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FIRM-LEVEL POLICY TOWARD  
OLDER WORKERS

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ABSTRACT

This paper focuses on one aspect of long-term labor contracts-- employer-provided pensions--in order to develop a better understanding of how such contracts affect employment patterns of older workers. Pensions are one of the few elements of the employment package which explicitly describe long term agreements between workers and their employers; consequently they offer a unique opportunity to study these agreements. The present paper combines labor supply and contract theory to examine pension responses to changes in taxes, Social Security benefits, and the federal government's recent decision to lift the age of mandatory retirement. Evidence on a longitudinal sample of pension plans from 1960 to the present suggests:

(1) During the 1960-70 period, Social Security increases generated changes in pensions favoring early retirement; and

(2) During the 1970-80 period, some plans reduced private pension benefits in response to the raising of the mandatory retirement age.

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## FIRM-LEVEL POLICY TOWARD OLDER WORKERS

In the last few years analysts interested in long-term worker/firm relationships have made a number of theoretical advances.<sup>1</sup> Despite this volume of theoretical work, empirical analysts have lagged far behind in examining the form and function of real-world long-term agreements between workers and firms. The present paper focuses on one aspect of the lifetime labor contract--employer-provided pensions--in order to develop a better understanding of how such contracts operate.

Private pensions are one of the few elements of the employment package in which employers spell out their long-term promises to employees. Because written documents containing pension promises are readily available, it is possible to quantify levels and changes in the value of employers' promises regarding this important form of deferred compensation.<sup>2</sup> In this paper we develop a new longitudinal data set on defined benefit pension plans covering the twenty-year period between 1960 and 1980, and evaluate how and why employers' pension promises changed through time. Of special interest are private pension responses to exogenous changes including Social Security, income and payroll taxes, and the federal government's decision to lift the age at which mandatory retirement can be imposed. Determining whether and how pension structures adapted to these regulatory policies provides unusual insight about the nature of these long-term contracts.

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<sup>1</sup> See Azariadis and Stiglitz (1983) for a survey of the recent theoretical literature.

<sup>2</sup> Detailed information has been provided to workers since the passage of the Employee Retirement Income Security Act in 1974 (ERISA); many firms also produced extremely detailed pension documents since the inception of their pension plans in the 1940s and 1950s.

It should be noted at the outset that we do not focus on the Employee Retirement Income Security Act (ERISA) of 1974, which set national standards for private pension eligibility and vesting provisions, accrual formulas prior to reaching retirement age, and funding and insurance of pension benefits. These regulations clearly affected the security of retirement benefits immediately, but probably did not alter benefit levels and profiles over the period under study.<sup>1</sup>

The plan of the paper is as follows: Section 1 sketches some of the key changes in the pension environment attributable to regulatory reforms over the period 1960-1980. Section 2 outlines the theoretical model used to predict how pensions responded to such changes in the regulatory environment. Section 3 presents empirical findings. In a final section we discuss the implications of the results for contract theory and policy analysis.

#### 1. Changes in the Pension Environment: 1960 to 1980

This section examines three major changes in the pension environment between 1960 and 1980: mandatory retirement age changes, tax increases, and Social Security benefit adjustments.

Mandatory retirement has received considerable attention in the labor economics literature, stemming mainly from the 1978 amendments to the Age Discrimination in Employment Act (ADEA) which raised the permissible mandatory retirement age from 65 to 70. Considerably less attention was devoted to the original ADEA of 1967. This Act protected individuals ages

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<sup>1</sup> Because ERISA reduced the riskiness of vested pension benefits, employers may have an incentive to reduce workers' wage profiles in the long run. Ehrenberg (1980) finds evidence of a wage-pension risk tradeoff.

40-65 from employment discrimination; age 65 was selected as the upper limit because at the time it was the commonly specified age of mandatory retirement in the private sector. It is interesting to note, however, that the Supreme Court interpreted the 1967 Act as permitting mandatory retirement prior to age 65 in the special case when the pension plan required it. The 1978 amendments explicitly disallowed this interpretation of the original Act, at the same time raising the protected age from 65 to 70. Initially, economists predicted that the 1978 reform would bring about changes in compensation aimed at achieving the same result (i.e. retirement at age 65);<sup>1</sup> since then, however, a few studies have found that mandatory retirement provisions were often not binding since a majority of workers retired before age 65.<sup>2</sup> The net effect of mandatory retirement rules on pension structures is thus still open to debate.

The 1960-80 period saw other changes in the pension environment in addition to the revised mandatory retirement rules. Between 1960 and 1970 income and payroll tax rates rose though real net earnings held their own. Between 1970 and 1980, in contrast, tax rates continued to rise, and in addition, the maximum earnings subject to Social Security payroll tax nearly quadrupled, going from \$7800 to \$25,900 (in contrast to the slower growth of \$4800 in 1960 to \$7800 in 1979). As a result real earnings for the average worker were only slightly higher in 1980 than in 1970.

Along with changes in taxes came reforms in the way Social Security benefits were computed. Benefits have always been based on workers' earnings histories, and as noted above, the maximum earnings recognized for

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<sup>1</sup> For example, Lazear (1979), Burkhauser and Quinn (1980).

<sup>2</sup> Burkhauser and Quinn (1980), Fields and Mitchell (1984), and Parnes (1981).

Social Security purposes rose over the period, with most of the increase occurring between 1970 and 1980. A retiree's basic monthly benefit, called the Primary Insurance Amount or PIA, also increased by 39% in nominal terms due to legislative reforms.<sup>1</sup>

During the second decade two major alterations were made in the way Social Security benefits were calculated. First, provisions were made for automatic adjustments in benefit levels to keep pace with inflation. Second, there were statutory increases in the multiples applied to earnings and huge increases in the amount of earnings counted. Finally, in 1977 a new method of calculating benefits was legislated using a much simpler formula based on indexed earnings.<sup>2</sup> The cumulative effect of all these changes was a nominal increase of 139%.

The combined effect of these changes in the pension environment can be illustrated with the help of Table 1. This table presents average net earnings and Social Security profiles in 1960, 1970 and 1980 using the tax and Social Security rules in effect at the time. All dollar values are reported in 1970 dollars for ease of comparison; a discussion of how the data were created appears in the appendix.

