[5] In comparison, the rate of U.S. price inflation has ranged from 6 to 13 percent in recent years. If the expected rate of Federal wage growth is 7 percent and expected price inflation is 12 percent, Federal workers with current replacement rates equal to 43 percent or more would receive higher annuities if they retired immediately rather than postponed their retirement. (Federal workers with 24 years or more of service might thus gain from immediate retirement.) If expected wage growth were 7 percent and expected inflation were only 10 percent, Federal workers with 71 percent (or higher) replacement rates might gain through early retirement. (However, it takes 39 years of Federal service to attain this replacement rate.)

Although the arithmetic may seem arcane, there is little doubt that this perverse inducement to take early retirement is widely understood within the relevant population. Popular newspaper columns aimed at Federal employees spell out the pertinent details and provide down-to-earth examples showing which employees are most likely to lose pension benefits from continued service in the U.S. Government. Shortly before one recent cost-of-living pension increase, for example, the Washington Post alerted older Federal workers of the gains from immediate retirement, and concluded with this sensible advice:

> President Carter has projected a 6.2 percent active pay raise
> for this November [1980]...That is an increase much less than
> the current rate of inflation. Retirees, on the other hand, are
> linked to the rate of inflation with twice yearly adjustments.
> The pay raise-retirement squeeze is causing many people to check
> their options. If you doubt it, check the number of people retiring
> from your agency this month. (Washington Post, February
> 17, 1980, p.B2)

Of course, for a Federal worker who anticipates that his own wages will rise

rapidly, the gains from immediate retirement are much more slight.

This section on incentive effects of the CSRS may be summarized by noting

the strikingly different incentives of the system for those who are currently

entitled to pensions, on the one hand, and those who are entitled to pensions

after some delay, on the other. Because the wage base used to compute pensions

is not indexed, the latter group has a strong incentive to remain in Federal

service simply in order to partially protect the real value of its ultimate

pensions. But because wages among older workers may rise more slowly than the

CPI, to which pensions are indexed, workers who are currently entitled to

benefits may retire immediately and receive pensions that are approximately

equal--in real terms--to the pensions that would be obtainable after several

extra years of Federal service.

In addition to the CSRS itself, a number of factors may affect the

retirement decisions of older Federal workers. For present purposes, one of the

most important is entitlement to benefits under OASDHI--the Social Security

system. Federal workers who are not vested in the Social Security system may

leave Federal service in order to become vested. The incentives to do so are

substantial. Benefits under Social Security can begin at age 62 or the year of

vesting in Social Security, whichever occurs later. Since Federal workers in our

sample are at least 55 years old and must accumulate no more than 33 quarters of Social Security-covered earnings in order to become vested, Social Security benefits are not a distant prospect; they can be anticipated in the relatively near future if vesting occurs. Also, because of the existence of a Social Security minimum payment amount and other redistributive features of the Social Security benefit formula, Federal workers who become vested in Social Security can anticipate receiving benefits under the system that are large relative to their FICA tax withholding. Finally, Social Security benefits, unlike Federal pension payments, are not subject to state or Federal taxation. Consequently, the net, after-tax value of a given Social Security benefit may substantially exceed that of an equal amount of Federal pension.

Among Federal employees who are already vested in Social Security, the incentive effects of Social Security are somewhat more ambiguous. Since the wage base used to compute Social Security benefits is indexed, the real value of a vested wage earner's pension is generally protected against the price inflation that occurs between the time the earner leaves covered employment and the time the Social Security benefit begins. Consequently, there is no particular incentive to remain in covered employment until just before benefit eligibility commences as there is in Federal service. On the other hand, for some Federal workers the real value of the Social Security pension may be substantially raised by working one or more additional years in Social-Security-covered employment. This could provide an important incentive to leave Federal service for other employment.

One complicating factor in considering the incentives offered by the Social Security system is the earning test applied in determining OASI benefits for those who are currently eligible to receive them. Annual wage earnings in excess

of a relatively low limit are subject to a 50 percent benefit reduction rate for those receiving Social Security benefits. This tax applies against Federal wages as well as Social-Security-covered wages. Consequently, Federal workers who are vested in Social Security have an incentive to concentrate all of their contemplated wage earnings—Federal as well as private—in the period before they begin receiving Social Security. By contrast, Federal workers who are not vested in Social Security do not have this incentive. Under the CSRS, the only wage earnings that affect the Federal pension entitlement are those that accrue from continuing in a Federal job; wages from a non-Federal job do not affect either eligibility for or the amount of a Federal pension.

