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12 The Effect of Pension Plans on the Pattern of Life Cycle Compensation

Richard V. Burkhauser and Joseph F. Quinn

Mandatory retirement is one means of enforcing long-term contracts between employees and firms to insure that earnings over a worker's tenure equal the value of that worker's marginal product. In this paper, we argue that pension plans provide an alternative way to enforce these contracts. In section 12.1, we discuss the implications of using pension plans as a mechanism for adjusting compensation to induce job exit. In section 12.2 we use actual earnings and pension data from the Retirement History Study to show the importance of pension benefits in labor compensation. In section 12.3, we show the effect of pension and social security rules on the pattern of net wage earnings for workers nearing "traditional" retirement age and consider their use as an alternative to mandatory retirement.

12.1 The Effect of Pension Plans on Net Wages

The passage of the 1977 Amendments to the Age Discrimination in Employment Act increased from 65 to 70 the minimum age at which a worker could be terminated for reasons of age alone. Some people have proposed that mandatory retirement be eliminated entirely. Edward Lazear has argued, however, that even in a competitive labor market, mandatory retirement may yield advantages to both labor and manage-

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ment (Lazear 1979, p. 1264). He argues that while the 1977 Amendments will aid the current group of older workers, the total elimination of mandatory retirement would reduce economic efficiency.

Lazear provides an important example of a life cycle approach to labor agreements. Once it is recognized that there is a multiperiod contract, it can be shown that the usual efficiency condition—that the wage equals the value of the marginal product (VMP)—is no longer a necessary characteristic of a competitive market. Though it is true that a worker's VMP over his tenure with a firm must equal his wage earnings over that period, wage earnings need not equal VMP during each period. "Other things equal, a worker would be indifferent between a wage path which paid him a constant dollar amount over his lifetime and another one which had the same present value but paid him less when he was young and more when he was old" (Lazear 1979, p. 1264). Other things equal, firms also would be indifferent between the two. As Lazear suggests, however, other things may not be equal, and it may pay both firms and workers to agree to long-term earning streams which pay workers less than their VMP when young and more than their VMP when old. This arrangement is superior because turnover and its attendant costs are decreased, and workers are induced to cheat less and work harder on the job (Lazear 1979, p. 1266). A necessary condition of such an agreement, however, is a mechanism for fixing a time after which the worker is no longer entitled to receive wage earnings greater than VMP. Lazear argues that mandatory retirement provides this mechanism.

Clearly, mandatory retirement rules are one means of forcing older workers to leave a job after some mutually agreed upon age. In this paper, however, we suggest that it is only one such mechanism. Firms can also use pension plans either to induce exit from the job or to reduce net earnings (as defined below) after some age. When a pension plan is part of a total compensation package, long-term contracts can be enforced through pension rules which effectively penalize workers who stay on the job "too long."

Employer pension plans are an extremely important component of the financial environment for many older Americans. These plans are complex and differ in many aspects, such as coverage criteria, age of earliest eligibility, age of full eligibility, benefit amount, and inflation protection after retirement. In empirical work on the impact of these plans on worker behavior, it is necessary to ignore many of the specifics of the plans (which are often unknown to the researcher in any case) and to summarize the plans along very simple dimensions.

The wealth equivalent of pension rights provides an excellent summary statistic of the magnitude of a plan. At any moment in time, the value of a pension to a worker is equal to the present discounted value of all anticipated future payments:

$$\text{WEALTH}(s) = \sum_{i=s}^{n} \frac{p_i B_i(s)}{(1+r)^i}, \tag{1}$$

where s refers to the time period in which pension benefits are first claimed. WEALTH(s) is actually a vector of asset values for a pension initially taken at different periods (s), all evaluated in present discounted value terms adjusted to period 0. P_i is the probability of living through the ith period, and $B_i(s)$ is the benefit stream associated with a pension accepted in period s. The discount rate is r, and n denotes the age at the end of benefit receipt (arbitrarily chosen to be 100 in this research).

Pension wealth is higher, the earlier one is eligible to accept benefits, the higher the benefits upon receipt, and the lower the relevant discount rate. The discount rate has two components: the real rate of interest (reflecting the fact that one would prefer a real dollar now to one in the future) and the expected rate of inflation (since nominal dollars in the future will buy less than they do today). In cases where plans are fully indexed (such as social security and federal government employee retirement benefits), the inflation component disappears. Where future benefits are only partly indexed (as with many state and local government plans), only the uncovered portion of inflation is included.

By structuring pensions so that their value falls when receipt is postponed past some age, employers can ensure either job exit or a reduction of real wages of workers who remain on the job past that age. We define DELTA as the change in pension wealth from period 0 to period 1 plus $C(0)$—the *worker's* contribution to the pension during the period (which is 0 in noncontributing plans):

$$\begin{aligned} \text{DELTA} &= \text{WEALTH}(0) - \text{WEALTH}(1) + C(0) \\ &= \sum_{i=0}^{n} \frac{p_i B_i(0)}{(1+r)^i} - \sum_{i=1}^{n} \frac{p_i B_i(1)}{(1+r)^i} + C(0). \end{aligned} \tag{2}$$

The sign and magnitude of DELTA depend on how the benefit stream changes when one delays receipt. There are two possible sources of a change in B_i: the benefit calculation formula and the postponed benefit adjustment formula. In a defined contribution pension system, yearly benefits are based on employer and employee contributions paid into the system. A worker continuing on his job until period 1 would increase $B_i(s)$ in the future because of increased contributions by him or the firm. Most pension systems are defined benefit plans, however, in which there is no direct relationship between yearly contributions and benefits. In such a case, $B_i(s)$ will increase on the basis of other criteria, like years of service, average earnings, or age.

Actuarial adjustments are additional changes in $B_i(s)$ which compensate workers for postponing acceptance. $B_i(s)$ increases by some percent-

age for each year benefits are postponed. Thus, pension wealth is sensitive to the method in which benefits are adjusted, either directly by increased contributions or by some defined benefit rule, or because of an actuarial supplement for postponed receipt.