Between 1960 and 1970, the most significant change was a large upward shift in Social Security benefits both in annual and present value terms. Annual benefits rose 33% in real terms for retirement at age 62 and 28% for retirement at age 65, while the present value of the real Social Security

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<sup>1</sup> The PIA is calculated in terms of a percentage of earnings. In 1960 the PIA equalled 58.85% of the first \$110 earned, plus 21.4% of up to \$290 additional earnings. By 1970, the formula had been adjusted so that the PIA equalled 81.83% of the first \$110, plus 29.76% of the next \$290, plus 27.81% of the next \$150, plus 32.69% of the next \$100.

<sup>2</sup> In 1980 the PIA equalled 90% of the first \$194, plus 35% of the next \$977, plus 15% of additional earnings up to the maximum.

Table I.

Net Earnings and Social Security Benefits for  
the Average Worker in 1960, 1970 and 1980<sup>a/</sup>  
(1970\$)

		If retirement is at age:										
		60	61	62	63	64	65	66	67	68	69	70
I.	<u>Annual Earnings: (Net)</u>											
	1960	\$ 6770	6755	6808	6643	6274	5997	6167	6066	6108	5791	0
	1970	7274	7114	7301	7256	7118	6943	6915	6800	6674	6689	0
	1980	7208	7269	7285	7143	6727	6487	6330	6160	5954	5691	0
II.	<u>First Year Social Security Payments When Eligible:</u> <sup>b/</sup>											
	1960	\$ 1234	1302	1300	1511	1747	2011	2146	2271	2396	2527	2665
	1970	1751	1741	1732	1981	2262	2567	2746	2911	3035	3167	3306
	1980	2179	2038	1908	2002	2089	2171	2172	2173	2176	2180	2185
III.	<u>Present Discounted Value of Social Security Benefit Stream (PDVSS):</u>											
	1960	\$19062	20793	21479	22717	23850	24854	23938	22780	21540	20281	19018
	1970	25085	25796	26536	27728	28851	29740	28811	27562	25842	24158	22505
	1980	25723	24878	24087	23416	22589	21636	19882	18221	16649	15164	13755

<sup>a/</sup> Figures presented are for single males; patterns for married males are similar.

<sup>b/</sup> Social Security benefits are computed assuming the individual retires in the year in question and files for benefits when first eligible.

benefit stream rose 24% and 20% for retirement at ages 62 and 65 respectively. Between 1970 and 1980, Social Security benefit formulas rose 10% for age 62 retirees, but dropped a bit for those deferring retirement until age 65. Expected Social Security present value streams declined slightly at age 62 (10%) and by a great deal (27%) at age 65. This occurred primarily because the system in 1980 rewarded deferred retirement less than it did ten years previously. In other words, the slope of the Social Security present value profile flattened and even became negative over the period 1970 and 1980.

The other significant change during 1970-1980 was the increase in the permissible mandatory retirement age. This is not evident from Table 1 because any changes in response to this would be expected in private pension rules. Empirical evidence on pension response to regulatory change is the subject of discussion in Section 3 of this paper.

## 2. Predicting Pension Responses

The regulatory changes described above clearly altered the economic incentives confronting older workers in significant ways over the period 1960-80. By drawing on prior labor supply research, it is possible to forecast how these budget set changes modified workers' desired retirement patterns. In turn, contract theory can be used to predict how these new behavioral outcomes would have elicited changes in the structure of compensation packages offered to older employees. This section derives predictions about the likely retirement age changes and consequent pension changes expected in response to the regulatory reforms of the 1960-80 period. Actual empirical patterns are compared with the predictions in the next section.



### A. The 1960-1970 Period

As noted in Section 1, the most significant change affecting the pension environment experienced during the 1960s was the large upward shift in Social Security benefits generating over 20% larger Social Security present values for an average worker. Understanding how such a significant change in older workers' budget sets would affect retirement patterns is facilitated by the use of an intertemporal labor supply model developed in Fields and Mitchell (1984). Here the worker's problem is posed as one where the individual selects a retirement age to maximize his utility, which is a function of consumption (C) and leisure during his retirement years (RET):

$$U = U(C, RET) \text{ where } U_1, U_2 > 0 \text{ and } U_{12}, U_{21} < 0. \quad (1)$$

Two constraints on the individual must be incorporated: First, there is a time constraint such that the time devoted to leisure plus the time spent working must not exceed time remaining until death ( $RET = T - R$ ).<sup>1</sup>

Additionally there is the constraint that lifetime consumption must not exceed available wealth as of the date the retirement computations are made,<sup>2</sup> plus the present discounted value of expected future income (PDVY). The PDVY term is composed of three parts in the analysis below: one part due to (net) labor market earnings over the employed period

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<sup>1</sup> The problem is described in the certainty case for clarity here; the empirical work below replaces fixed and known life expectancies with survival probabilities which change with age.

<sup>2</sup> The empirical analysis below assumes that detailed retirement plans are made when the worker attains age 60, since evidence suggest that retirement planning occurs fairly late in life for most workers.

(PDVE),<sup>1</sup> a second portion due to (net) Social Security payments over the retirement period (PDVSS), and the last part due to (net) private pension payments from retirement until death (PDVPP).<sup>2</sup> These are readily summarized as follows:<sup>3</sup>

$$PDVY (R) = PDVE(R) + PDVPP(R) + PDVSS(R) \quad (2)$$

where

$$PDVE (R) = \int_0^R E(t) e^{-rt} dt, \quad E(t) > 0 \quad \forall t;$$

$$PDVPP (R) = \int_R^T P(t,R) e^{-rt} dt;$$

$$PDVSS (R) = \int_R^T S(t,R) e^{rt} dt;$$

and  $R$  = year of retirement,  $t$  = year in question, and  $0$  = base year for retirement computations (age 60).

All income components are subscripted with  $R$  to emphasize the direct dependence of all present value streams on the worker's retirement age. In the case of earnings, this dependence is straightforward as the formula indicates. In the case of pensions and Social Security payments, the annual benefits themselves vary depending on when the worker leaves his job. For instance in some private pension plans, early retirees (at 60 or 61) receive a special supplement until they become eligible to file for Social Security at age 62, whereupon the supplement is reduced to zero. Alternatively, workers deferring benefits until after age 65 may sometimes

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<sup>1</sup> We abstract from part-time work or work after retirement from a main job since these practices were rare for the workers covered by our pension plans (See Mitchell and Fields, 1984). Post-retirement work has been examined by Gustman and Steinmeier (1984).

<sup>2</sup> Income and payroll taxes are subtracted from all relevant income streams as explained in the appendix.