Final factors to consider among determinants of early retirement are age and health. We expect that advances in age and declines in health status should increase the probability of leaving work, either in the Government or in the Social-Security-covered sector. In fact, health status and its interactive effects with pension eligibility are frequently found to be the most important factors associated with retirement (see, e.g., Quinn (1977). Unfortunately, the data at our disposal do not permit us to measure an individual's health status with any precision. Thus, we have adopted a specification of the effects of age that is consistent with our notions about the interrelationship between age and health. In particular, we believe that among younger workers variations in health are comparatively less important in determining work status than they are among older workers. This is primarily because variations in health become more pronounced as an age cohort becomes older. This general notion will be given more precision as we describe our empirical specification below.

3. EMPIRICAL SPECIFICATION AND ESTIMATION PROCEDURE

In the previous section we described in general terms the factors that may affect an individual's decision to leave Federal employment. Our discussion concentrated on the effects of the Federal retirement system itself and on the possible effects of Social Security and age. In the present section we specify an empirical estimating equation, and in the next section we summarize the results obtained from applying it.

There are two general reasons for leaving Federal service. The first is the desire to leave gainful employment altogether and the second is the desire to accept a job from a non-Federal employer. Because the incentives that lead Federal workers to take one or the other of these alternatives are so different, we have adopted a three-state qualitative choice model. The three states are defined on the basis of individual information covering the 1977 calendar year. It will be recalled that our sample consists of men or women aged 54 to 61 who were Federal employees at the end of 1976. (Employees who did not make wage contributions to the CSRS are excluded from our sample.) We define an individual as a "Federal employee" if there is an indication on our file that the person was Federally employed during 1977 and if there is no indication that he or she began receiving a Federal pension some time during 1977. Remaining individuals are defined either as "privately employed" or as "retired;" a "privately employed" person is one who has Social-Security-covered wages during 1977, while a "retiree" does not.

We assume that each of the three states just defined have particular attributes that individuals find either attractive or unattractrive. To the extent that two of the states possess a similar attribute, both states should be viewed similarly by individuals in the sample. To fix ideas, consider an

attribute like "Federal pension benefits." Two states--"private employment" and "retirement"--allow individuals to collect the Federal pensions to which they may be entitled, and thus both states ought to be considered identical with respect to "Federal pension benefits." (By contrast, the remaining state--"Federal employment"--is quite different; current Federal employees cannot collect Federal pensions.) Other attributes may be unique to a single state. For example, the only state in which an individual can become entitled to increases in future Federal pension benefits is "Federal employment." The attributes (or variables) characterizing the three states are defined in Section 4, below.

The econometric specification used to estimate our model of retirement decisions is the covariance probit model of Hausman and Wise (1978). The covariance probit specification removes the independence assumption of the conditional logit specification which has characterized previous econometric work on retirement, e.g., Boskin and Hurd (1978). The reason that the independence assumption seems improper in the context of a model of retirement is that two of our three states, working for the Federal government or working in the private sector, seem closer together in terms of the unobserved attributes than does the third state, complete retirement. The covariance probit specification assumes that a distribution of tastes exists in the population. Here we assume a distribution of tastes exists for work (or leisure), so that an individual with a lower than average preference for leisure will be more likely to be in either of the first two states than an observationally equivalent individual with a higher than average preference for leisure. Only through relaxing the assumption of independence can we allow these differential taste factors to enter the model and influence choice of work states or retirement states.

The specification of the model assumes a level of utility U_{ij} for person i in state j. Let X_{ij} stand for attributes of state j for person i, e.g., the individual's nominal federal pension entitlement, and S_i stand for individual attributes such as age. Then utility U_{ij} can be decomposed, without loss of generality, into a deterministic part, which represents the "average" individual, and a stochastic term, which represents the deviation from average utility for this particular individual:

$$(4) \qquad U_{ij} = U(X_{ij}, S_i) = \overline{U}(X_{ij}, S_i) + (X_{ij}, S_i) \qquad j=1,2,3 \quad i=1,n$$
$$= \overline{U}_{ij} + \varepsilon_{ij}$$

