9 Rewards for Continued Work: The Economic Incentives for Postponing Retirement

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This chapter develops empirical measures of the economic incentives for deferred retirement among older workers. Using a new data file on pay and pensions, we construct intertemporal budget sets reflecting income available to workers at alternative retirement ages. The analysis explores how continued labor force attachment is rewarded in terms of net earnings, Social Security benefits, and private pension income.

Two motivations guide the research. First, it is important to understand how workers' income opportunities change with age. Studies of retirement patterns, including our own and others',[1] have demonstrated that these economic rewards influence the choice of retirement age. Savings decisions, consumption paths, and other economic outcomes are also responsive to the budget set at older ages. Unfortunately, data limitations have made it difficult for previous authors to explore the range of income opportunities available to older individuals. This paper presents and discusses new empirical evidence on how older workers' income opportunities change as the workers age.

Exploring how companies differ in the compensation packages they offer to older workers is important as well. Some authors, e.g., Lazear (1982), have suggested that firms use their pension plans to encourage early retirement, though data on this phenomenon are difficult to obtain. The present chapter develops a detailed description of private pension structures and the ways in which they treat prolonged job attachment.

Two main conclusions arise from the analysis. First, the data show that total net income rises as people defer retirement, but the size of the income increment varies with age. Second, the data show that some pension plans encourage early retirement among older workers but others penalize it. Thus differences in private pension structures prove to be an important source of variation in income opportunities among older workers. Our results have implications for researchers interested in older workers' income patterns and for policymakers who propose mandating actuarial neutrality in private pension plans.

Section 9.1 of this chapter reviews briefly the most important theoretical features of older workers' income opportunities and discusses some general considerations when building an empirical counterpart of the theoretical budget set. Section 9.2 presents our methodology and data, and section 9.3 presents the findings. Conclusions are collected in section 9.4.

9.1   Theoretical Considerations

We consider the rewards for continued work in the context of older persons' retirement decisions. Previous theoretical studies of retirement behavior have identified the individual's problem as selecting the optimal amount of work to do over the remaining lifetime, subject to income and time constraints.[2] *Optimal* is defined as the labor supply path that maximizes intertemporal utility; accordingly, the goal is to select the retirement age that provides a worker with his most preferred combination of leisure time and income from among available options. The worker's income constraints are determined by net earnings available from market work, and net Social Security and private pension benefits available during retirement. His time constraint consists of time remaining until death; this time may be allocated between work and leisure.[3]

More formally, the worker is postulated to select the retirement age (R) that maximizes intertemporal utility, the arguments of which are lifetime consumption (C) and lifetime leisure (RET):

2. For a review of studies of retirement behavior, see Mitchell and Fields 1982.
3. We abstract here from retirement options involving part-time work or gradual withdrawal from the labor force; Gustman and Steinmeier 1984 and Burtless and Moffitt 1982 consider these alternatives in some detail. For the sample of older workers described below, retirement may be best described as accepting the pension and leaving the firm since only a tiny minority ever worked after becoming pensioners.

$$U = U(C,RET); \; U \text{ concave},$$

subject to an intertemporal budget constraint with the following structure:

$$C = PDVY(R) + W_0 - B_0.$$

In other words, planned consumption equals the present value of discounted income over the remainder of the individual's life ($PDVY$), plus wealth at the time of retirement decision (W_0), minus planned bequests (B_0). Survival probabilities and pure time preference are incorporated via a discount factor (r). Both the lifetime utility function and the income constraint are viewed as stationary over time.