<sup>3</sup> Bequests may readily be incorporated in the theoretical model but are ignored here since our data contain no information on such amounts.

receive special late retirement credits. In general, defined benefit pension structures are not actuarially neutral, as the empirical work below will demonstrate.

Solving first order conditions and equating them reveals that the worker's optimal retirement date is that which sets equal the marginal utility of additional income gained by working another year, with the marginal utility of leisure foregone from another year's work. This optimal retirement age is defined implicitly as follows:

$$\frac{\partial U}{\partial C}(C, RET) [E_R \delta_R - S_R \delta_R - P_R \delta_R + R \int^T \frac{\partial S(t, R)}{\partial R} \delta_t dt + R \int^T \frac{\partial P(t, R)}{\partial R} \delta_R dt] - \frac{\partial U}{\partial RET}(C, RET) = 0 \quad (3)$$

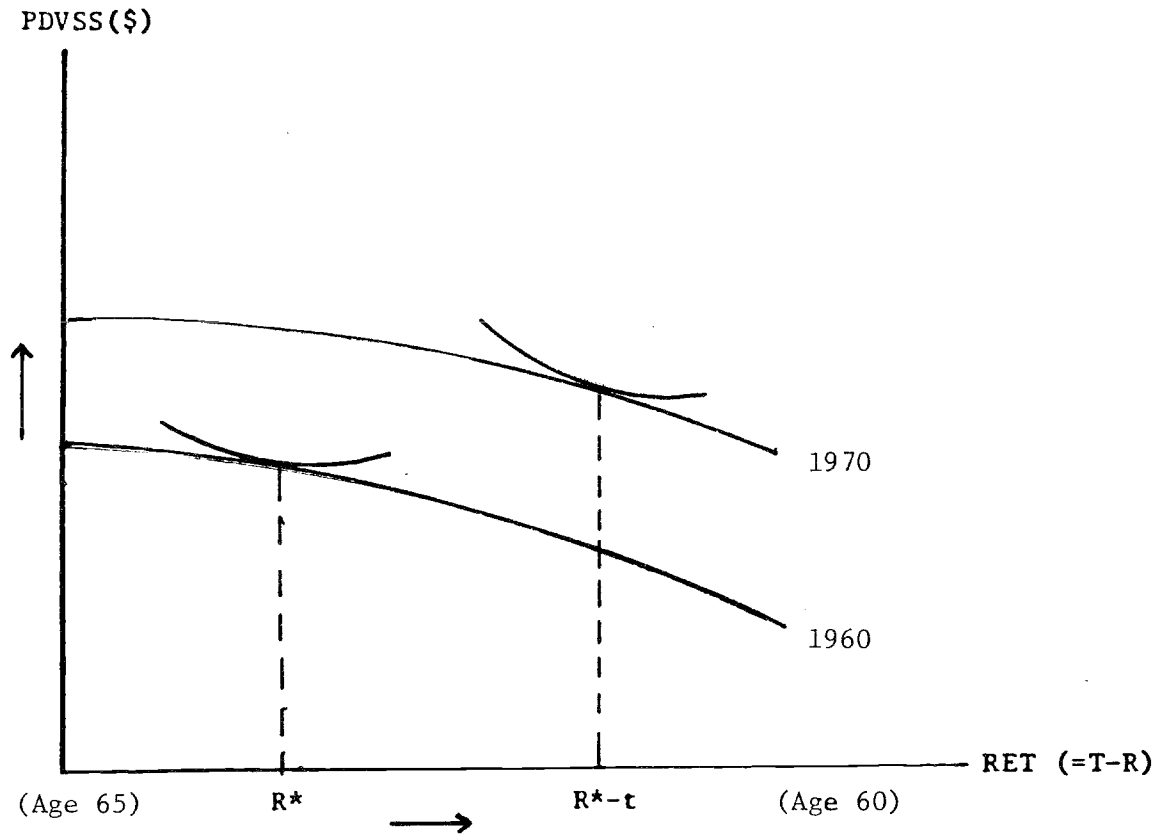
where  $\delta_R = e^{-RT}$ .  $R^*$  is the optimal retirement age solving equation (1).

Evaluating the effect of increased generosity in Social Security benefits such as those experienced during the 1960s becomes straightforward in this context. Cast in their simplest form, the benefit changes of the first decade shifted out older workers' present value streams without materially affecting their slopes, since levels rose but the rewards for deferring retirement stayed practically the same. Figure 1 illustrates this pattern graphically by depicting the tradeoff between years of leisure foregone (years worked) and increments in income from Social Security benefits.

As is evident from the Figure, this restructuring of Social Security would be predicted to have a powerful income effect increasing workers' demand for leisure at older ages and hence encouraging them to retire earlier than prior to the reform. In terms of equation 3, this occurred because the rise in benefits lowered the marginal utility of consumption

Figure 1.

Present Value of Social Security Benefit Streams at  
Alternative Retirement Ages: 1960 and 1970



Note: See Table 1 and text for construction.

from income and raised the marginal utility of leisure. In other words, raising Social Security benefits as was done during the 1960s induced workers to retire earlier, holding all else constant.

Given that older workers' desired retirement ages would most likely have become earlier during the 1960s as a result of the changes in their budget sets, it remains to ask how compensation structures might have adapted to the new workforce patterns. In order to do so, it is necessary to assume that employers would have responded to the legislated changes by altering their pension structures (if they altered anything), rather than by changing wage patterns. This seems most reasonable for the relatively short period under consideration, since past earnings for workers nearing retirement age would have been fixed and unalterable at that point.<sup>1</sup>

Employers operating under a long-term contract are posited to equate workers' lifetime compensation with their lifetime value of marginal product streams. Using Lazear's (1984) notation, the firm specifies a retirement age  $R^+$  at which lifetime productivity ( $V(R^+)$ ) at least equals the sum of wages plus pensions:

$$V(R^+) = PDVE(R^+) + PDVP(R^+). \quad (4)$$

When the workers' optimal retirement age  $R^*$  coincides with the firm's optimal  $R^+$ , neither employers nor workers have an incentive to alter the status quo.