In equation (4) the $\overline{U}(.)$ terms represent how the average individual with attributes (X_{ij}, S_i) would value the utility from state j. The (X_{ij}, S_i) term represents the deviation from average and therefore has expectation equal to zero.[6] The discrete choice model then assumes that person i chooses state j if his utility in that state is highest. Since the ε_{ij}'s introduce a stochastic element into the model we have a probability statement for each outcome. For instance, the probability that person i chooses state 1, here continued Federal employment, is

$$(5) \qquad \varepsilon_{i1} = pr(\text{person i makes choice 1}) = pr(U_{i1} > U_{i2} \ \& \ U_{i1} > U_{i3})$$
$$= pr(\overline{U}_{i1} - \overline{U}_{i2} > \varepsilon_{i2} - \varepsilon_{i1} \ \& \ \overline{U}_{i1} - \overline{U}_{i3} > \varepsilon_{i3} - \varepsilon_{i1}$$
$$= pr(U_{i12} > \varepsilon_{i21} \ \& \ U_{i13} > \varepsilon_{i31}).[7]$$

where the number subscript notation in the last line of equation (5) signifies

subtraction.

To make the model operational we now choose a probability distribution for

the ε_{ij}'s. We assume that they are independent across individuals, but that the

joint density function $f(\varepsilon_{12}, \varepsilon_{12}, \varepsilon_{13})$ is distributed as trivariate normal

$N(0, \Sigma)$. Thus we allow for covariance among the ε_{ij}'s through specification of Σ.

This covariance probit assumption is more general than the conditional logit

model which assumes independence of the ε_{ij}'s. Given the specification of the

of the joint density function we can compute the probability π_{i1} of equation (5)

$$(6) \quad \pi_{i1} = \int_{-\infty}^{\infty} \int_{-\infty}^{\overline{U}_{i12} + \varepsilon_{i1}} \int_{-\infty}^{\overline{U}_{i13} + \varepsilon_{i1}} f(\varepsilon_{i1}, \varepsilon_{i2}, \varepsilon_{i3}) \, d\varepsilon_{i3} d\varepsilon_{i2} d\varepsilon_{i1}.$$

Let us represent the unknown parameters of $\overline{U}(\cdot)$ and Σ as the vector θ. Then we

estimate the unknown paramters by the method of maximum likelihood using the log

likelihood function

$$(7) \quad \mathcal{L}(\theta) = \log L = \sum_{i=1}^{n} \sum_{j=1}^{3} y_{ij} \log (\pi_{ij})$$

where $y_{ij} = 1$ if person i makes choice j and is zero otherwise.

We now consider the specification of the $\overline{U}(X_{ij}, S_i)$ term in equation (4) and

the covariance matrix Σ. We use the variables mentioned above as well as

individual attributes to specify $\overline{U}_{ij} = Z_{ij}\beta$ as a linear in parameters function

for ease of computation. Note that nonlinear functions of the X_{ij}'s and S_i's can enter the Z_{ij}'s via ratio or polynomial terms. However, the linear-in-parameters specification does impose a limitation on the model. Since pensions and Social Security benefits represent a stream of payments over time, they need to be discounted back to the present. Of course, the discount rate used by the individual is an unknown parameter of the model. The proper method to introduce discounting over time is through use of exponential functions, $\exp(-\gamma t)$, where γ is the unknown discount rate and t is the relevant time period. But since use of the exponential function would introduce an extremely complicated nonlinearity into the model, we instead use a quadratic specification in t and t^2 as an approximation that is much simpler to estimate. As it turns out, all of the quadratic functions take the correct shape as a function of their estimated parameters. Specification of Σ also presents a problem. The original Hausman-Wise (1978) specification would introduce 12 additional covariance parameters which would be difficult to estimate precisely. Instead we use a considerably more simple specification which is meant to capture the distribution of preferences in the population toward work. We allow the parameter representing age effects to vary in the population, giving the specification[8]

$$(8) \quad \Sigma = \begin{bmatrix} \sigma^2 + \sigma_\beta^2 \, \text{Age}^2 & & \\ \sigma_\beta^2 \, \text{Age}^2 & \sigma^2 + \sigma_\beta^2 \, \text{Age}^2 & \\ 0 & 0 & \sigma^2 \end{bmatrix} = \begin{bmatrix} \sigma_i^2 & & \\ \rho_i & \sigma_i^2 & \\ 0 & 0 & \sigma^2 \end{bmatrix}$$

Thus, the correlation coefficient ρ_i, which measures tastes for Federal employment or private employment, rises with age. At the same time the variation

of these two states also rises with age relative to the variance of the retirement choice. This specification is meant to capture the increasing variability of the work decision which arises because of the (unobserved) deterioration of health with increasing age. At the same time, the rising correlation can capture the effect that taste for work and leisure increasingly dominates the individual's decision once he has qualified for the appropriate pensions and their rate of increase becomes less. As it turns out, we estimate σ_β^2 to be an important component of our specification for males. However, for females, the covariance component does not turn out to be an important part of the model.