The $PDVY$ component of the older worker's budget constraint depends on the retirement age chosen. This is because $PDVY$ is composed of three elements, each of which is a function of R. The present value of earnings ($PDVE$) is computed from the age at which the worker begins planning for retirement (normalized to 0) until R:

$$PDVE = \int_0^R E_t e^{-rt} dt.$$

The other two components of $PDVY$—the discounted values of Social Security and pension benefits—also depend on R since they are computed from R to the end of the planning horizon (T):

$$PDVSS = \int_R^T SS_t e^{-rt} dt$$

and

$$PDVPP = \int_R^T PP_t e^{-rt} dt.$$

Annual retirement benefits are fairly complex functions of several factors including the worker's retirement age:

$$SS_t = f(R,t,F),$$
$$PP_t = g(R,t,F).$$

When the worker defers retirement, many firms raise annual pension benefits to acknowledge the shorter period over which benefits will be paid; when benefits are only sufficiently larger to offset increased mortality, the pension structure is termed actuarially neutral.[4] As with private pension formulas, Social Security rules also provide a positive credit as R

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4. In the empirical analysis below, we focus on defined benefit plans, i.e., those in which benefit amounts are functions of years of service and/or pay rather than pension contributions. Benefits in such plans need not be actuarially neutral.
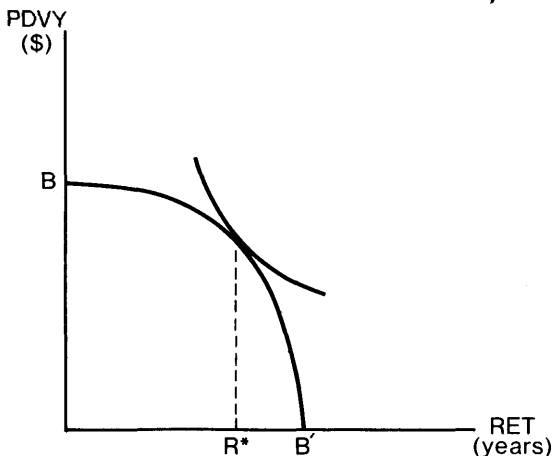
Fig. 9.1.   The intertemporal budget set (BB') and the optimal retirement date (R^*).

increases. Social Security and private pension benefits depend upon two other variables as well. The year itself, t, enters the annual benefit computation because benefits often vary with time. This would occur in the case of negotiated benefit improvements in bargained plans, or legislated Social Security formula changes. Finally, the pension factor (F) is included to allow for interactions between benefits and other variables; for example, in some pension plans, preretirement earnings are used in the benefit formula.

In addition to the income constraint, an older worker faces a total time constraint. By definition, years of retirement leisure (RET) are equal to the difference between the individual's expected lifetime (N) and the age at which retirement occurs:[5]

$$RET = N - R.$$

Understanding the income-leisure trade-off facing older workers is facilitated by figure 9.1. This figure graphs the present value of income available to the older individual and the expected retirement period for all possible retirement ages; the diagram indicates that, for this hypothetical worker at least, his income is lowest if he chooses to retire as early as possible, while his income would rise substantially if he remained with the firm additional years. The figure presumes that deferring retirement is rewarded by even more income; below we show empirically that the intertemporal budget set in fact has such a shape.

5. Remaining lifetime may, of course, vary with health. The empirical work below uses standard life expectancies in computing the average value of future income streams; however, annuities are worth less to those with shorter remaining lifespans due to poor health, and benefits to such retirees should be adjusted accordingly.

Presenting the older worker's decision in this way highlights the similarities between this model and the conventional labor economics approach to the hours-of-work decision. Figure 9.1 also indicates that the optimal retirement date (R^*) is determined in a familiar way: R^* is the age at which the marginal utility of an additional increment to lifetime income is just offset by the loss in utility from leisure foregone. While we do not develop comparative dynamics for R^* here, they may be derived in much the same manner as in the cross-sectional framework (Fields and Mitchell 1984).

Some features of the intertemporal budget set should be underscored. First, the older worker's budget set is defined over all possible retirement dates rather than at just one moment in time. A complete understanding of the rewards for continued work therefore requires that one investigate not only one or two points on the budget surface, but all alternatives. Second, to be able to compute *PDVY* at each age, one must understand the private pension and Social Security benefit formulas facing a given worker, since these institutional rules impart structure to the intertemporal budget set. Third, the income-leisure trade-off embodies expectations about future income streams and formulas, inflation rates, mortality rates, and a host of other variables. These must also be modeled in empirical work.