When the pension environment was altered in ways such as described above, the firm/worker equilibrium would have been disturbed such that

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<sup>1</sup> In the short run, wages for new entrants could react to the policy changes, and certainly in the longer run, all elements of the compensation package including wages could be altered. However our focus on older workers and the relatively short period under consideration in the empirical section limits our attention to changes in pension profiles alone.

lifetime productivity no longer equalled lifetime compensation. For instance, raising Social Security payments during the 1960s would have induced many workers to select an individually optimal retirement date ( $R^*-t$ ) earlier than the date which had initially been optimal from both the firm's and the worker's viewpoint. At that new date, lifetime VMP exceeded the value of compensation paid by the firm:

$$V(R^*-t) > PDVE (R^*-t) + PDVP (R^*-t). \quad (5)$$

Maintaining the assumption that earnings streams for workers nearing retirement were fixed, the only variable subject to change would have been the value of the retiree's pension. Of course employers would have preferred to leave the pension structure unchanged since they would then receive an unexpected excess of worker output over compensation, as a result of the reforms in Social Security. On the other hand, employees would have attempted to equalize lifetime compensation and productivity by demanding a higher pension value at the new, earlier retirement date  $R^*-t$ .

Which outcome was more likely depended, in part, on employees' ability to induce employers to share the windfall gains generated as a result of the reforms and subsequent change in behavior. Presumably in unionized firms, workers could have forced some redistribution of these unanticipated gains, both because of union strength per se and because unionized firms tend to be larger and therefore more sensitive to reputation costs associated with renegeing on long-term promises of a contractual nature.<sup>1</sup> Thus the increase in Social Security benefits of the 1960s, by inducing workers to desire earlier retirement, generated an unanticipated surplus of productivity over lifetime compensation for employers with long-term

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<sup>1</sup> Azariadis and Stiglitz (1983) review the role of reputation costs in contract models.

contracts. Workers most able to capture a portion of the windfall would be expected to demand higher pension levels at younger retirement ages, so as to equalize lifetime pay and output. In practice this would also tend to be accompanied by pension benefit structures providing more income for retirement at earlier ages, and perhaps less than actuarially fair amounts for those deferring retirement. Unorganized employees would have desired the same changes in pension structures though the degree to which they could achieve these outcomes would be relatively less.

#### B. The 1970-1980 Period

During the subsequent ten years, three major regulatory changes altered older workers' budget sets: income and payroll taxes increased dramatically, Social Security rewards for deferring retirement declined, and the mandatory retirement age was raised to age 70. How desired retirement patterns responded to these changes can again be sketched with the aid of equation 3.

Increased taxes directly reduced earnings available from continued work by a significant amount.<sup>1</sup> A reduction in earnings has a theoretically ambiguous impact on optimal retirement ages, since the income effect implies the worker will remain on the job (purchase less leisure) while the substitution effect suggests more leisure will be consumed and retirement will occur sooner. Again earlier empirical work has suggested that on average, people will respond by retiring earlier.

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<sup>1</sup> For example, a 65 year old single worker earning a gross real salary of \$9500 (1970\$) would have taken home eleven percent less in the 1980s than in the 1970s due to increased taxes.

Decreases in the payoff for deferring retirement under Social Security would likewise have theoretically conflicting influences, since the lower rewards for waiting to retire would imply earlier retirement but workers facing diminished income opportunities would tend to work longer. If the substitution effect dominates as above, earlier retirement would be likely to be the average response. (See Figure 2).

In either of these two circumstances, pension structures would tend to respond to earlier desired retirement ages as above. Again employers would benefit from workers leaving earlier than the initial  $R^*$ , if they paid out less in earnings and pension at that earlier date. The windfall might be shared in the form of higher annual pension levels and earlier pension present value peaks in the case of organized workers. Nonunion employees would have desired the same pension increases but would be less able to effectuate them.

Predictions derived from an examination of the impact of raising the mandatory retirement age differ somewhat from those just mentioned. If there were a case where an employee desired to remain on the job beyond the original mandatory retirement date set in the long-term contract (say to  $R^*+t$ ), lifetime compensation would exceed his value of output:

$$V(R^*+t) < PDVE (R^*+t) + PDVP (R^*+t). \quad (6)$$

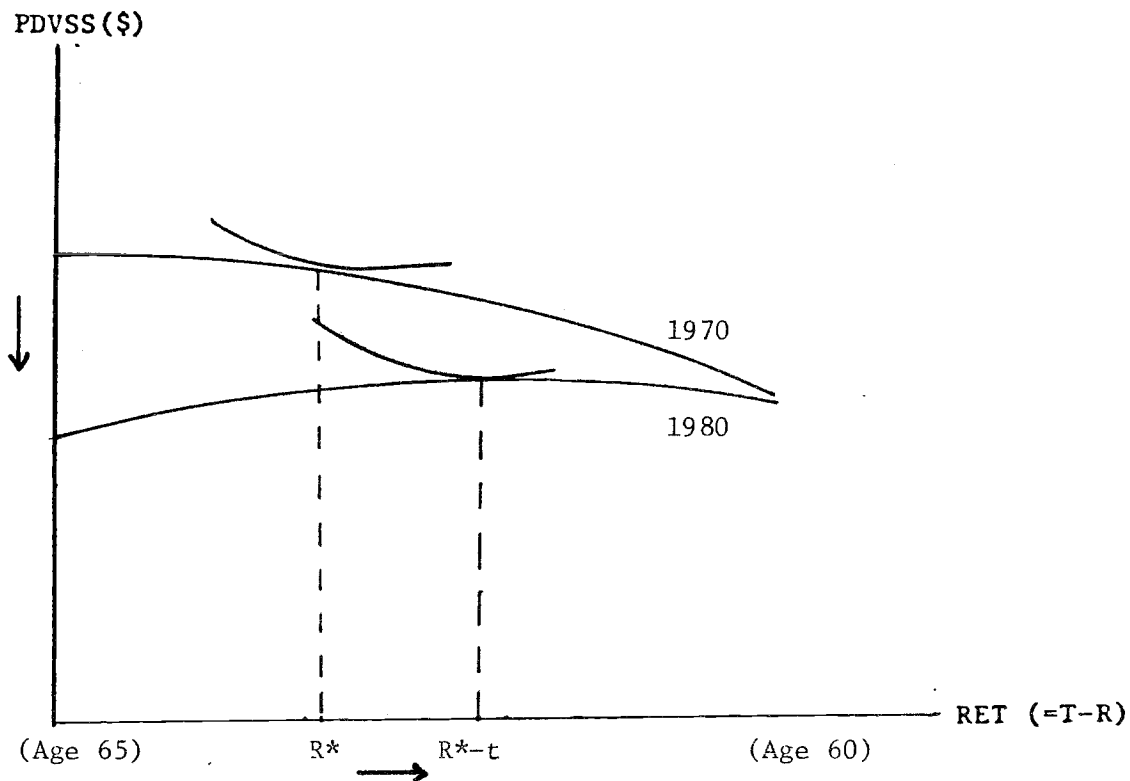
This windfall loss to employers of older workers would tend to be met by changing the only available instrument: the pension benefit structure. In particular, employers would attempt to cut costs by lowering the value of pension benefits directly, and also by shifting to an earlier age the point



Figure 2.

