Retirement and the Evolution of Pension Structure

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ABSTRACT

Defined benefit pension plans have become considerably less common since the early 1980s, while defined contribution plans have spread. Previous research showed that defined benefit plans, with sharp incentives encouraging retirement after a certain point, contributed to the striking decline in American retirement ages. In this paper we find that the absence of age-related incentives in defined contribution plans leads workers to retire almost two years later on average, compared to workers with defined benefit plans. Thus, the evolution of pension structure can help explain recent increases in the typical retirement age, after decades of decline.

I. Introduction

The typical employer-provided pension has changed dramatically in the last 20 years. The percentage of pensioned full-time employees with a 401(k) or other defined contribution (DC) plan in the Survey of Consumer Finances rose from 40 percent in 1983 to 79 percent in 1998. The percentage covered by a defined benefit (DB) plan declined similarly, from 87 percent in 1983 to 44 percent in 1998.

Pension wealth in traditional DB plans is a complicated function of earnings, tenure, and age. DB pension wealth typically accumulates slowly early in a job, then accelerates or jumps after many years of tenure, and ultimately slows down or

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declines after some point. Therefore, DB pensions encourage workers to stay in a job in order to gain access to large pension accruals late in the career and then to leave, typically after 25–30 years of tenure.[1] Earlier studies showed that DB pension plans influenced retirement behavior by as much or more than Social Security and that the postwar spread of DB plans contributed to the striking decline in American retirement ages. However, retirement ages leveled off in the early 1980s and have risen since then.[2] We argue that the shift in pension structure played a role in reversing the decades-long decline. In DC pensions contributions and returns accumulate in a portable account, so the timing of pension wealth accruals is not tied to the timing of retirement as in DB pensions.

Our goal in this study is to analyze how the decline in DB pension coverage has influenced retirement. Our approach is essentially quasi-experimental, comparing retirement responses to exogenous financial incentives in DB versus DC plans. In addition, we offer extensions to the literature on private pensions. We show that the measures of pension accrual that are crucial for understanding DB pension incentives do not meaningfully describe DC plans. We also employ new data from the nationally representative, longitudinal Health and Retirement Study. The HRS began in 1992, more recently than data used in earlier studies of DB pensions, and it offers descriptions of pension plans from employers.[3]

We hypothesize that retirement hazards will smooth out for workers with DC plans, compared to workers with DB plans. In theory, that might reduce the average retirement age, if DB plans generally constrain workers to retire later than they would otherwise; or it might raise it, if DB plans constrain workers to retire earlier. Our estimates show that differences in pension wealth accrual significantly affect retirement. Moreover, simulations based on the estimates demonstrate that workers with DB plans retire almost two years *earlier*, on average, compared to workers with DC plans and holding other characteristics constant. Accounting for DC contributions that are voluntary and possibly endogenous does not affect the estimation results, nor does allowing retirement behavior to differ by pension type, which controls flexibly for other differences between DB and DC pensions.

The simulations imply that the shift in pension structure will raise the median retirement age of full-time employees with a pension by about ten months when comparing cohorts aged 53–57 in 1983 and in 2015. Under different assumptions about those without a pension, this corresponds to a 9–12 month increase in the median retirement age of all full-time employees. Therefore, this response can help explain recent increases in employment of older workers.

Although our work builds on previous research that treats pension type as exogenous, we recognize that workers may sort into firms endogenously, based on pension

1. Burkhauser (1979); Kotlikoff and Wise (1985); Quinn et al. (1998).

2. Labor force participation fell from 58 to under 20 percent between 1930 and 1990 among men aged 65 and over and fell from 82 to 67 percent between 1940 and 1990 among men aged 55–64 (Costa 1998). Recent increases are documented in Quinn (2000) and Gendell (2001).

3. Coile and Gruber (2000b) used the same HRS data to analyze the impact of Social Security on retirement. In some specifications they summed together pension and Social Security incentives, assuming the same reaction to public and private pensions that have different characteristics. Also, they measured financial incentives in DB and DC plans in the same way.

characteristics or on other characteristics correlated with pensions. We argue that the shift in pension structure does not appear to be related to retirement preferences. Moreover, we find little evidence of sorting into pension type on observable worker and job characteristics.