9.2 Building the Empirical Intertemporal Budget Set

To construct an intertemporal budget set, we require complete data on each worker's earnings, private pension benefits, and Social Security benefits. The data set used in the present empirical analysis is a subsample of the Benefit Amounts Survey (BAS) developed in 1978 by the U.S. Department of Labor's Pension and Welfare Benefits Program.[6] This survey consisted of a stratified random sample of private sector pension plans filing reports with the Labor Department as required under the Employee Retirement Income Security Act of 1974 (ERISA). The firms whose pension plans were selected for analysis were asked to provide a limited amount of information on the beneficiaries; data collected at the firms included birth year, year of retirement, and tenure with the firm for each sample worker. Individual records were then merged with administrative data from the Social Security Administration so that each worker's file also contained his earnings history from 1951 on.

The sample of workers available for analysis consists of 8,733 men born in 1909 or 1910. This limited age cohort was selected because, by the survey date (1978), virtually all would have been retired, yet relatively few would have died and therefore been excluded from the sample.

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6. A data appendix describing empirical computations in more detail is available from the authors on request.

For the analysis at hand, we must know the rules determining pension benefits. We constructed such information from union contracts and summary plan descriptions on file with the U.S. Department of Labor for fourteen defined benefit plans. No larger data set with information on both pensions and their beneficiaries is now available; the present analysis thus extends our own previous efforts as well as those of other analysts who have generally been limited to an examination of a single pension plan.[7] On the other hand, our sample of pension plans is still small enough that findings reported here must be viewed as exploratory rather than re-presentative of pension plans as a whole.

The plans represented here cannot be identified individually for confidentiality reasons. We may say, though, that our sample includes several blue collar plans negotiated with the United Auto Workers, several other plans in the manufacturing sector, a craft union plan, and one in the trade sector.

An example of the benefit rules used in one of the United Auto Workers plans is given in table 9.1. Even this apparently simple years-of-service formula turns out to be quite complex in practice.

The formula given in table 9.1 describes pension benefit rules in effect around 1970, at which time our sample workers were about sixty years of age. But the rules in 1970 would not necessarily have been appropriate for a worker who waited to retire until, say, 1975. In this company, and in the other companies in our study, the pension formulas were incremented several times during the 1960s. In evaluating what future retirement benefits would have been, workers in that company might reasonably have expect-ed that benefits would rise in the future as much as they had in the past. Therefore we looked at prior union contracts, the Bureau of Labor Statis-tics *Pension Digest*, and other documents to determine what had occurred prior to 1970. Empirical analysis of changes in pension benefits over time for newly retiring workers, as well as for previously retired individuals, re-vealed that pension plans typically raised benefits in line with inflation for workers not yet retired, but held nominal benefits constant for those al-ready retired. Therefore, the empirical model assumes that a prospective retiree would have expected nominal preretirement increases just short of the inflation rate, but probably zero postretirement increases.

The specific pension formula outlined in table 9.1 depends only on age and years of service. To compute pension amounts in plans where earn-ings are also used in the benefit formulas, it is necessary to know what a worker would have earned had he remained on his job. Earnings informa-tion is also needed, of course, in constructing the total lifetime income available from alternative retirement strategies.

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7. See, for instance, the work of Burkhauser 1979 and Fields and Mitchell 1984 on the United Auto Workers, and Burtless and Hausman 1982 on federal government workers.

Table 9.1   **Private Pension Structure in Company X**

	Benefit until 62	Benefit until 65	Benefit at 65 and Beyond
Retire after 60[a]	$4,800	$5,400	$2,548
Retire after age 62[b]	—	$5,400	$2,944
Retire after age 65[c]	—	—	$3,214

Note: The pension structure in company X is negotiated every three years and written into a contract with the United Automobile Workers union (UAW). The plan is noncontributory. The benefit formula negotiated in the early 1970s, when the sample workers were about sixty years of age and were presumably deciding when to retire, varied depending on age and/or years of service. The above figures applied to an individual who started work at company X at age thirty.

[a]This benefit is available only after completing ten years of service. Calculated as ($90 × years of service less [.04 × the difference between the retirement age and 62]) + $63.60.