Present Value of Social Security Benefit Streams at

Alternative Retirement Ages: 1970 and 1980



Note: See Table 1 and text for construction.

at which the PDVP profile attained a maximum. Thus pension profiles are expected to peak at an earlier age as a result of raising the mandatory retirement age as well as in response to Social Security and tax changes during the 1970s. However, pension values would be lowered in response to the change in mandatory retirement, but raised in response to changes in taxes and Social Security. Which effect dominates is an empirical matter examined next.

### 3. The Empirical Findings

In order to evaluate which of the theoretical predictions are in fact sustained in empirical analysis, it is necessary to develop information on pension incentive structures as they changed through time. No data set exists on private sector pensions which is both longitudinal and sufficiently detailed to provide the necessary insight into benefit structures. Thus the present research extends earlier work by building on a data file of detailed benefit formulas for fourteen pension plans described in Fields and Mitchell (1984).

Our sample was originally selected from a file collected in 1978 by the U.S. Department of Labor entitled the Benefit Amounts Survey (BAS). That file was not longitudinal, however, so that an analysis of pensions through time required a new compilation of company and union pension documents from the 1950s through 1984. The degree of detail in these documents enabled us to devise computer algorithms for determining re-

tirees' incomes in three different decades: 1960, 1970 and 1980. No more representative data set with information on the identical plans through time is now available.<sup>1</sup>

The individual pension plans cannot be identified for confidentiality reasons. However it is possible to say that the sample includes several pensions basing benefits primarily on years of service; these pattern plans are typical of four United Auto Worker (UAW) pensions for which we have data. Also included are four other unionized firms in transportation, construction and trade, as well as six nonunion plans including firms in the service and finance sectors.

Because individual benefit formulas are quite complex, and vary according to a workers' years of seniority, salary and retirement age, there is no simple way of summarizing benefit streams available to the older worker in a given plan. It is thus necessary to compute benefits for illustrative workers to determine how pension opportunities varied over the period 1960-80. This was in fact done for each pension plan using sixty illustrative workers described in the appendix with several possible combinations of earnings levels, seniority levels, and marital status groups. In all cases, the perspective taken was a forward-looking one in

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<sup>1</sup> Efforts to match pension plans described in Bankers' Trust data for 1975 and 1980 are described in Lazear (1983). However the formula used to match these plans through time (which are not identified by name) is subject to a great deal of error. In addition the pension descriptions in those volumes are often so terse as to be uninformative about benefit levels as well as pre- and post-retirement increases. Thus our sample contains more precisely measured pension specifications for a smaller sample than Lazear's.

that we sought to model what a worker attaining age 60 would have anticipated receiving in financial terms if he retired immediately versus deferring retirement to alternative dates between age 60 and the firm's mandatory retirement date.<sup>1</sup>

The individual contemplating retirement at age 60 would use the pension rules then in effect at his firm to determine what would be available if he retired immediately. In addition it would be necessary for him to develop some notion of how benefits might change if he were to defer retirement by one year, two years, and so forth. The figures below assume that workers considered past adjustments in formulating forecasts of how benefit rules might be expected to change in the future. For instance, workers in unionized firms could have expected new contracts to incorporate pension changes similar to those adopted in previous contracts; nonunion employees could also look to the recent evolution of their own pension structure in projecting how benefits would change with deferred retirement. Our best estimate of workers' expectations about benefit levels are thus devised by looking at how pension formulas actually changed during the decade before the worker turned 60.

An examination of the plans under study reveals that they were altered surprisingly often over the period under consideration--sometimes as frequently as three times a decade. These changes took many forms: some simply raised dollar values associated with retirement at different ages, while others revamped their benefit structures completely. For instance one nonunion firm set benefits as a simple percentage of pay in 1960, while

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<sup>1</sup> For benefit computation purposes below, we used age 70 as the latest likely retirement age if no mandatory retirement age was given. Virtually no employee worked beyond that age in the pension plan data file for the 1970s.

by 1980 it moved to an integrated plan in which Social Security payments were subtracted from retirees' private pension amounts. At times the changes were quite subtle: in 1960, one firm designated the "normal" retirement age as 65 and reduced benefits for early leavers, whereas by 1980 the same firm entirely eliminated the early retirement penalty even though the formal definition of "normal" retirement was left unchanged. This overview suggests that it is extremely difficult to obtain a simple summary measure of pension incentives, and indeed prompts a full consideration of benefit computations over time for the same set of plans to see exactly how they changed. Most plans raised benefits in response to inflation, though during the 1970s only 9 of the 14 had benefit increases which recouped even half of the benefit erosion due to inflation. Benefit increases after retirement were even less generous; only four plans had benefits rising at one-half the inflation rate and the rest were lower.<sup>1</sup> In all cases, pre- and post-retirement increases consistent with actual experiences were built into the pension value computations.

The data in Table 2 report pension benefit levels across plans for the 1960, 1970 and 1980 cohorts using single worker tax tables; patterns for married males are virtually identical.<sup>2</sup> Benefit amounts in the top panel represent annual pension payments (gross and net of taxes) under the assumption that the worker filed for benefits as soon as eligible. The second panel reports the net present discounted value of the annual streams

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<sup>1</sup> These findings agree in general with the results reported by Clark, Allen, and Sumner (1983) regarding the degree of inflation protection of pensions during the 1970s.

<sup>2</sup> Those figures are available from the authors on request.

Table 2.