It is important to recognize the difference between pension wealth and the pension income available in a single year. Two workers both eligible to receive $5,000 in annual pension benefits if they left their jobs today may act quite differently if the first worker, by delaying acceptance, receives a substantially larger yearly pension in the future, while the second worker receives no increase in benefits. In the first case, the increase in future benefits offsets the loss in pension benefits this year, while in the latter case, postponed benefits are lost forever.

How then does a typical pension affect life cycle earnings? For simplicity, we assume in figure 12.1 that the VMP of a worker on the job and in all other activities is constant across life, but that the employer and employee find that it is optimal to agree on a lower yearly salary at younger ages. Total yearly compensation (what we define as net earnings) equals wages and salary minus DELTA, the loss in pension wealth.[1] In this example, we assume the worker is vested at age A, first starts to receive total compensation above VMP at age B, and reaches peak total earnings and pension wealth at P. After that age, decreases in the asset value of the pension reduce net earnings until at S^* they just equal VMP.

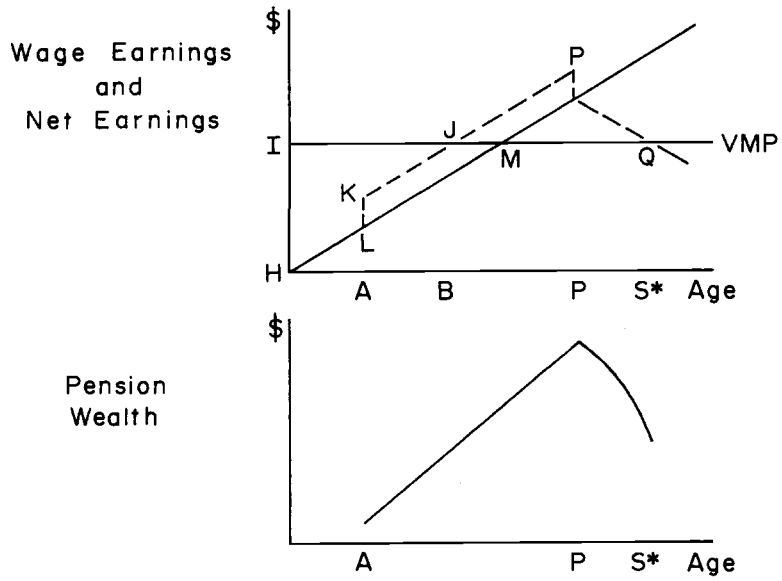

Fig. 12.1 Life cycle gross and net earnings of a worker in a given firm.

Notice, however, that lifetime earnings also equal lifetime marginal product. Hence, the area (*HIJKL*) equals the area (*JPQ*) (in present discounted value terms). The ability to mix pension benefits and salary enables the employer to decrease actual net earnings, even as wage earnings (the size of the paycheck) continue to increase. We argue that changes in pension wealth can have a significant effect on the actual net earnings of older workers and can provide employers with an alternative means of enforcing long-term labor contracts.

12.2 The Importance of Retirement Income Plans

Pension wealth is important in the retirement decision in two ways. First, it has a wealth effect as does any asset. The higher the pension wealth, ceteris paribus, the higher the probability of labor force withdrawal. But equally important, pension wealth is not a constant, it varies with the age at which the pension is claimed. This concept of wealth change (DELTA) is central to this paper, and we treat this change as a component of current compensation. When positive, DELTA represents a wealth loss—a cost to continued work, or equivalently, an earnings reduction. When negative, the present discounted value is increasing by more than the employee contributions, and net earnings are higher than they appear.

Both the WEALTH and DELTA values for workers around retirement age can be substantial. We use data from the Social Security Administration's Retirement History Study (RHS) to estimate these values. (A description of the data and the derivation of these variables appears in the appendix.) Table 12.1 shows pension WEALTH values for full-time, private sector, male workers (not self-employed) aged 63 to 65 in 1974, using 5 and 10 percent discount rates.[2] Almost two-thirds of the sample has some pension wealth (either from their current job or a previous job). Using the lower discount rate, over 5 percent of our sample (9 percent of those with pensions) has over $50,000 (in 1974 dollars) in pension wealth, and one-third of the entire sample (over one-half of those with pensions) has benefits in excess of $20,000. One measure of the value of a pension for the group is that the median pension wealth value for those with pensions—about $21,000—is over twice the value of median annual wage earnings for this group ($9,400). At the higher 10 percent discount rate, pension wealths are lower, but the median is still over $15,000—one and a half times the average annual earnings.

DELTA values for these same respondents are shown in table 12.2. These values are positive when the wealth value of a pension falls over the year. While we know the yearly pension benefit of workers in the RHS, we do not know the method used by each private pension to derive these

Table 12.1 **Percentage Distribution of Pension WEALTH for Full-Time Employed Men, Aged 63 to 65, by Age and Discount Rate (5% and 10%), 1974**

Age	0	$1–5,000	$5,001–10,000	$10,001–20,000	$20,001–30,000	$30,001–50,000	$50,001–75,000	$75,001+	*N*	Median[a]
					Discount Rate = 5%					
63	36.5	4.8	13.2	12.1	12.2	13.8	7.4	0.0	189	$21,500
64	36.2	5.5	11.0	18.1	16.5	11.0	1.6	0.0	127	$17,813
65	38.6	4.0	2.0	17.8	11.9	14.9	6.9	4.0	101	$26,250
					Discount Rate = 10%					
63	36.5	11.1	13.2	16.4	9.5	11.6	1.6	0.0	189	$15,000
64	36.2	11.0	12.6	24.4	12.6	3.1	0.0	0.0	127	$12,708
65	38 6	4.0	10.9	14.9	12.9	14.9	3.0	1.0	101	$20,417

Source: (for all tables): Retirement History Study, 1969–75.

[a]Median of those with positive pension WEALTH. Medians calculated on intervals of $2,500.