[b]This benefit is available only after completing ten years of service. Calculated as ($90 × years of service) + $63.60.

[c]Calculated as ($90 × years of service) + $63.60.

Information on earnings is available from the BAS–Social Security earnings data merged file. For the period prior to retirement, earnings in excess of the Social Security taxable maximum are imputed using a variant of a routine described in Fox (1976). Earnings a worker could anticipate if he did not retire are imputed from previous years' real earnings figures. Gross earnings are then reduced by income taxes and payroll taxes to obtain net earnings.

The other element of the intertemporal budget set is Social Security benefits. These are computed based on the Social Security rules in effect in 1972. We use 1972 benefit rules for retirement plans being devised in 1970, because future changes had been legislated two years in advance. The algorithm incorporates what the worker might have anticipated had he retired earlier and filed for benefits when first eligible at age sixty-two, and what he would have received if he had postponed retiring and filing for benefits until later ages. As with the projection of future private pension benefits, this requires an assumption about how benefits would have been expected to change over time. The algorithm incorporates the real growth rate in Social Security benefits experienced during the 1960s as the best estimate of how real benefits might have been expected to change during the 1970s.

One limitation of the Social Security computation should be noted. It is possible to estimate only the male's Social Security benefits, but not his spouse's benefits, since marital status information is not reliably reported in our file.

In moving from the annual budget set components (all of which are in nominal dollars) to present discounted values (which are much more in-

formative if expressed in real dollars), several additional assumptions must be made. Standard practice is followed by discounting each year's benefits by the probability of mortality at each age, based on survival rate information for the cohort in question. In addition, future benefits are deflated by two factors—inflation and a real discount rate. Estimated future benefit streams assume continuation of the rate of price increases prevailing in the early 1970s; to discount benefits accruing in the future, the same nominal rate is used. In addition, a 2 percent real discount rate is used to reflect time preference. Confirmatory analysis with other discount rates produces results virtually identical to those reported below.

The foregoing describes the construction of the budget set in the BAS file. In the balance of the chapter we summarize this information by calculating the overall budget set and its components for a specific "illustrative worker."[8] We do this for purposes of comparison, since it is useful to derive benefits using the same basic earnings and job tenure characteristics, while holding constant other factors that might vary across plans. Nonetheless, this illustrative individual should be relatively similar to actual workers in the pension plan, since benefit structures are generally constructed with a relevant salary range in mind. The illustrative worker discussed below is assigned the mean net earnings and job tenure derived from the underlying sample described above. The average tenure figure, twenty-six years, is compatible with Hall's (1982) recent discussion of lifetime jobs among males in the U.S. labor force. Others who have computed pension benefits (e.g., Lazear 1982; Kotlikoff and Smith 1983) did not have this type of individual-level information and were thus required to use a range of tenure and salary assumptions to represent most possibilities.

9.3   The Economic Rewards for Deferring Retirement

As discussed earlier, two empirical questions guide our empirical explorations: (1) How do total income profiles change as workers age? and (2) How do pension plans reward continued work effort? Each question is investigated in turn in this section.[9]

9.3.1   The Shape of the Total Income Path (*PDVY*)

Table 9.2 displays the elements of the illustrative worker's intertemporal budget set, expressed in annual terms in the top panel and in present discounted value terms in the lower panel.[10] Expected income amounts are reported only until age sixty-five in this relatively aggregative table, since some firms prohibited employment after that age; disaggregated figures

8. Readers of our earlier work should be alerted to the fact that those papers use actual workers in a company, not the illustrative worker used here.

9. The calculations in this section assume that the illustrative worker is single. Alternative calculations assuming that he is married yield identical qualitative conclusions, except for one point noted below.