One last econometric point deserves mention. Since our data set consists of a single year's decision by Federal employees aged 55-61, we have omitted individuals who have previously left the Federal service. Since the probability of retirement increases with age, we have oversampled younger individuals. But the age variable and various discounted pension terms should capture this effect. The problem which might arise is if the model were used for long-run simulation purposes. If the age distribution of Federal employees is not in equilibrium and our model does not accurately capture all age effects, the parameter values might be different for a later period. In particular, we might expect our estimate of σ_β^2 to change. To fully explore this possibility, we would need a complete sample of Federal employees and their age of termination or retirement. Such data are not presently available.

4. EMPIRICAL RESULTS

Empirical results for our retirement model are presented in Table 1 below. The attributes characterizing the three states and the affected individuals are defined in the accompanying attachment to the table. The inclusion of these variables in our model was justified in Section 2, where we described the incentives that induce older workers to leave Federal employment. Note that the financial variables are included in ratio form, i.e., as replacement rates. This specification turned out to be more successful in explaining retirement patterns than the alternative of including values of potential pensions in non-ratio form.

Estimates for both men and women are qualitatively similar so we shall focus our discussion on the results for men. As expected, the rate of growth of an individual's wages in the Federal Government (WAGE76/WAGE73) is an excellent predictor of whether he will remain in Federal service. Two reasons for this association may be advanced. First, when the direct payoff from working in the Federal service is rising rapidly, the attractiveness of Federal employment in comparison to both private employment and retirement is strengthened. Second, rapid rises in current wages lead to similarly rapid rises in deferred compensation because an individual's wage upon leaving Federal service constitutes one third of the wage base used to compute ultimate pension benefits. The more rapid the wage rise, the larger the gain in ultimate pension benefits from remaining in Federal service. (See equation (3) above.)

The second set of variables—FED.REPL.RATE, FRR*YR, and FRR*(YR)^2—reflects the generosity of a worker's Federal pension entitlement. As expected, workers eligible to receive a pension immediately upon leaving Federal service are more likely to take private employment or to retire than are otherwise identical workers who can receive a pension only after some delay. Also, among workers who

TABLE 1

QUALITATIVE CHOICE MODEL FOR FEDERAL EMPLOYMENT, PRIVATE EMPLOYMENT, AND RETIREMENT

Variable	State Attribute?[*]			Parameter Estimates[**]	
	#1	#2	#3	Males (N=3,116)	Females (N=1,040)
WAGE76/WAGE73	X			1.344 (0.165)	1.693 (0.197)
FED.REPL.RATE		X	X	0.172 (0.353)	0.807 (0.444)
FRR*YR		X	X	-0.922 (0.187)	-1.398 (0.334)
FRR*(YR)^2		X	X	0.094 (0.041)	0.206 (0.066)
CHG.S.S.REPL.RATE		X		-1.999 (6.946)	-29.386 (17.599)
SSRR*YR--RET			X	-5.467 (1.472)	-4.561 (2.288)
SSRR*(YR)^2--RET			X	0.927 (0.239)	0.723 (0.389)
S.S.REPL.RATE--FED	X			18.373 (5.580)	11.383 (6.807)
SSRR*YR--FED	X			-8.376 (2.715)	-9.176 (4.187)
SSRR*(YR)^2--FED	X			0.941 (0.314)	1.199 (0.553)
AGE		X	X	-0.113 (0.049)	-0.173 (0.033)
Covariance Parameter: AGE, $\sigma^2_{\beta_{AGE}}$				0.201 (0.104)	0.0*** (-----)
Log of likelihood f'cn				-1600.1	-473.8

* The variable represents an attribute of the indicated state(s):
State #1 = Federal employment; #2 = private employment;
#3 = Retirement.

** Asymptotic standard errors are listed in parantheses beneath parameters.

*** The indicated coefficient is constrained to be zero. Empirical tests showed that this constraint could not be rejected.