Net Pension Annual and Present  
Value Amounts in 1960, 1970 and 1980<sup>a/</sup>  
(1970\$)

If Retirement is at age:

	60	61	62	63	64	65
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I. Annual First Year Pension Benefits:<sup>b/</sup>

1960:	Gross	\$ 686	770	922	1021	1123	1326
	Net	651	728	867	952	1036	1216
1970:	Gross	1876	1974	2178	2333	2483	2441
	Net	1790	1877	2073	2208	2331	2364
1980:	Gross	1989	2189	2207	2360	2483	2590
	Net	1841	2006	2043	2163	2255	2383

II. Net Present Discounted Value of Pension Stream (PDVP):<sup>b/</sup>

1960:	\$ 6684	6998	7862	8018	8073	<u>8755</u>
1970:	17560	17660	<u>18530</u>	18450	18143	<u>18688</u>
1980:	16212	16501	<u>18867</u>	18821	18453	18284

<sup>a/</sup> Figures presented are for single males; patterns for married males are similar.

<sup>b/</sup> Benefit data provided for ages 60 to 65 only since some plans enforced mandatory retirement at later ages in 1960 and 1970.

computed as described in the Appendix, assuming a 2% real discount rate and the inflation rate in effect when the worker turned age 60 and was evaluating retirement income options. All figures are in real 1970 dollars.

The overall patterns are consistent with the predictions generated in Section 2. Between 1960 and 1970, both annual and present value streams of private pension payments increased in both gross and net terms rather dramatically--more than doubling and sometimes tripling. A second change is also evident if one examines the shape of the PDVP profiles: for retirees in the 1960s, the PDVP stream attained a maximum at age 65 (underlined in the Table) whereas ten years later there simply was not much difference between the size of the pension stream for retiring at ages 62 and 65. In other words, for the sample as a whole, pension incentives went from actively encouraging prolonged work in the 1960s, to a far more neutral pattern between ages 62 and 65 in the 1970's.

In general then, the large upward shift in Social Security benefits appears to have been reinforced by increases in private pension levels, particularly at earlier retirement ages. Since these findings conform remarkably well to the predictions derived in Section 2, it is at least plausible to accord some support to the contract theory as described above.

Between 1970 and 1980, a rather different empirical picture emerges. Annual pension values declined a bit at some retirement ages in real terms, with roughly similar declines in PDVP values. This is attributable in part to the fact that most of the plans did not fully protect benefits against inflation. In addition, the point at which the PDVP stream peaked became rather more pronounced in the later year as well, with proportionally larger benefit reductions for those choosing to work beyond age 62.

It will be recalled that two different predictions emerged from Section 2 regarding anticipated empirical changes. Had the impact of Social Security and tax reforms dominated, one would have expected to see benefits rising, reinforcing patterns of the earlier decade. However benefits were predicted to fall if raising the mandatory retirement age was more influential. The data indicate that employers slightly reduced pension benefits and, in many cases, lowered the payoff for workers retiring at ages other than 62.<sup>1</sup> Thus the weight of the evidence so far would seem to be more compatible with the conclusion that the change in the mandatory retirement age had the stronger impact on pension benefit structures.<sup>2</sup>

Table 3 offers a detailed breakdown of the way pension structures changed between the 1960s and 1980s, by separately identifying those pensions directly negotiated by union employees (grouped into United Auto Workers plans and other unions plans), and the remaining non-union plans. The hypothesis advanced earlier was that during the 1960-70 period, organized employees might have been better able to obtain both earlier retirement and a share of the firm's windfall compensation gain due to earlier retirement, as compared to workers with less negotiating power. Patterns in Table 3 bear out this prediction: between 1960 and 1970, the UAW plans increased benefit levels far more quickly than either of the other two groups. At the same time, the UAW pension incentives were

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<sup>1</sup> Our findings thus confirm Lazear's (1983) results on pension changes occurring between 1975 and 1980 using Bankers' Trust data.

<sup>2</sup> It would be useful to show that in the absence of changes in the pension, workers would have opted to remain employed beyond their firm's initial mandatory retirement age. However, empirical data on workers covered by these plans is not available for analysis at this time.



Table 3.

Net Pension Present Value Amounts in  
1960, 1970 and 1980 for Union and Nonunion Workers<sup>a/</sup>  
(1970\$)

If Retirement is at Age:

	60	61	62	63	64	65
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Net Present Discounted Value of Pension Stream (PDVP):<sup>b/</sup>

1. UAW Plans:

1960	\$ 5444	5932	6338	6712	6987	<u>7194</u>
1970	<u>28132</u>	27480	27051	25676	24333	23761
1980	<u>19015</u>	18208	18547	17745	16719	16067

2. Other Union Plans:

1960	7846	7719	7532	7356	7167	<u>8274</u>
1970	9651	9692	11286	11524	11731	<u>13294</u>
1980	14158	14082	<u>15284</u>	14818	14291	14307

3. Nonunion Plans:

1960	6736	7228	9100	9330	9400	<u>10117</u>
1970	15785	16425	17678	18250	18291	<u>18902</u>
1980	15713	16975	21468	22208	22383	<u>22413</u>

<sup>a/</sup> Figures presented are for single males; patterns for married males are similar.

<sup>b/</sup> Benefit data provided for ages 60 to 65 only since some plans enforced mandatory retirement at later ages in 1960 and 1970.

completely reversed so as to reward most highly those retiring before age 65. By way of contrast, the non-UAW union as well as the non-union groups experience a far smaller pension benefit increase over the 1960's. There was also no change in the age-65 pension peak. The difference in these patterns is consistent with the interpretation that employers outside the strong union sector probably benefited from Social Security changes during that period, since most did not increase pension benefits as much as the UAW sector did.

Pension profiles by 1980 had a pronounced peak at age 62, as opposed to being flat from 62 through 65 as in 1970. This is consistent with the hypothesis that firms wished to discourage workers who otherwise might have wished to remain on their jobs beyond that point. Interestingly, Table 3 again reveals some differences between groups of workers: the non-UAW union plans became more like the UAW set, developing a pension peak at the early age of 62. Nonunion pension profiles continued to be fairly neutral from ages 62 to 65.