10. All present discounted value figures are reported in 1970 dollars.

Table 9.2   **Earnings, Social Security, and Private Pension Income at Alternative Retirement Ages, for the Illustrative Worker**

	If Retirement Occurred at Age					
	60	61	62	63	64	65
A. Annual Amounts (nominal dollars)						
1. Net earnings (E_t)	$ 0	8,254	8,717	9,185	9,563	9,760
2. Social Security (SS_t)[a]	1,858	1,916	1,973	2,333	2,749	3,209
3. Net private pension (PP_t)	2,190	2,350	2,322	2,513	2,724	2,634
B. Present Values of Streams (real dollars)						
1. Net earnings ($PDVE$)	$ 0	7,677	15,203	22,549	29,618	36,269
2. Social Security ($PDVSS$)	27,887	28,755	29,614	31,013	32,288	33,191
3. Net private pension ($PDVPP$)	19,071	18,960	19,953	19,493	19,029	18,542
4. *Total PDVY*	$46,958	55,392	64,770	73,055	80,935	88,002
5. *Marginal Increases*	8,434 (18%)	9,378 (17%)	8,285 (13%)	7,880 (11%)	7,067 (9%)	

Note: These computations are based on pension algorithms devised for fourteen pension plans and illustrative worker; see text.

[a]Assumes worker retires at that age and files then or at age sixty-two, whichever is later.

for later ages are provided below for those plans in which continued work beyond age sixty-five was possible.

Of most interest for the present discussion are the last two lines on table 9.2 (lines B.4 and B.5), which report total *PDVY* and marginal changes as retirement is deferred. The following features of the expected *PDVY* stream are noteworthy:

1. *PDVY rises monotonically as retirement is deferred.* At each age, earnings plus (or minus) pension and Social Security accruals exceed the pension and Social Security benefits foregone. In real terms, a worker postponing retirement from age sixty to sixty-five would roughly double his real income stream.

2. *PDVY rises nonlinearly with age of retirement.* The payoff to working one additional year is highest in both dollar and percentage terms between ages sixty and sixty-one; if the same worker deferred retiring between sixty-four and sixty-five, his dollar gain would be about $1,400 less, for a marginal percentage gain only half as large.

Therefore, the data show that the economic rewards for postponing retirement are positive but that the gains vary across ages. Previous studies have not discerned these patterns because they used data containing less detail on the components of *PDVY*.

The fact that the intertemporal budget set for older workers rewards deferred retirement implies that observed income for any particular retiree is a function of when he chooses to retire, rather than being exogenously given. If one wishes to assess income opportunities that would have been available to a retired worker prior to his retirement, it is necessary to develop an intertemporal budget set such as the one in table 9.2 indicating the magnitudes of contingent income flows at alternative retirement dates.

The observed pattern of the budget set for the BAS sample also implies that the value of *PDVY* (or its component parts) at any one particular age will not be very informative about the overall shape of workers' intertemporal income paths. Unfortunately, most data sets other than the BAS contain insufficient detail on earnings, Social Security, and private pension benefits, making it difficult to develop a *PDVY* path in as much detail as here.[11]

On average, workers in the fourteen plans have very similar earnings and Social Security streams. The main source of variation arises in the private pension streams. These differences are elaborated below.

9.3.2   The Shape of Private Pension Income Paths

Pension benefits constitute a fairly significant source of income for older workers who participate in these plans. The top panel of table 9.2

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11. Approximations are possible using the Longitudinal Retirement History Survey; see Fields and Mitchell 1984.

shows that annual (first-year) benefits from private pensions are sizeable, equaling or exceeding the single worker's Social Security payments for all ages but sixty-five, where they are only slightly less.[12] Net private pension benefits amount to one-quarter to one-third of after-tax earnings for individuals in the sample.[13]

Still focusing on annual benefits, line A.3 indicates large differences in benefits depending on when the worker retires. On average, an age-sixty retiree would have received private pension income of about $2,200 in the year he retired. If he deferred retirement by one year, the addition to (nominal) benefits would be on the order of 7 percent. However, the marginal pension payoff to an additional year's work is by no means uniform across retirement ages; for example, benefits at age sixty-two are *lower* than for age sixty-one. This benefit decline is attributable to pension plan supplements provided until a retiree attains age sixty-two, the age of eligibility for Social Security. A reduction is again evident between the ages of sixty-four and sixty-five; the pension rules thus acknowledge that workers can file for full Social Security retirement income at age sixty-five and provide a bridge for individuals retiring earlier. In general, the marginal pension payoff to retiring one year later varies a lot across retirement ages, a fact not immediately evident from a cursory review of benefit rules.