Variable Name	Variable Description
WAGE76/WAGE73:	Ratio of individual's Federal wage in 1976 to wage in 1973.
FED.REPL.RATE:	Ratio of individual's nominal pension entitlement in 1977 to his 1977 wage.*
FRR*YR:	FED.REPL.RATE multiplied by the number of years until individual is eligible to begin receiving pension.
FRR*(YR)^2:	FED.REPL.RATE multiplied by the number until individual is eligible to begin receiving pension.
CHG.S.S.REPL.RATE:	Change in individual's Social Security "replacement rate" if he works in "private employment" in 1977 at his 1977 wage.*
SSRR*YR--RET:	S.S.REPL.RATE multiplied by the number of years until individual is eligible to receive Social Security (age 62)--effect on retirement only.
SSRR*(YR)^2--RET:	SSRR*YR multiplied by the number of years until individual is eligible to receive Social Security (age 62)--effect on retirement only.
S.S.REPL.RATE--FED:	Ratio of individual's nominal Social Security pension entitlement in 1977 (computed using 1977 formula) to his 1977 wage*--effect on Federal employment.
SSRR*YR--FED:	S.S.REPL.RATE multiplied by the number of years until individual is eligible to receive Social Security (age 62)--effect on Federal employment.
SSRR*(YR)^2--FED:	SSRR*YR multiplied by the number of years until individual is eligible to receive Social Security (age 62)--effect on Federal employment.
AGE:	Individual's recorded age minus 54 years.

Each of the variables just defined is related to the discussion in Section 2 above.

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*The 1977 wage is assumed to be 8 percent higher than the Federal wage recorded for 1976.

can immediately receive a pension, those who are entitled to a higher replacement rate are more likely to take private employment or to retire. However, the evidence concerning Federal pension incentives contains one surprise. Suppose we consider Federal workers who must wait one to three years after leaving Federal service before their pensions commence. Among these workers, the likelihood of leaving Federal service actually declines as the nominal replacement rate rises. We conjecture that this may be attributable to inflation. Workers with a higher replacement rate stand to lose more in absolute terms as a result of price inflation, and consequently they may be more likely to remain in Federal service simply to protect the real value of their pension.

The next variable, CHG.S.S.REPL.RATE, is intended to measure the amount of net gain in ultimate Social Security pension that a worker could obtain by moving from Federal to private employment. In computing this variable, it is assumed that his attainable wage in the private sector is equal to his potential 1977 Federal wage. While partly unrealistic, this assumption serves to grossly distinguish between workers for whom Social Security offers a good payoff and those who gain only slightly from the "tilt" in OASI benefits. (The variable takes nonzero values only for workers who are already vested in Social Security or who would become vested if they worked four additional quarters in the Social-Security-covered sector.) The estimated coefficient is opposite in sign to what might be expected , though obviously it is not very precisely measured. However, the reader should be cautious in interpreting this result, since the incentive to take Social-Security-covered employment is probably poorly measured by our variable. (Alternative variable definitions did not yield any better results, however.)

The next variables (SSRR*YR--RET, and SSRR*(YR)^2--RET) capture the effects

of Social Security "wealth" on retirement. As anticipated, the longer the wait

till Social Security benefits commence, the smaller the likelihood of retirement.

However, individuals who will ultimately be entitled to receive Social Security

benefits are actually <u>less</u> likely to retire during their late 50's and early 60's

than are otherwise comparable Federal workers who have no anticipated benefits

under Social Security. We surmise that potential Social Security recipients, to

avoid the high implicit tax in the Social Security earnings test, may concentrate

their earnings in the period before they begin receiving OASI benefits. The next

three variables (S.S.REPL.RATE--FED, SSRR*YR--FED, and SSRR*(YR)^2--FED) capture

the effect of Social Security "wealth" on remaining in Federal employment. Here

the response of men and women, although apparently quite similar, is actually

somewhat different. We shall discuss the female results first. On balance,

women who are entitled to eventually receive Social Security benefits are more

likely to leave Federal service than are otherwise comparable women not entitled

to Social Security. (To see this, the reader should note that because of the age

limitation we impose, no woman in our sample is entitled to receive Social

Security benefits for at least one year. For most women in the sample, a longer

period is required. Consequently, the interaction between the Social Security

replacement rate and years-to-benefit receipt causes the overall impact of Social

Security to be negative.) Also, as the Social Security replacement rate rises,

the likelihood of leaving Federal service also rises. Curiously, women who are

closest to being eligible for Social Security (i.e., those who are closest to age

62) are the least affected by its incentive effects.