Table 4 confirms these conclusions in a somewhat different format by presenting descriptive regressions across hypothetical workers and plans. The dependent variable is the age at which workers' pension present values peaked, taking each of the three decades separately and also pooling years. All explanatory variables in the micro data are dichotomous, taking the value of 1 if the worker had the characteristic in question, and 0 otherwise. (See Table 4 for variable descriptions). Coefficients on the year dummy variables emphasize the point that a tremendous turnaround in pension incentives was experienced between 1960 and 1970, moving from a system which generally encouraged work at later ages, to one in which deferred retirement was actively penalized in many cases. That the same remained

Correlates of Age When Pension Present Value Peaks  
(N = 840)

	1960	1970	1980	Pooled Years
Year = 1970	-	-	-	-1.39** (15.69)
Year = 1980	-	-	-	-1.01** (11.40)
UAW Union	0.39** (3.40)	-2.90** (19.46)	-2.61** (18.43)	-1.71** (19.56)
Other Union	-0.95** (8.20)	0.01 (0.08)	-0.79** (5.56)	-0.58** (6.59)
Married	0.12 (1.26)	0.17 (1.39)	0.05** (18.43)	0.11 (1.58)
Minimum Wage	-0.64** (5.15)	-0.40** (2.51)	-0.20 (1.34)	-0.41** (4.44)
Tax Max	-0.17 (1.41)	0.11 (0.70)	0.07 (0.43)	0.00 (0.00)
Low Seniority	0.12 (1.03)	1.28** (8.45)	0.78** (5.42)	0.73** (8.20)
High Seniority	-0.10 (0.85)	-0.21 (1.37)	-0.33** (2.26)	-0.21** (2.38)
R <sup>2</sup>	.15	.41	.33	.24

Variable Descriptions:

- Year - 1970 or 1980: Variable equals 1 if observation drawn from that year, 0 otherwise (1960 is omitted category).
- UAW Union, Other Union: Variable equals 1 if observation is from a UAW-negotiated pension plan or a plan negotiated with some other (non-UAW) union, respectively, 0 otherwise. (Nonunion is omitted category).
- Married: Variable equals 1 if the observation was drawn from the sample of married workers, 0 otherwise (Single is omitted category).
- Minimum Wage, Tax Max: Variable equals 1 if the worker's earnings profile was equal to the minimum wage or the Social Security taxable maximum over his lifetime, respectively, 0 otherwise (Average LRHS earnings is omitted category).
- Low or High Seniority: Variable equal to 1 if the worker's seniority was equal to: 10-15 years for Low, 25-30 years for High, 0 otherwise (20 years is omitted category).

Notes:

t statistics in parentheses

\*\* t &gt; 1.96

\* t &gt; 1.65

true in 1980 is evident from the 1980-year dummy, though the effect is attenuated slightly as compared to 1970. The regression analysis also supports the finding that workers subject to pensions negotiated by the UAW had significantly earlier retirement incentives, even controlling on pension bonuses for seniority and pay.

A direct method of examining the effect of mandatory retirement reforms on pension structures is also available. Table 5 presents an analysis of changes in the age at which the pension benefit structures peaked, comparing the 1970 benefit structure with that in 1980. Under the hypothesis that lifting the mandatory retirement age induced employers to alter pension incentive patterns, one would expect to observe that the PDVP result. This is exactly what the pooled data show. Firms that initially imposed mandatory retirement ages prior to age 70 were also those which reduced the age at which their pension benefit stream peaked between 1970 and 1980, after they were forced to raise their mandatory retirement ages. Further, the pattern is the same irrespective of whether the firms had initially specified mandatory retirement at age 65 or at some later age, and does not seem sensitive to the inclusion of other control variables.

Finally, pension levels changed between 1970 and 1980 in rather interesting ways. Benefits fell for the UAW workers, a finding compatible with the conclusion that this group was more strongly affected by the ADEA reforms. The other pension plan values rose, in contrast, consistent with a stronger response to changes in taxes and Social Security rules.<sup>1</sup>

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<sup>1</sup> Regression results (available on request) confirm that pension levels fell in real terms between 1970 and 1980, holding constant union status, earnings levels, taxes, marital status, and seniority.

Table 5.  
Correlates of Change in Peak Pension Age

	<u>Between 1970 - 1980</u>	
	(N = 840)	
	<u>Dependent Variable:</u>	
	<u>Change in Age at which PDVP Peaks</u>	
	<u>(1970 to 1980)</u>	
	(1)	(2)
Mand. Ret. (ever)	-0.35** (2.36)	-
Mand. Ret. (at 65)	-	-0.36** (2.91)
UAW union	-0.23* (1.91)	-0.38** (3.09)
Other union	0.60** (4.05)	0.62** (4.61)
Married	0.12 (1.23)	0.12 (1.23)
Minimum Wage	-0.20 (1.55)	-0.20 (1.56)
Tax Max	0.05 (0.36)	0.05 (0.36)
Low Seniority	0.50** (4.12)	0.50** (4.13)
High Seniority	0.12 (0.97)	0.12 (0.97)
R <sup>2</sup>	.11	.12

Notes:

t statistics in parentheses

\*\* t > 1.96

\* t > 1.65

Variable Descriptions:

See text and notes to Table 4.

#### 4. Conclusions

The question motivating this analysis was whether private pension systems react in predictable ways to changes in their environment, where by "predictable" we mean in accordance with contract theory. The particular changes examined here include innovations in taxes, Social Security and mandatory retirement regulations over the period 1960-1980. Our findings indicate that pensions did in fact appear to behave in ways consistent with contract theory, in that benefit levels and patterns of benefit incentives changed over time in ways that agreed with the model's predictions.

The most significant changes observed in our sample of fourteen pension plans were those occurring during the 1960-70 period. It was argued that Social Security reforms encouraged employees to opt for earlier retirement, and in many cases private pension offerings adapted to accommodate these new retirement patterns. Union plans, especially those negotiated by the United Auto Workers, appeared to be especially successful in restructuring pension incentives to fit workers' changing behavior.

The 1970-80 period saw two regulatory policies with theoretically different effects: a real reduction in the value of Social Security payments for early retirees, and the passage of the ADEA amendment raising the age at which firms could require mandatory retirement. While few workers in fact remained on the job long enough to be constrained by mandatory retirement rules, it is still reasonable to argue that firms altered their pension patterns in anticipation of changes in worker behavior. Some support for this proposition was detected, in that pensions

requiring mandatory retirement during the 1960s and 1970s altered their benefit incentives by 1980 so as to encourage earlier retirement and UAW plans actually reduced the value of pension benefits between 1970 and 1980.

It must be emphasized that this analysis is based on a small sample of pension plans so that the results must be replicated elsewhere before they can be generalized. On the other hand there is certainly sufficient evidence to indicate that a longitudinal study of pension agreements is a fruitful method of uncovering empirical evidence on long-term contractual arrangements between workers and firms. In addition it seems clear that private pension systems do respond in predictable ways to changes in the economic and regulatory environment in which they operate. This last point is often overlooked in policy studies investigating the impact of Social Security reform, tax changes, and other labor market retirement income innovations. Future research on such policy issues should begin to acknowledge the potential for pension responses to changes in their environment, using contract theory as a base.