Table 12.2 **Percentage Distribution of Pension DELTAs[a] for Full-Time Employed Men, Aged 63 to 65, by Age and Discount Rate (5% and 10%), 1974**

Age	$-2,000 to -1,000	$-999 to -1	0[b]	$1–1,000	$1,001–2,000	$2,001–3,000	$3,001–4,000	$4,001–5,000	$5,001+	*N*	Median[c]
					Discount Rate = 5%						
63	3.2	21.7	43.4	20.1	4.8	2.6	1.6	0.5	2.1	189	$148
64	0.0	3.9	46.5	18.9	15.0	11.0	0.0	3.9	0.8	127	$1,156
65	0.0	1.0	47.5	10.9	13.9	12.9	4.0	4.0	5.9	101	$2,062
					Discount Rate = 10%						
63	1.6	18.0	43.4	13.8	12.2	5.3	3.2	0.0	2.6	189	$482
64	0.0	3.1	46.5	15.7	16.5	10.2	3.1	2.4	2.4	127	$1,393
65	0.0	1.0	47.5	8.9	13.9	12.9	4.0	4.0	7.9	101	$2,208

[a]The difference in pension wealth when the pension is postponed one year from 1974 to 1975. See the appendix for a fuller explanation of this variable.

[b]Some respondents have positive pension WEALTH but no DELTA because the pension was earned on a previous job. DELTA refers only to the changes in pension wealth on the *current* job, since this is the only wealth affected by current labor supply decisions.

[c]Median of those with nonzero pension DELTA. Median calculated on intervals of $250.

benefits or to change them over time. Therefore, we have used data from the Bureau of Labor Statistics' Level of Benefits Study to assign pension characteristics to workers in our sample based on their industry and occupation. Since years of service is the dominant method of calculation in defined benefits programs, we assume benefit increases are based on years of service, a value available in the RHS, and use industry and occupation averages to calculate actuarial adjustments. (A fuller discussion of our methodology is found in the appendix.)

For workers aged 63, DELTAs (discounting at 5 percent) are closely split between positive and negative values. For those aged 64 and 65, pension wealth falls with continued work for most workers. The median loss at age 65 is over $2,000—almost 20 percent of the median wage of workers aged 65 who are in jobs with pensions. For those aged 64 it is $1,156 or 12 percent, while for those aged 63 it is only $148. With the 10 percent rate, future gains are discounted more heavily, and the resultant DELTA values are slightly larger.

Using a very different methodology (data on actual pension plans are applied to hypothetical individuals), Lazear reaches similar conclusions, that the expected present value of pension rights generally declines as retirement is postponed (Lazear 1981, p. 20). He interprets this as a modern form of severance pay—a bonus to those who retire early. The terminology is different from ours, but the basic point is the same—beyond some age workers are penalized financially by their pension plans for continued work.

The incentives implicit in the social security system can be summarized in analogous fashion, although there are two complications. The first involves spouse's and dependent's benefits in the event of the respondent's death. These are important aspects of social security coverage and should be considered. In this work, we have ignored children's benefits, but have augmented social security wealth by considering the probability of the spouse outliving the respondent (using the age of each and survival tables) and collecting benefits on her own, at two-thirds of the combined rate.

The second complication concerns an option open to workers under social security, but not under private pension plans—to continue working at the same job *and* collect benefits. A worker who stays at a given job cannot at the same time receive a private pension from that job. This is not the case with social security, which exempts a certain amount of earnings ($2400 in 1974) and then reduces benefits by $1.00 for every $2.00 of wage earnings. Since we are interested in discrete changes in labor force behavior (withdrawal from a given job), and because we are primarily interested in the impact of pensions on net earnings in a given job, we have ignored this option and have defined social security DELTAs in the same manner as above—the difference between current

social security wealth and the wealth following an incremental year of work, plus employee social security taxes during that year. The more difficult it is for a worker to adjust his hours within a job, the more likely it is that discrete changes in labor force behavior will be the response to social security incentives. To the extent that workers receive benefits during that year and remain in their same job, this calculation overstates the social security cost of that employment and the disincentive to remain on the job. To minimize that problem, we have restricted our sample to those who are employed full-time and who are, therefore, least likely to combine work in the same job with social security receipt.

Tables 12.3 and 12.4 illustrate the magnitude of social security WEALTH and DELTA value to workers nearing traditional retirement age. Social security WEALTH is substantial for our subsample of full-time workers. Coverage is almost universal, and over 70 percent of this sample has over $50,000 in social security rights (1974 dollars—5 percent real discount rate). At the lower 2 percent real rate, two-thirds of this sample has over $70,000 in social security wealth. Wealth values rise or fall over time depending on whether the benefits lost by delay are outweighed by the future increments due to the recalculation of average earnings and the actuarial adjustment.

Prior to age 65, whether the actuarial adjustment and benefit recalculation outweigh the benefits lost through postponement of acceptance depends on the discount rate used (see table 12.4). When a 5 percent rate is employed, about 80 percent of the 63 and 64 year olds in our sample gain by delay. The median values of the wealth increases for those eligible for social security are $1852 (for those aged 63) and $857 (for those aged 64). When a 10 percent rate is used, only 41 percent of the 63 year olds and less than 20 percent of the 64 year olds gain, and the median wealth *losses* associated with a year's delay are $115 and $937, respectively.[3]

At age 65, when the actuarial adjustment drops to 1 percent (3 percent as of 1982), nearly everyone loses with delay, and the losses are substantial. Even with a 5 percent discount rate, the median loss in our sample is over $3000. At 10 percent, it is slightly higher.

That industrial pensions and social security benefits are a major source of wealth for workers on the verge of retirement is clearly shown in tables 12.1 and 12.3.[4] That this wealth will vary to an important degree across potential retirement ages is seen in tables 12.2 and 12.4. As we will see in the next section, ignoring the effect of these changes will lead to a significant overstatement of the actual net earnings of older workers.