For men, on the other hand, Social Security "wealth" seems to provide an inducement to remain in Federal service. On balance, older men who are vested in Social Security have a greater likelihood of remaining in Federal employment than comparable men who are not vested. This tendency is greatest for men who are closest to age 62, the age at which Social Security benefits can commence. For men in their mid-50's, there is little difference between those vested and those not vested in Social Security.

The last variable we consider is AGE. As anticipated, advancing age significantly reduces the likelihood that a Federal worker will choose to work, either in the Federal Government or in the Social-Security-covered sector. Among men, although not among women, there is good evidence that the variability of age effects on working also rises with age. We attribute this to the fact that the variability of health status rises with advancing age.

5. SIMULATION OF REFORM IMPACTS

It is natural to consider the implications of our results for reform of the retirement programs now available to Federal employees. In this section we consider two possible reforms, one involving the Civil Service Retirement System and the other involving Social Security retirement benefits. Both reforms cause a change in the financial attractiveness of occupying one or more of the states we have been considering in this paper. In particular, one or more attributes obtainable from a particular state can be affected by the reforms, and as a consequence utility maximizers may attain greater satisfaction by choosing a different status than the one chosen in the prereform world. We will measure the impact of the proposed reforms by computing the fraction of people represented by our sample who would choose a different status in the postreform world than in the prereform world.

In principle, this can be accomplished in two ways for a given sample. First, the probability of occupying each of the states in the postreform world can be computed for each observation. Then each observation can be assigned to a particular state by means of a random process in which the probability of being assigned to any state is equal to the computed probability of occupying that state. The effect of the reform can then be computed by summing up the number of individuals occupying each of the states and comparing the resulting totals to the simulated or actual prereform distribution. A second method of computing the postreform distribution of individuals is to compute the probability of occupying one of the states successively for each observation and then to sum the probabilities across observations. This procedure is then repeated for all but one of the states. As sample size becomes indefinitely large, both procedures will yield identical estimates of reform impacts. In this paper we use the

latter method because it is associated with smaller prediction varibility in finite samples.

Federal pension reform. The first reform we consider is changing the age requirements for Federal pension receipt. As noted in the first section, Federal employees who have met minimum tenure requirements are currently eligible to receive a pension when they reach age 55. Under the simulated reform, the earliest allowed pension receipt is postponed to age 62. Given the distribution of age in our sample (55 to 61, inclusive), very few persons would become eligible for pension receipt during the 1977 calendar year under the proposed reform. (By contrast, nearly half of the men in our sample were eligible for 1977 pensions under the prereform rules.) Thus the reform reduces the present discounted value of the Federal pension. The fact that the Federal wage base is not indexed in computing a pension entitlement means that the reform also reduces the real value of the pension once it commences at age 62 for persons retiring before 62. Our discussion in the first section suggests that this reform should reduce the incentive to leave Federal employment. Our specification of the incentives to retire captures this effect in the two interaction terms between the Federal pension replacement rate and the number of years of wait until the pension commences. The effect of this pension reform on financial variables in our sample can be seen in Table 2 where we have given the mean sample values both for the prereform system (column 1) and the postreform system (column 2). As can be seen in this table, the third and fourth variables listed -- the pension-delay interaction terms -- are substantially increased by the reform.

To estimate the effects of these financial changes on retirement patterns, we performed two simulations of the type described above. The first simulation yields predictions on the prereform retirement pattern; the second, predictions

TABLE 2

MEAN VARIABLE VALUES UNDER PROPOSED REFORMS*

Variable	Sample mean values		
	PREREFORM	REFORM #1	REFORM #2
WAGE 76/WAGE 73	1.3260	1.3260	1.3260
FED. REPL. RATE	0.4516	0.4516	0.4516
FRR*YR	0.6243	2.1866	0.6243
FRR* (YR) ^{2}	2.4412	12.3213	2.4412
CHG. S.S. REPL. RATE—PRIV.	0.0085	0.0085	0.0115
CHG. S.S. REPL. RATE—FED.**	0.0	0.0	-0.0039
S.S. REPL. RATE—RET.	0.0514	0.0514	0.0400
SSRR*YR—RET	0.2451	0.2451	0.1909
SSRR* (YR) ^{2} —RET	1.3677	1.3677	1.0654
S.S. REPL. RATE—FED	0.0514	0.0514	0.0400
SSRR *YR—FED	0.2451	0.2451	0.1909
SSRR* (YR) ^{2} —FED	1.3677	1.3677	1.0654
AGE	3.1355	3.1355	3.1355

* Variable means are computed for the 3,116 males in the sample used both
to estimate the parameter values reported in Table 1 and to simulate the effects
of the reforms described in the text. Reform #1 is the reform in the Civil
Service Retirement System, and Reform #2 is the reform of the Social Security
retirement benefit formula.