Line B.3 of table 9.2 converts the annual pension benefit figures into present discounted values in real dollars. Again it is evident that the reward structure built into private pensions varies for different retirement ages. The illustrative worker would receive *more* in lifetime benefits if he left the firm at age sixty than if he postponed retirement to age sixty-one, despite the fact that annual benefits are higher at age sixty-one than at sixty. In fact, the annual pension benefits are increased at less than actuarially neutral rates at several ages, as is evident from computed changes in the present values of lifetime benefits:

	Change in Retirement Age				
	60–61	61–62	62–63	63–64	64–65
Change in *PDVPP*	0%	+ 5%	− 2%	− 2%	− 2%

Clearly the structure of lifetime pension income flows very much affects the economic rewards for continued work.

12. For a married worker, the sum of the worker's plus spouse's Social Security benefits exceeds private pension benefits.

13. Previous studies have not computed after-tax replacement rates both for private pensions and Social Security, so these figures cannot be directly compared with others in the literature. We find that the overall replacement rate including both pensions and a single retiree's Social Security benefit is between 50 and 60 percent on average, though in some cases individuals received as much as 95 percent of preretirement net earnings. Replacement rates would be higher if spouse benefits were included.

Present values in table 9.2 are averages across fourteen pension plans, so they conceal potentially interesting differences in company pension structures. Table 9.3 splits the sample into two groups: *pattern* and *conventional* plans. Pattern plans are pensions where benefits are based almost exclusively on years of service with the firm (or occupation, if a craft union). Conventional plans, more common among nonunion firms, determine benefits based both on final salary and tenure with the firm.

It is evident from table 9.3 that the overall means obscure some key differences between the two kinds of benefit structures. Pattern plans tend to structure their first-year benefits so that they rise more or less smoothly, reaching a peak at age sixty-four; annual benefits typically fall for workers deferring benefits beyond that point. First-year benefits in conventional plans operate differently; in this case, benefits for the age-sixty-two retiree are lower than for the worker leaving one year earlier. It is this subgroup of plans that produces the dip in annual benefits found in the overall mean. However, after age sixty-two, conventional plans tend to provide ever-increasing benefit amounts for workers postponing retirement up to age sixty-five.

An examination of discounted pension values in these two types of plans suggests even sharper contrasts. Pattern plans (line B.2) actively discourage work beyond age sixty.[14] An employee in a pattern plan who defers retirement until age sixty-five will in fact receive lifetime benefits that are about 18 percent *lower* than he would have received had he retired at age sixty! On the other hand, present value streams in conventional plans are structured so that a worker deferring retirement until age sixty-five receives about 17 percent *higher* benefits than if he retired at age sixty. Thus between ages sixty and sixty-five, conventional pension plans appear to improve benefits by about the same amount that pattern plans reduce them.

Clearly, the overall incentives differ between the two types of plans. To see whether marginal incentives are smooth or erratic, changes in pension present values are computed for each additional year of work:

	Change in Retirement Age				
	60–61	61–62	62–63	63–64	64–65
Pattern plans change in *PDVPP*	−2%	−2%	−5%	−5%	−5%
Conventional plans change in *PDVPP*	+2%	+14%	+0%	+0%	+0%

Evidently, pattern plans actively encourage early retirement, whereas conventional plans strongly encourage work up to age sixty-two. After age

14. This is similar to the finding reported by Lazear 1982.

Table 9.3   **Net Private Pension Amounts at Alternative Retirement Ages in Pattern and Conventional Plans**

	If Retirement Occurred at Age					
	60	61	62	63	64	65
A. Annual Net Pension Benefits[a]						
1. Overall mean	$ 2,190	2,350	2,322	2,513	2,742	2,634
2. Pattern plan mean	2,653	2,760	2,907	3,059	3,214	2,626
3. Conventional plan mean	1,728	1,939	1,883	2,103	2,356	2,639
B. Present Value of Net Pension Benefits[b]						
1. Overall mean	$19,070	18,960	19,953	19,493	19,029	18,542
2. Pattern plan mean	24,795	24,192	23,787	22,617	21,432	20,275
3. Conventional plan mean	14,777	15,036	17,078	17,150	17,227	17,243

Note: This table is based on pension algorithms of fourteen plans as applied to the illustrative worker (see text).