12.3 An Empirical Look at Net Earnings

In this section we calculate the net earnings of men aged 59–65 who are full-time wage and salary workers in the private sector. It is this group of

Table 12.3 **Percentage Distribution of Social Security WEALTH, Full-Time Employed Men, Aged 63 to 65, by Age and Discount Rate (2% and 5%), 1974**

Age	0	$1–30,000	$30,001–40,000	$40,001–50,000	$50,001–60,000	$60,001–70,000	$70,001–80,000	$80,001–90,000	*N*	Median[c]
					Discount Rate = 2%					
63	36.5	4.8	13.2	12.1	12.2	13.8	7.4	0.0	189	$21,500
64	36.2	5.5	11.0	18.1	16.5	11.0	1.6	0.0	127	$17,813
65	38.6	4.0	2.0	17.8	11.9	14.9	6.9	4.0	101	$26,250
					Discount Rate = 5%					
63	5.8	5.3	7.9	12.2	68.8	0.0	0.0	0.0	189	$54,216
64	3.1	2.4	8.7	12.6	44.1	29.1	0.0	0.0	127	$56,818
65	5.9	2.0	7.9	7.9	20.8	55.5	0.0	0.0	101	$62,278

[a]Median of those with positive social security WEALTH. Calculated on intervals of $2,000.

Table 12.4 **Percentage Distribution of Social Security DELTAs,[a] Full-Time Employed Men, Aged 63 to 65, by Age and Discount Rate (5% and 10%), 1974**

Age	−$6,000 to −3,000	−$2,999 to −1,500	−$1,499 to −750	−$749 to −1	0	$1–750	$751–1,500	$1,501–3,000	$3,001–6,000	*N*	Median[b]
					Discount Rate = 5%						
63	3	51	15	14	6	11	1	0	0	189	−$1,852
64	1	34	16	29	3	12	4	1	0	127	−$857
65	0	0	0	1	6	1	2	43	48	101	$3,044
					Discount Rate = 10%						
63	0	1	3	37	6	24	24	5	0	189	$115
64	0	0	1	18	3	28	31	19	0	127	$937
65	0	0	0	0	6	0	3	28	63	101	$3,586

[a]Social security DELTA is the change in social security wealth if receipt is postponed one year (from 1974 to 1975), plus employee social security taxes paid during that year. Because of the peculiar technique used by the social security system to adjust postponed benefits, 5 and 10 percent discount rates were used in this table rather than the 2 and 5 percent rates used for social security WEALTH. (See note 3 and Burkhauser and Turner 1981).

[b]Median of those with nonzero social security DELTA.

men nearing "traditional" retirement age who were expected to benefit most from the change in the mandatory retirement law. Using the first four waves of the RHS (1969–75), we study men who were aged 59–61 in 1970 and these same men aged 63–65 in 1974.[5] All the men in our sample remained on their same full-time jobs from 1969 to 1973. We analyze the effect of the private pension system on the net earnings of these men and, more importantly, on the relationship between the net earnings of workers with and without pensions and mandatory retirement.

Table 12.5 presents the median earnings and median net earnings (earnings minus private pension DELTA) at various ages for three subsamples defined by pension and mandatory retirement status. (A fourth group, those without pensions but with mandatory retirement, was too small for analysis.) As can be seen, workers with pension plans have higher earnings than those without such plans regardless of mandatory retirement.

What then is the effect of pension rules on net earnings in this age group? How do pensions relate to mandatory retirement as a method of assuring that lifetime contracts are enforced? In table 12.6, we calculate the ratio of earnings net of pension DELTA to unadjusted earnings for those who are eligible for pensions.[6] (For those not eligible for pensions, the ratio (as defined so far) would be 1.) The impact of age can be seen in two ways. The median ratios decrease monotonically, and decline to 0.83 by age 65. In addition, the display of the distribution illustrates the shift from ratios above 1 at the younger ages to below 1 later on. At ages 59 and 60, for example, most of these workers are enjoying a slight supplement to pay because of increasing pension asset values. By 64 and 65, however, nearly all are losing, and a substantial proportion is experiencing a pay decrement of over 20 percent.

Table 12.7 shows another interesting result. Here we compare the median net earnings of those with pensions to that of those without. We disaggregate the pension sample by mandatory retirement status and simply create ratios from the columns in table 12.5. For those without mandatory rules, we find that the median net earnings of the pension subsample has dropped to precisely that of those without pensions by age 65 (i.e., the final ratio in the first column is 1.00).[7] For those with a pension and with mandatory retirement, the ratio also falls, but only to 1.19.

These results are preliminary and are based on small samples. But they strongly suggest that pension systems do eventually reduce the true earnings of older men who continue on their same job. In fact, the difference in earnings between workers with and without pension plans narrows dramatically as workers approach age 65, and for those in our sample, it disappears entirely for workers not subject to mandatory retirement.

Table 12.5 **Median Earnings and Earnings Net of Pension DELTA[a] by Age and by Pension and Mandatory Retirement Status**

	Without Mandatory Retirement Without Pension Benefits			Without Mandatory Retirement With Pension Benefits			With Mandatory Retirement With Pension Benefits		
Age	Wage Earnings	Net Wage Earnings	*N*	Wage Earnings	Net Wage Earnings	*N*	Wage Earnings	Net Wage Earnings	*N*
59	$6,292	$6,292	66	$ 8,250	$ 8,188	38	$ 8,700	$ 8,583	69
60	5,750	5,750	50	7,750	8,250	32	8,312	8,188	36
61	6,594	6,594	42	7,833	8,167	19	10,027	10,292	34
63	7,750	7,750	66	10,250	10,458	38	11,250	10,786	69
64	6,521	6,521	50	10,075	9,479	32	9,791	8,441	36
65	7,813	7,813	42	9,750	7,833	19	12,250	9,321	34

[a]Pension DELTA with 5 percent discount rate. Earnings are in 1970 dollars for ages 59–61, and in 1974 dollars for ages 63–65. Medians based on intervals of $500.