** Change in individual's Social Security "replacement rate" if he works in "Federal
employment" in 1977 at his estimated 1977 Federal wage.

on the _postreform_ pattern. These simulation results are presented in the first and second panels of Table 3. (The actual prereform retirement pattern is given in the bottom row of the first panel. As may be seen, the actual prereform distribution differs only slightly from the predicted pattern, where the predictions are based on the estimated parameters in Table 1.) The simulation results suggest, as expected, that the number of older Federal employees leaving Federal employment will drop sharply (by 47 percent) as a result of the reform. The number of workers going into private employment drops even more sharply than the number choosing complete retirement because Federal work and private work are "closer" substitutes than Federal work and complete retirement. Interestingly, there is a larger proportional effect on decisions to leave Federal employment among older workers (aged 58 to 61) than among the youngest cohort (aged 55). The readers should note that these simulation results reflect the first-year effect of the proposed reform. In later years the proportional effect will be quite different as the composition of the older Federal work force is affected by cumulative effects of the reform.

Social Security reform. In the introduction to this paper we mentioned that potential double coverage of civil servants by both Federal pension and Social Security retirement benefits has raised serious equity questions about the interaction between the two programs. The equity issue arises because the Social Security benefit formula is intentionally redistributive, paying larger benefits relative to contributions to workers with low lifetime earnings than to workers with high earnings.[9] Civil servants do not pay Social Security taxes on their government earnings, nor do those earnings count in the determination of Social Security benefits. Consequently, when civil servants become vested in Social Security they are inappropriately treated as low-wage workers, since only a

TABLE 3

SIMULATED PREREFORM AND POSTREFORM
RETIREMENT PATTERNS AMONG MALES, BY AGE

Age Group	Federal Workers	Private Workers	Retirees	Total
Prereform Distribution of Workers—				
55	480	20	41	541
56–57	925	56	97	1,078
58–59	696	51	102	849
60–61	498	34	116	648
Simulated Totals	2,599	161	356	3,116
[Actual Totals	2,605	137	374	3,116]
Reform #1 Distribution of Workers—				
55	497	12	32	541
56–57	1,006	24	48	1,078
58–59	778	23	48	849
60–61	560	15	73	648
Simulated Totals	2,841	74	201	3,116
% Change from Prereform Totals	+9.3%	−54.0%	−43.5%	—
Reform #2 Distribution of Workers—				
55	480	22	39	541
56–57	924	57	97	1,078
58–59	691	49	109	849
60–61	487	35	126	648
Simulated Totals	2,582	163	371	3,116
% Change from Prereform Totals	−0.7%	+1.2%	−0.8%	—

fraction of their lifetime earnings -- those earned in Social-Security-covered employment -- are counted in Social Security benefit determination.

A variety of reforms has been suggested to reduce or eliminate the unintended subsidies" that accrue to retired civil servants as a result of double coverage by Social Security and Federal pensions. The reform we simulate here was suggested by a panel commissioned by the U.S. Congress to investigate the interaction between government pensions and Social Security.[10] The panel suggested computing Social Security benefit entitlements on the basis of the sum of Federal and Social-Security-covered wages, rather than Social-Security-covered wages alone. (Federal wages would not, however, become taxable by Social Security.) This computed replacement rate would than be applied only against average Social-Security-covered wages (E_1) in determining the Social Security benefit.

To phase in this reform, Federal wages would only be counted starting with wages paid in an initial year, say 1975. Federal wages paid prior to that year would not be counted in the benefit determination. In our simulation, we assumed that 1975 and 1976 (and subsequent years') Federal wages up to the Social Security taxable maximum were recorded by the Social Security Administration and were used in computing Social Security benefits under the reformed formula. As may be seen in Table 2 above, this reform affects a considerable number of variables in our specification of the retirement decision. All variables associated with the Social Security replacement rate are of course affected, though their mean values are only slightly affected because only a small proportion of persons in our sample is vested in Social Security. In addition, the reform affects the change in Social Security replacement rate that results from an additional year of working. Under the prereform system, earnings in the Federal Civil Service do

not affect the Social Security replacement rate at all, since Federal wages are
not counted in determining Social Security benefits. But under the reformed
system, Social Security benefits for Federal employees vested in Social Security
actually _fall_ with each additional year of Federal employment. This change
should affect the relative attractiveness of remaining in Federal employment for
persons vested--or expecting to become vested--in Social Security.