[a]Nominal dollars.

[b]Real dollars.
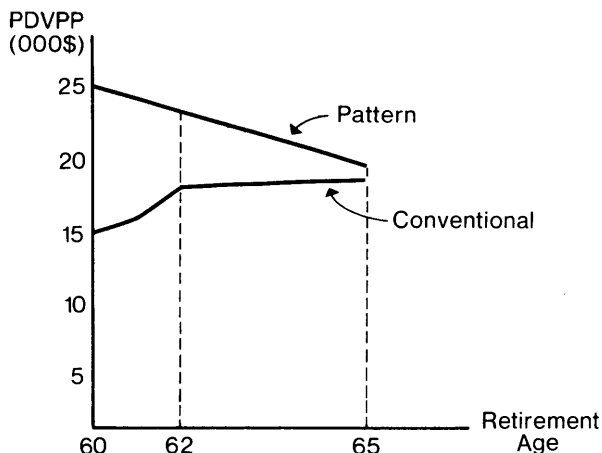
Fig. 9.2.   Present value of private pension benefits in pattern plans and conventional plans.

sixty-two, conventional plans provide a flat payoff schedule for additional years of work; in pattern plans, the slope becomes strongly negative (see figure 9.2).

Table 9.4 disaggregates to the level of the individual plan. This breakdown of pension plan benefit structures reveals even more variability in economic rewards for continued work. These plan-specific data permit the computation of benefit streams for ages beyond sixty-five in cases where continued work was permitted; firms with mandatory retirement are indicated with a dash.

This disaggregative investigation of pension plan rules suggests two conclusions:

1. *Pension plans reward deferred retirement differently from one company to the next.* Pattern plans as a whole, and the UAW plans in particular, encourage early retirement by structuring benefits so that they attain a maximum between ages sixty and sixty-two. Conventional plans are more complex, but as a rule structure their benefit flows to reward continued work well beyond age sixty.

2. *Marginal payoffs to deferred retirement are uneven; actuarial neutrality across retirement ages is rare.* In our sample, a worker deferring retirement by one year could have increased his lifetime pension income flow by as much as 14 percent, or reduced it by 5 percent, depending on the pension plan in which he worked.

In overview, then, some private pensions reward prolonged work and others penalize it, both in overall and marginal terms. It is *not* true that pensions always discourage work beyond age sixty.

Table 9.4   **Present Values of Net Private Pension Benefits for Alternative Retirement Ages: Plan-Level Data**

	\$28,181	61	62	63	64	65	66	67	68
	If Retirement Age Occurs at Age								
	60	61	62	63	64	65	66	67	68
A. Pattern Plans									
UAW plans									
Plan A	\$28,181	27,586	27,189	25,455	23,787	22,195	21,706	21,140	20,500
Plan B	36,030	36,146	36,599	36,341	35,730	34,987	34,081	—	—
Plan C	28,176	27,571	27,189	25,455	23,787	22,195	—	—	—
Plan D	28,176	27,571	27,189	25,455	23,787	22,195	21,706	21,140	20,500
Non-UAW plans									
Plan E	21,858	19,814	17,912	16,147	14,512	13,001	11,608	10,328	9,153
Plan F	6,351	6,464	6,641	6,850	6,986	7,079	6,620	6,156	5,692
B. Conventional Plans									
Plan G	0	0	9,300	10,027	10,087	10,497	9,461	8,891	7,951
Plan H	13,527	14,176	20,471	19,364	18,173	16,869	—	—	—
Plan I	16,410	16,709	16,841	16,977	17,028	16,893	—	—	—
Plan J	20,012	20,256	20,270	19,335	18,359	17,246	16,190	15,081	13,841
Plan K	14,851	15,079	15,290	15,504	16,318	17,174	16,563	15,866	15,109
Plan L	17,671	19,669	21,594	23,468	25,295	26,981	—	—	—
Plan M	16,526	17,042	17,668	18,291	18,810	19,084	—	—	—
Plan N	19,491	17,254	15,193	14,230	13,742	13,198	12,605	11,592	10,950