Table 12.6 **Percentage Distribution of Ratio of Earnings Net of Pension DELTA to Earnings for Those with Pensions, by Age and Mandatory Retirement Status**

Age	Less than .80	.80–.90	.91–.95	.96–1.00	1.01–1.05	1.06–1.10	1.11–1.20	1.21–1.30	Median Ratio
Without Mandatory Retirement									
59	11	0	5	5	39	39	0	0	1.04
60	3	9	6	9	44	16	9	3	1.03
61	16	0	5	11	53	5	5	5	1.03
63	11	8	11	18	37	13	3	0	1.00
64	28	28	25	16	3	0	0	0	0.88
65	42	21	11	26	0	0	0	0	0.83
With Mandatory Retirement									
59	7	3	1	13	41	26	9	0	1.03
60	7	3	0	19	50	17	3	3	1.02
61	6	6	15	24	29	21	0	0	1.00
63	9	9	20	23	23	13	3	0	0.98
64	25	42	8	14	8	3	0	0	0.86
65	35	53	6	3	3	0	0	0	0.83

Table 12.7 **Ratio of Median Net Earnings of Those with Pensions, by Mandatory Retirement Status, to Median Net Earnings of Those without Pensions**

Age	Without Mandatory Retirement	With Mandatory Retirement
59	1.30	1.36
60	1.43	1.42
61	1.24	1.56
63	1.35	1.39
64	1.45	1.29
65	1.00	1.19

Source: Net wage medians in table 12.5.

The net earnings of workers subject to mandatory retirement also decreased as they neared age 65. Nevertheless, their net earnings were still about 20 percent greater than net income of those not subject to mandatory retirement rules. In fact, this may be the reason why mandatory retirement was a necessary part of the personnel strategy in these firms.

In table 12.8, we add the effect of social security DELTAs, using a 5% discount rate. As mentioned above, workers can continue on their job and receive social security benefits. For workers who do both, the DELTAs used here exaggerate the losses. Nevertheless, the results are provocative. Here we calculate the ratio of earnings net of both pension and social security DELTAs to current earnings for those with and without pensions. The medians suggest that pensions and social security on average provide a slight wage increase up to age 65. These medians hide a considerable amount of dispersion, however. Among those 59–61, for example, between a sixth and a third of those with pensions lose retirement wealth if they continue to work. At age 65, the median ratio is about two-thirds for those without pensions and nearly down to one-half for those with a pension. Thus, measures of compensation which do not take the effect of pensions and social security into consideration dramatically overestimate the value of continued work at this age. For the median workers in our sample eligible for both social security and pension benefits at age 65, unadjusted wages overstate true earnings by almost 100 percent.

In this paper, we have described and estimated some of the work (or retirement) incentives implicit in current pension and social security rules. But we do not estimate the impact of these incentives on labor supply. In a related paper, however, we do and find that changes in pension and social security wealth are significant explanators of the labor supply behavior of older Americans (Burkhauser and Quinn 1983). The

Table 12.8 **Percentage Distribution of Ratio of Earnings Net of Pension and Social Security DELTA to Earnings, by Age and Pension Status**

Age	.70 and less	.71–.90	.91–.95	.96–1.00	1.01–1.05	1.06–1.10	1.11–1.20	1.21–1.30	1.31+	Median Ratio
					Without Pensions					
59	0	0	0	6	23	41	24	6	0	1.07
60	0	0	0	0	22	44	30	2	2	1.08
61	0	0	2	7	19	33	31	7	0	1.08
63	0	3	6	11	12	11	24	23	11	1.13
64	6	4	8	10	16	6	32	10	8	1.10
65	74	17	2	7	0	0	0	0	0	0.65
					With Pensions					
59	6	4	1	3	17	29	35	7	0	1.08
60	4	1	3	7	12	29	35	3	4	1.09
61	6	8	4	13	11	23	32	2	2	1.07
63	6	1	6	12	7	11	34	17	7	1.12
64	15	18	13	9	15	4	22	4	0	0.97
65	92	6	2	0	0	0	0	0	0	0.52

larger the DELTA values, the higher the probabilities that respondents leave their jobs over a two-year transition period. In fact, these variables do a better job of predicting transition behavior than do simple eligibility dummies. This is evidence that these incentives are important and that workers both understand their general nature and respond to them.

12.4 Conclusions and Data Needs

Mandatory retirement is one method of enforcing long-term contracts so that the earnings of a worker over his tenure with a firm will just equal the value of his marginal product. In this paper, we suggest that it is not the only method of enforcing such contracts. Pension plans which vary in value across life enable employers to reduce earnings at older ages even when wage and salary payments as traditionally measured are increasing.

Using data from the RHS we show that pension WEALTH is an important component of a worker's wealth portfolio and that pension DELTAs significantly affect net earnings as workers approach traditional retirement age. In fact, a measure of compensation which includes pension DELTAs shows that workers in our sample who are not subject to mandatory retirement earn approximately the same amount for work at age 65 regardless of whether or not they are eligible for a pension. For those who are subject to mandatory retirement, earnings net of pension DELTAs fall as they approach age 65 yet still exceed the net earnings of those without pensions and mandatory retirement. Thus, firms do appear to have some motive to use mandatory retirement to enforce job exit. But adjustments to pensions also are used and appear to be an important alternative method of enforcement. Once social security is considered it is even less likely that workers will continue to work past the traditional retirement age.

There are at least two implications of these findings with respect to mandatory retirement. The first is that mandatory retirement is less important than a simple comparison of workers with and without these provisions would suggest. This is because mandatory retirement often occurs at precisely the time that these strong social security and pension incentives go into effect. A simple comparison implicitly attributes the impacts of all of these factors to mandatory retirement, and thereby exaggerates its effect. In our paper (Burkhauser and Quinn 1983), we estimate that approximately half of the raw differential in quit behavior can be attributed to factors other than mandatory retirement.

The second implication concerns the labor market repercussions to be expected from changing the age of mandatory retirement (as Congress has done) or from eliminating it altogether (as has been suggested). Our research indicates that the effect will depend dramatically on the extent to which employers can change other aspects of the employment agree-

ment, particularly the details of the pension system. With enough leeway, we would argue, firms can bring about retirement patterns very similar to those observed with mandatory retirement.