References

- Azariadis, Costas and J. Stiglitz. "Implicit Contracts and Fixed Price Equilibria." Quarterly Journal of Economics 98 (1983 Supplement).
- Burkhauser, Richard V. and Joseph E. Quinn. "Task Completion Report on the Relationship Between Mandatory Retirement Age Limits and Pension Rules in the Retirement Decision." Final Report of the Urban Institute to the U.S. Department of Labor Under Contract J-9-E-9-0065, June 1980.
- Clark, R. L., S. G. Allen, and D. A. Sumner. "Inflation and Pension Benefits." Preliminary Draft Final Report to U.S. Department of Labor, June 1983.
- Ehrenberg, Ronald G. "Retirement System Characteristics and Compensating Wage Differentials in the Public Sector." Industrial and Labor Relations Review, July 1980, Vol. 33, No. 4.
- Fields, Gary S. and Olivia S. Mitchell. Retirement, Pensions and Social Security. Cambridge, MA: MIT Press, 1984.
- Gustman, Alan L. and Thomas L. Steinmeier. "Partial Retirement and the Analysis of Retirement Behavior." Industrial and Labor Relations Review 37 (April 1984): 403-415.
- Lazear, Edward. "Pensions as Severance Pay," In Financial Aspects of the U.S. Pension System, eds. Z. Bodie and J. B. Shoven. Chicago: University of Chicago Press, 1983.
- Lazear, Edward. "Social Security and Pensions." National Bureau of Economic Research Working Paper No. 1322, April 1984. 1984.
- Lazear, Edward. "Why Is There Mandatory Retirement?" Journal of Political Economy 87 (December 1979): 1261-1284.
- Mitchell, Olivia S. and Gary S. Fields. "The Effects of Pensions and Earnings on Retirement: A Review Essay," in Research in Labor Economics. Vol. 5, ed. R. Ehrenberg, Greenwich, CT: JAI Press, 1982.
- Mitchell, Olivia S. and Gary S. Fields. "Rewards to Continued Work: The Economic Incentives for Postponing Retirement," in Horizontal Equity, Uncertainty and Measures of Well Being, eds. M. David and T. Smeeding. Chicago: University of Chicago Press, 1984.
- Morrison, Malcolm H. Final Report to Congress on Age Discrimination in Employment Act Studies, U.S. Department of Labor, Employment Standards Administration, Division of Program Development and Research, 1982.
- Parnes, Herbert S., ed. Work and Retirement: A Longitudinal Study of Men. Cambridge, MA: MIT Press, 1981.



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### Data Appendix

#### 1. Earnings

Sixty different illustrative workers were developed for the purpose of computing benefit figures reported in the text; sixty is the product of five pay profiles, six tenure patterns, and two marital status groups. An intermediate pay trajectory utilized the average annual earnings for male employees in the Social Security Administration's Longitudinal Retirement History Survey (LRHS) covered by a pension plan.<sup>1</sup> In addition two other workers were devised at 80% and 135% of the LRHS average providing a reasonable salary range about the mean.<sup>2</sup>

This procedure generates a group of illustrative workers reaching age 60 as of 1970. These were used in benefit computations for the decade of the 1970s. It was also necessary to specify earnings profiles for cohorts reaching age 60 in 1960 and 1980 as well. Nominal earnings streams for the

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<sup>1</sup> The sample selection criteria for LRHS workers are described in Fields and Mitchell (1984). Imputed earnings rather than actual earnings were employed so as to avoid possible sample selection bias that might arise if earnings from non-retirees alone were used.

<sup>2</sup> Analysis of the workers covered by the 14 plans in the BAS sample indicates that their earnings fell within the salary range set by the LRHS workers.

three LRHS workers were thus deflated to 1960 values and inflated to 1980 values using the CPI. This holds constant real earnings by age in the three decades so as to better be able to compare resultant benefit patterns through time.

In order to assess whether the benefit figures generated were specific to LRHS earners, we also devised two additional earnings streams. A low earnings worker was devised by attributing to him for each year of work the statutory minimum wage (times 2000 hours of work per year), and a high wage worker was one who always earned a salary placing him at the taxable earnings ceiling for the purposes of Social Security taxation. The text refers to averages across all six earnings profiles, since these results proved sufficiently similar to the underlying individual patterns so as not to warrant separate mention.

The six seniority profiles were measured in terms of the tenure accumulated as of age 60: 10, 20 and 30 years (groupings commonly seen in retirement data), as well as 15, 22 and 25 years representing the minimum, mean and maximum years of seniority found in earlier research using retirees from the 14 plans during the 1970s. Finally, these thirty pay-tenure combinations became 60 by considering both a single and a married worker for each case.

## 2. Taxes

In order to determine net income values for alternative retirement ages, it was necessary to deduct both payroll and income taxes from employment earnings and retirement income. Actual tax schedules were used until the worker attained age 60; thereafter tax forecasts were assumed to be based on changes in the formulas experienced during the workers'

previous ten years. This set of computations produced net annual earnings streams for the illustrative workers had they remained on the job, as well as net pension and Social Security payments if instead they had retired at alternative points. Net income streams were computed for both single and married workers (assuming standard deductions) to see whether changing income and payroll taxes altered retirement incentives differentially by marital status through time. The text refers to results for single workers since those for married taxpayers are qualitatively similar.

### 3. Social Security Benefits

Workers' expectations about Social Security benefits available for immediate retirement were assumed to be based on the rules in effect at the beginning of the planning period; anticipated future Social Security changes incorporated pre- and post-retirement increases consistent with those experienced during the decade prior to that when the worker turned age 60. Throughout its history, Social Security has been constantly redesigned by Congress: for instance, a worker retiring in 1960 or even in 1970 would reasonably have expected real Social Security payments to remain constant or even rise somewhat after retirement since benefits had done just that throughout the previous decades. Since the mid-1970s, of course, benefits have been formally indexed. These assumptions were incorporated in the computations for both married and single workers, assuming that married workers' spouses filed for one-half of their husbands' benefits.

#### 4. Present Value Computations

All benefit and earnings present values incorporate a 2% real discount rate and survival probabilities based on life tables specific to each cohort.