Note: This table is based on pension algorithms as applied to illustrative worker; see text. Underlined numbers are row maxima. Dashes indicate retirement is mandatory in that plan at that age.

9.4   Conclusion

The notion of an intertemporal budget set facing older workers flows from an economic model of choice of retirement age subject to income and time constraints. Measuring the budget set empirically requires that total discounted income be computed for each possible retirement age. In so doing, it is important to model Social Security and private pension rules defining benefits available at each age, and in addition to determine how workers would have expected these rules to change in the future.

Using a unique new data set known as the Benefit Amounts Survey, we develop empirical answers to two questions: (1) How do workers' total incomes change as they defer retirement? and (2) Do private pension structures reward or penalize continued work at older ages?

The data suggest two important features of the discounted total income streams (*PDVY*) facing older workers, which have not been noted in previous studies. *First, PDVY rises monotonically as retirement is deferred.* This is the result of rising Social Security and earnings streams balanced against flat or declining private pension streams. *Second, PDVY rises nonlinearly with age.* In general the economic rewards to postponing retirement are always positive but the gains vary depending on the age in question.

The data also point to two new conclusions about the incentive structures of private pension plans. *First, pension plans reward deferred retirement differently across companies. Second, marginal payoffs to deferred retirement are uneven; actuarial neutrality across retirement ages is uncommon.* Some private pensions reward prolonged work but others penalize it.

The patterns just noted have implications for both researchers and policymakers. Analysts interested in modeling and estimating the determinants of retirement, savings, and other economic behavior among older workers must build and examine the intertemporal budget sets anticipated by individuals as they age. Similarly, income distribution studies should recognize that actual retirement income among retirees is determined to a significant degree by workers' retirement behavior. These considerations highlight the importance of developing new data sets containing more complete information on workers, their earnings histories, and their company records, including pension system rules. In particular this chapter has shown that evaluating older individuals' incomes requires devising data sets quite different from those used by social scientists in the past. Conventional worker-level or even household-level surveys collected over short periods of time cannot provide detail sufficient to compute accurate measures of Social Security benefits and private pension opportunities. Instead what is required is a new and more creative matching of data on workers, their entire work histories, and characteristics of the firms em-

ploying them throughout their lifetimes. Ideally such data would also incorporate other needed measures on employee health, wealth, and demographic traits especially important for the study of income and aging.

The observed differences in pension patterns also have an interesting policy implication. One proposal that has received some attention of late in policy circles is the idea that the federal government should mandate pension benefit neutrality. This proposal is motivated by the belief that pension structures currently encourage early retirement. It is thought that mandatory pension neutrality would result in higher benefits for those continuing to work beyond age sixty, thereby encouraging longer workforce commitment. However, our analysis shows that the actual result depends on the benefit structure presently available to the covered employee. In pattern plans, the effect of mandatory neutrality would probably be to cut early benefits rather than to increase later ones. Though this would affect retirement ages in the anticipated direction, retirement benefits would be lower than at present, not higher.

In conventional plans, on the other hand, mandatory neutrality could conceivably remove the desired incentives currently in place to defer retirement; such a result would not be consistent with federal efforts to encourage later retirement. Altering pension reward structures currently in place could produce other undesirable results as well. If the current pension benefits patterns are structured in accordance with firms' perceptions of the relative efficiency of older workers compared to younger ones, imposing regulatory restrictions would be expected to increase firms' costs, some part of which would probably be passed on to workers in the form of lower wages or lower pension benefits. Both the welfare and the efficiency costs of mandating pension neutrality should be analyzed much more carefully before concluding that such a policy is desirable.

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