A major shortcoming of this research is the lack of knowledge about respondents' pension plans—how benefits are determined and how they change over time. This knowledge is needed for two reasons. It is required in order to calculate DELTA values more precisely and to judge more accurately the impact of these incentives on retirement behavior. In addition, it is important baseline data from which to measure changes in pension rules in response, partly, to changes in mandatory retirement options.

Specific data on individual pension plans are collected by the Department of Labor and have been used by researchers (Lazear 1981 and Urban Institute 1982). But such data are not generally available about the respondents who appear in large microeconomic surveys, such as the Retirement History Study. In other words, we have longitudinal microdata sets with superb demographic and economic data, but with very little detail on pension plans, and we have excellent pension data with little or no personal data on the individuals covered.[8] That we do not have both is particularly unfortunate because there is considerably more diversity across pension plans than across social security. A much larger proportion of the population is not covered, and for those workers who are, the variation in benefit levels is extreme.[9] Linking these two types of information is not a simple process. Asking individuals about the details of their pension plans (beyond information like age of eligibility and amount expected) is probably fruitless. Using existing Department of Labor files on pension plans has not been successful. And even asking firms may not always be the answer, because often they do not administer their own pension plans. The cost of gathering this institutional information is high. But so, we would argue, is the benefit. In the meantime, we must continue to use broad industrial and occupational averages for the benefit calculation rules, as we have done in this paper, and accept the biases which such measurement error entails.

Appendix

The data for this research are taken from the first four waves of the Retirement History Study (RHS)—a ten-year longitudinal analysis of the retirement process undertaken by the Social Security Administration. The study began with over 11,000 men and nonmarried women aged 58–63 in 1969. The respondents were reinterviewed at two-year intervals. By 1975, the last wave available when this research was undertaken, the sample was down to approximately 8,600 due to the death, institu-

tionalization, mobility, or noncooperation of some respondents. Our work is based on a subsample of these 8,600 respondents. (For more detail on the RHS, see Irelan [1976].)

Social security and pension WEALTH and DELTA variables were calculated for each worker for 1970 and for 1974. This was a relatively simple process for social security because RHS data include actual social security records, and because we knew the rules on which benefits are based. For 1970–71, for example, we calculated

(i) WEALTH(0), the present discounted value, in 1970 dollars, of the social security benefit stream if the individual claimed benefits in 1970 (see eq. [1] in the text), and

(ii) WEALTH(1), the present discounted value, in 1970 dollars, of the stream which would begin in 1971, after the individual worked another year. Following the zero value for social security receipt in 1970, $B(1)$ would exceed $B(0)$ both because of the actuarial adjustment past age 62 and because of the change in average monthly wages due to increased wage earnings. We assume real wages for 1970–71 would equal the actual 1969–70 wages for all workers. Because these calculations are sensitive to the interest rate, we use a 2, 5, and 10 percent rate, both here and in the pension estimates.

As described in the text (eq. [2]), social security DELTA is this change in the WEALTH value if acceptance is postponed one year plus the employee's social security contributions during that hypothetical year of additional work. This same process is then repeated for the entire sample in 1974.

Pension WEALTH and DELTA estimates for 1970 and 1974 were more difficult to obtain, since annual benefits had to be derived from individual questionnaire responses. As with social security, knowing a yearly pension is only the first step in estimating WEALTH and DELTA values. Because we had no details on the structure of pension plans, the following assumptions were made:

(a) The yearly benefits described by the workers did not include a joint and survivor provision, though some private pension plans do provide for actuarial adjustments for survivors' benefits.

(b) The benefit amount ($B[s]$) is based on years of service, so that an additional year of work increases the benefit by $1/n$, where n is the number of years with the firm.

(c) For those currently eligible for reduced but not full benefits, the benefit amount also increases because of an actuarial adjustment. Since we do not know these actuarial adjustment factors for the individual pension plans, we used very rough industry averages. (These averages were taken from Urban Institute [1982], which used data from the BLS Level of Benefits Study).

The procedure was then the same as is described above and in equa-

tions (1) and (2) for both 1970 and 1974. We calculated two values of pension wealth (with and without an additional year of work), and defined DELTA as the difference. The derivations were again done with 2, 5, and 10 percent discount rates. A fuller discussion of the problems associated with all the variables used in our analysis is available (Burkhauser and Quinn 1983).

Notes

1. A comprehensive definition of compensation is obviously broader than this, and should include other fringe benefits (such as medical, disability and life insurance, paid vacations, etc.) as well as nonpecuniary aspects of the job, like working conditions and employment security. These are not included here because they are not the focus of the paper and because we have no data on them for the respondents in our sample. Changes in these other dimensions of compensation after a particular age (for example, a cessation of medical benefits after age 65) could certainly be important, and would have the same type of effect as would a decrease in pension wealth.

In this paper, DELTA is defined to equal the loss in pension wealth plus employee contributions during the year. For ease of exposition, the latter phrase is often dropped. Operationally, for employer pensions we assumed $C(0)$ was zero; for social security we used employee payroll taxes in a given year.

2. Private pensions include all employer pensions, but do not include social security, which is considered separately. Most private sector pensions are not automatically indexed for inflation after retirement, so a nominal rate of interest should be used in discounting. The early 1970s were a transitionary period for inflationary expectations, so we use two discount rates, 5 and 10 percent. When we consider social security benefits below, we use lower real rates (2 and 5 percent) since benefit adjustments have traditionally been greater than or equal to the cost of living—previously by congressional action and now by law.

3. Due to a quirk in the social security law prior to 1977, we employ higher discount rates for the social security DELTA than for social security WEALTH. From 1961 to 1977, the *absolute* cost of living raises given to those who retired early at actuarially reduced amounts were the same as the increments to those who claimed benefits at 65 (Burkhauser and Turner 1981). The penalty for early retirement was therefore a constant *dollar* amount, not a constant percentage. One discounts a constant dollar amount with the nominal rate of interest, not the real rate used with social security wealth.

It should be remembered that social security DELTA contains both the change in wealth (usually a loss at age 65) plus the employee's social security contribution during the year. The full-time workers in our sample are disproportionately high wage earners, so their DELTAs are generally higher than those in the general population.