The simulation results for this reform are presented in the bottom panel of
Table 3. The simulation indicates that the reform would have only a very small
impact on retirement patterns among men aged 55 to 61, though of course the
impact may be expected to grow over time as additional years of Federal wages are
included in the Social Security benefit computation. In later years the
reform's effect on Social Security replacement rates will become larger, and the
incentive to retire from market work altogether should become proportionately
smaller. The reader should recall that our estimate of the effect of the change
in Social Security replacement rates (i.e., the coefficient on CHG.SS.REPL.RATE)
is not only imprecise but may also be somewhat implausible. Consequently the
impact of one of the most important changes arising from the proposed reform may
not be well predicted. Nonetheless, the simulation suggests that one of the more
significant of recently proposed reforms may be expected to have only modest
effects on Federal retirement patterns in the first few years after it is
implemented.[11]

SUMMARY

In this paper we have presented and estimated a model that predicts the choice of older Federal workers among three alternatives: continued Federal employment, employment solely in the Social-Security-covered sector and complete retirement. Our empirical estimates confirm some reasonable expectations concerning the effects of certain financial and nonfinancial incentives to retire--

- Both the amount of a Federal pension entitlement and the expected wait until the pension commences affect the timing of retirement from the Federal service.

- The rate of anticipated wage growth significantly affects individual decisions to remain in Federal employment.

- Advancing age is a significant disincentive to remaining in Federal or non-Federal work.

- Workers who are eligible to ultimately recieve Social Security in some cases show a different pattern of retirement than do workers not vested in Social Security:

    --- Vested workers are more likely to remain in Federal service, especially as they approach age 62.

    --- Among vested workers, those with higher anticipated replacement rates from Social Security are more likely to remain in Federal service than those with lower replacement rates.

However, our analysis did not reveal any massive shift of Federal workers into Social-Security-covered employment in order to benefit from the "tilt" in the Social Security formula. The reader should be very cautious in interpreting this last result, however, because our measure of the gains from working in Social-Security-covered employment is extremely imprecise.

Finally, we presented simulation results for males in our sample based upon making changes in the financial attractiveness of the Federal pension system and the Social Security benefit formula. Our results suggest that advancing the age at which Federal pension receipt is permitted will have a substantial impact on the pattern of Federal retirement: far fewer Federal employees will choose to leave Federal for private employment or to leave paid employment altogether. On the other hand, reform of the Social Security benefit formula to reduce unintended subsidies to Federal reitrees was found to have only a very small impact of Federal retirement patterns.

All of our conclusions are presented with the caveat that they are based on retirement decisions in a self-selected group of nonretirees from Federal employment. An important goal for future research must be the development of longitudinal individual records that permit the examination of retirement decisions within the context of longer term or life-cycle models. In the absence of such data, inferences about the impact of employer-provided pension programs must rely on theory and cross-sectional models of qualitative choice.

NOTES

[1]For the first 5 years of Federal service, each year adds 0.015 to the replacement rate; years 6 through 10 add 0.0175 per year to the replacement rate; and each year in excess of 10 adds 0.02 to the replacement rate.

[2]Many employees, of course, were not immediately entitled to receive a pension upon retirement. Thus, only 48 percent of the men and 24 percent of the women were eligible to receive a pension if they left Federal employment during 1977.

[3]For workers with fewer than 10 years' previous service, the increase is smaller. See note 1.

[4]Five years of Federal service is required for vesting.

[5]Among older Federal workers, a substantial fraction are not entitled to annual merit pay increases.

[6]The type of random utility specification of equation (1) within the context of a discrete choice model was introduced into the econometrics literature by McFadden (1974)

[7]We rule out the possibility of ties in utility rankings.

[8]The last state is occupied by that fraction of the sample not accounted for in the preceding states.

[9]Contributions to the Social Security system come from a fixed percentage tax on wage earnings up to a taxable limit per worker per year. The tax is paid equally by both employers and employees.

[10]Report of the Universal Social Security Coverage Study Group, U.S. Government Printing Office, Washington, D.C., March 1980. See especially pp. 82-83.

[11]We emphasize that these results are only valid for Federal employees between the ages of 55 and 61, inclusive. Since none of these people are currently eligible for Social Security benefits, which cannot commence until age 62, it is conceivable that the impact of the reform might be much larger on Federal worker aged 62 and older.

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