4. This point is confirmed in a related paper, in which pension and social security wealth are explicitly compared to other more traditional forms of wealth—financial assets and net equity in the home, business, or real estate (Quinn 1983). It is found that for many workers in this age group the asset value of retirement rights dominate all other forms of wealth, including the value of the home.

5. The Retirement History Study reinterviewed the sample at two-year intervals (1969, 1971, 1973, and 1975), and these are the four snapshots we have. We assumed that respondents maintained their initial labor force status until the middle of each two-year interval and then made whatever transitions we observed in the subsequent interview. Hence, we refer to men aged 59–61 in 1970 and 63–65 in 1974.

6. We are grateful to Cordelia Reimers for suggestions on the restructuring of tables 12.6 and 12.8.

7. Since the magnitude of the pension DELTA values increases with age, we suspect that the pattern illustrated in table 12.7 is actually smoother than it appears, and the decline in the ratio more gradual. Unfortunately, our particular sample of respondents with neither mandatory retirement nor pensions includes one age group (60 in 1970 and 64 in 1974) with particularly poor earnings (see table 12.5). When they are compared with the subsamples with pensions, the ratios are very high. We suspect that this would not be the case in a larger sample.

8. The Department of Labor has a data source which combines information on the details of several hundred plans with the social security data on approximately 400,000 individuals in these plans. With respect to demographic and other economic variables, however, the research is limited to the very sparse detail on the social security earnings record. There have been proposals to combine this source with current microsurveys (such as the Survey of New Beneficiaries or the Exact Match File), but so far this has not been done.

9. For example, using 1975 data on 244 pension plans from the Bankers Trust Study of Corporate Pension Plans, and a 10 percent discount rate, Lazear finds pension wealth for hypothetical individuals ranging from about $400 to over $400,000 (Lazear 1981, p. 19).

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Comment

Cordelia W. Reimers

This paper opens up a large terrain for future investigation. The basic insight about changes in the asset value of pensions being a component of net earnings—one that these authors have written about before—is unassailable, and the empirical work is sufficient to establish the practical importance of pension rules as a mechanism for reducing the net earnings of older workers and, presumably, encouraging retirement. Burkhauser and Quinn have clearly put their collective finger on an alternative mechanism to mandatory retirement.

The actual numbers they report are, as they are the first to say, preliminary, based on very small and restricted samples and hampered by the lack of information on respondents' pension plans that plagues most research on retirement behavior. I would therefore not make too much of the exact numbers reported here, but would urge Burkhauser and Quinn, and others, to try to refine these estimates further.

For instance, if we are to believe these numbers, DELTA (even taking private pensions alone) does not appreciably reduce median net earnings before age 64; and social security appears to *increase* median net earnings before age 65. Yet most men currently retire before that age. Mandatory retirement cannot be the reason, either, so it appears that we have still not got a satisfactory explanation of observed retirement behavior.

But there are several ways the numbers might be improved upon, even with existing data, before abandoning the hypothesis. I shall discuss four problem areas: the calculation of the private pension DELTAs; the model of the retirement decision; the use of the median earnings of those without pensions as evidence on the alternative wage; and the biases involved in the choice of samples for study.

I can't say much about the way the private pension DELTAs were calculated, because the appendix is too vague on this point. But one question does arise regarding these DELTAs. To get around the lack of information in the Retirement History Study about benefit formulas, the authors use industry-occupation averages for certain pension plan characteristics. To evaluate this strategy, it is important to know how much pension plans vary among firms, *within* an industry and occupation. How much of the true variation in DELTA is being lost by this imputation? If industry-occupation averages are much alike, but firms vary a great deal, Burkhauser and Quinn's method will produce a much narrower distribution of private pension DELTAs than actually exists. Then the distributions of private pension DELTAs and of the net earnings/current wage ratios would be more spread out in reality than appears in tables 12.2,

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12.6, and 12.8 of the paper. How this might affect the medians is anybody's guess.

On a related point about measurement, these net earnings/current wage ratios should of course be measured, insofar as possible, net of taxes and inclusive of other fringe benefits—especially those that change with age. It's not clear that taxes have been netted out of the numbers reported in the paper.

I now turn to the way Burkhauser and Quinn model the retirement decision and use the numbers as evidence bearing on the hypothesis that pension rules induce retirement. First, their model of the retirement decision, while a major improvement over one that simply compares the current period's wage and pension benefit, is still too myopic. There is no more reason for a worker to consider only his current period wage than only his current period pension benefit. The optimal timing of retirement involves comparison of the present values of the entire *streams* of future wages, alternative wages (or values of nonmarket time), and pension benefits. To use a one-period wage comparison in modeling retirement, one must assume that once net earnings dip below the alternative wage, they remain there forever after. (To see this, ask yourself why we do not expect a man of 35 to retire from the labor force just because he has a spell of disability or unemployment that drastically, but temporarily, reduces his market wage.) We may be perfectly comfortable making this assumption for older men, but we ought to be explicit about it.

Second, the numbers in table 12.7 of the paper appear to be presented as evidence about whether the private pension DELTAs are large enough to induce retirement. But there are several difficulties in interpreting them that way. If we are trying to explain retirement, we will want to know how a man's net earnings compare with his own alternative, or reservation, wage. If we know how much pension DELTAs reduce net earnings, one additional piece of information is needed: how the net earnings compare with the alternative wage. Burkhauser and Quinn seem to interpret their table 12.7 as if it contained that sort of information. What it does show is the ratio of median net earnings of those *with* a pension to median earnings of those *without* a pension, allowing for the private pension DELTA only.

To interpret these ratios as containing any evidence at all about whether pensions reduce net earnings enough to enforce job exit requires four assumptions about the median alternative wage: (1) that it is the same for those with and without a private pension; (2) that it is the same for those with and without mandatory retirement; (3) that it is equal to the median current wage of those who have no private pension; and (4) that the distributions of individuals' net earnings and alternative wages just happen to be related in such a way that the ratio of the medians is equal to the median ratio.

Given these four assumptions, we could conclude from table 12.7 of the paper that, for those without mandatory retirement, the private pension plan alone is sufficient to reduce net earnings to the alternative wage level for half the sample at age 65. We could also conclude that, where it exists, mandatory retirement is needed because the private pension plan does not sufficiently reduce median net earnings. These are, in fact, the conclusions drawn by Burkhauser and Quinn.

However, I think it highly unlikely, first of all, that the median alternative wage is the same across pension-mandatory retirement status, or is equal to the no-pension wage. The idea of comparing net earnings of people with and without pensions to get a comparison of a person's net earnings and alternative wage would be justified by a model in which people are randomly assigned to pension-mandatory retirement status and are identical in other respects—in particular, their alternative wage. Moreover, those without pensions would have to be in a spot labor market, where wage = VMP at all times. But this model violates the basic fact that pension-mandatory retirement status is not random, but results from a selection process such as Walter Oi discusses in his paper in this volume.

For one thing, we know private pension coverage is positively correlated with education. Besides, workers will tend to sort themselves among firms on the basis of mandatory retirement and their own preferences for leisure (i.e., their reservation wages). Furthermore, even on most jobs without pension plans the wage probably includes some return to firm-specific human capital and therefore is above the alternative wage. Some effort to standardize for education and other determinants of the alternative wage should be made before comparing net earnings across pension and mandatory retirement categories. Moreover, Burkhauser and Quinn's table 12.7 completely ignores social security, and it is the *combined* effect of social security and a private pension plan that determines whether mandatory retirement is necessary to end the period when $W > \text{VMP}$.

Even if we could accept assumptions (1) through (3), however, and take the median no-pension wage as a measure of the median alternative wage for those with pensions, there is a serious problem with using the ratio of these medians as evidence on the distribution of the ratio of the two variables. Individual workers' net earnings/alternative wage ratios are the variable of interest; yet what Burkhauser and Quinn report is not, even under assumptions (1) through (3), the median ratio, but the ratio of median net earnings to the median alternative wage. This may be quite misleading. Suppose, for example, net earnings were distributed as in figure C12.1A, and the distribution of alternative wages looked like figure C12.1B, with everyone's rank order being preserved. Then the *ratio of medians* = 1, but the *median ratio* is clearly much greater than 1.

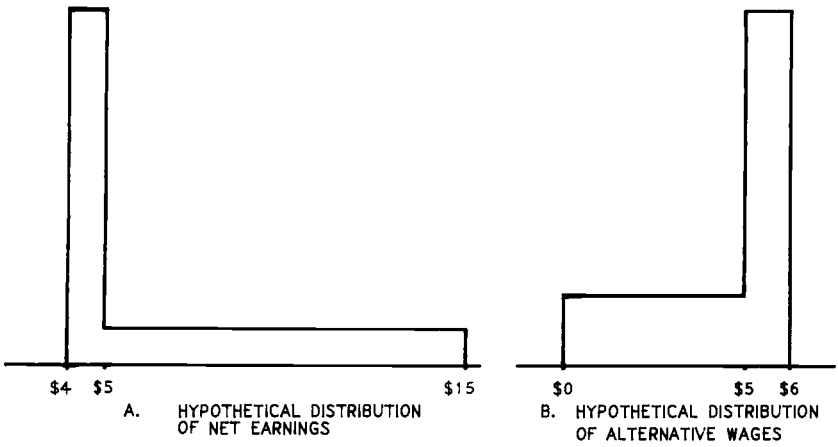

Fig. C12.1

(In fact, it would be about 1.8.) It is obvious that we cannot, in general, learn much of value about the median ratio by looking at the ratio of the medians.

Turning now to the authors' choice of samples for study: is it really necessary to confine the samples to *full-time* workers, and in some cases to those who were in the *same full-time* job in 1969 and 1974? If the hypothesis underlying the paper is correct, men over 60 with large positive DELTA are more likely to retire, other things being equal. This presumably biases the samples toward those men with small or negative DELTA (though the bias, in fact, depends on the correlations among DELTA, wages, and reservation wages). This could explain the authors' finding that median net earnings are not appreciably reduced by private pensions before age 64.

Burkhauser and Quinn are concerned that people who take social security benefits while keeping the same job would bias their estimates of the social security DELTA upward, if they included part-time workers. They could presumably determine from the Retirement History Survey how widespread this practice is. My guess is that it's rare, because it is hard to adjust hours drastically on the same job, and that the downward bias of DELTA from selecting only full-time workers is more serious. This bias question is further complicated by the information in note 3 of the paper, that the social security DELTAs are biased *upward* because the sample members tend to be high wage earners.

Those are the main things that bother me about this paper. These criticisms should not obscure the useful contribution that Burkhauser and Quinn have made in emphasizing the potential importance of pension

DELTAs and in actually calculating a thought-provoking, albeit preliminary, set of estimates. I am sure we shall soon be seeing a variety of efforts to produce better estimates of DELTA, net earnings, and alternative wages. I shall conclude with a few words about the broader research agenda in this area of pensions and mandatory retirement.

Lazear (1979) pointed out that, if you have a long-term contract with $W < \text{VMP}$ at first and $W > \text{VMP}$ later, some cutoff mechanism is necessary, and mandatory retirement rules can play this role. In this paper, Burkhauser and Quinn show that pension plans may be structured with large positive DELTAs after a certain age and can then play the same role as mandatory retirement in a long-term contract. But these mechanisms are not identical, and none of this tells us why either mandatory retirement or nonactuarially fair pensions exist in the first place, nor why we see them used instead of simple wage reductions to terminate the period when $W > \text{VMP}$ in a long-term contract. There may be some clues in the types of firms and workers that do and don't have mandatory retirement and pensions with large DELTAs. Perhaps one mechanism is more efficient than another, depending on the circumstances. Perhaps they act in different ways to sort workers among firms according to workers' preferences about how long to work. The costs associated with the various cutoff mechanisms need investigating before we will know the true costs of raising or abolishing the mandatory retirement age. Burkhauser and Quinn make a start in opening up this important subject.

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