In Section II of this paper, we outline how differences between DB and DC pensions influence retirement and why pension structure may have changed. In Section III we describe the data and show raw statistics on pensions and retirement. We present the estimation and simulation results in Section IV and summarize our findings in Section V.

II. Pensions and Retirement

In this section, we show how pension structure may influence retirement. Then, we argue that changes in pension structure did not occur for reasons related to retirement preferences.

A. The Impact of Pensions on Retirement

1. The Retirement Decision

Each period a worker decides whether to stay in a job or leave (retire).[4] He or she weighs the utility of retiring now and receiving utility from leisure or of staying in the job, receiving a wage, and deciding next period whether to retire. The decision depends on how current and expected future compensation compare to the value of retirement.

2. Pensions

A pension is a form of compensation deferred until a worker leaves his or her job. The value of the pension may depend on the retirement date in one of several ways:

- Delaying retirement may substantially raise long-term benefits, so pension wealth accrual is large at some future date, though small today. That encourages later retirement. This pattern arises in DB plans at younger ages.
- Delaying retirement may have little or no effect on future pension benefits. Then, the foregone income makes pension wealth accrual small or negative, encouraging immediate retirement. This pattern generally arises in DB plans after eligibility for early or full benefits.
- Future pension benefits may increase at a constant rate when retirement is delayed. This pattern occurs in DC plans, in which case the incentive to retire depends on factors like the employer contribution rate.

4. This framework may apply to quits at any age, if leaving a job is irreversible. Similarly, older workers may choose to take another job rather than retiring completely.

3. DB Pension Wealth Accrual

A person who retires at age t has DB pension wealth equal to

$$P_t^{DB} = E\left[\sum_{s=t}^{T} \frac{1}{(1+r)^{s-t}}\, \delta_{slt}\, p(q,t)\right],$$

the expected value of the benefit $p(q, t)$ received each period after the pension commences at age $q \geq t$, discounted by the age-conditional survival probability δ and the interest rate r.[5] A typical formula for $p(q, t)$ involves a benefit that is proportional to the worker's final or average salary, with the proportion increasing in tenure. DB pension wealth accrual $\left[\frac{1}{1+r} P_{t+1}^{DB}\right] - P_t^{DB}$ measures the gain in pension wealth if one works an additional year and then retires.

Figure 1 shows pension wealth accrual in an actual DB plan as the retirement age t increases.[6] Two or three key dates can cause sharp changes in P_t^{DB}. Pension wealth is zero until vesting, when a worker becomes eligible to receive a future pension. Pension wealth then accrues gradually as the future benefit rises with earnings growth, tenure, and the approach of retirement. Accruals generally spike again if the plan offers an early retirement date (ERD), when a worker can leave the job and first receive a reduced benefit, or at the normal retirement date (NRD), when a worker qualifies for the full benefit. The spike in Figure 1 results from a discrete jump in the pension benefit at the ERD. Accruals often turn negative following the NRD because current benefits are foregone. In Figure 1 the penalty for receiving early benefits is mild, so accruals turn negative after the ERD.[7]

It is clear that a single year's pension accrual does not capture the full value of postponing retirement. Stock and Wise (1990) developed an "option value" approach that reflects the increment to utility from postponing retirement and gaining access to distant accruals. Estimation of their model requires numerous functional form and distributional assumptions, however. In their analysis of Social Security incentives, Coile and Gruber (2000a, 2000b), introduced a simpler measure of the "peak value" of pension wealth accrual $\left[\frac{1}{(1+r)^{m-t}} P_m^{DB}\right] - P_t^{DB}$, where pension wealth reaches its maximum in future year m. They argued that peak value isolates the key incentives influencing retirement while requiring fewer assumptions.[8] Although peak value does not fully capture the effect of the number of years until the peak, we find that the results are not sensitive to normalizing by years to peak.

5. Retirement may precede eligibility, but it is almost always optimal to begin receiving benefits as soon as one is eligible.

6. Pension accruals in Figure 1 were computed from sample HRS plans, slightly modified to protect anonymity. Following the literature, we assume a 3 percent discount rate, average mortality probabilities by age and gender, and a terminal age of 120.

7. The maximum vesting date is now five to seven years but was ten years in the plan shown in Figure 1. The elimination of age-related limits on pension benefits in 1986 and the reduction in the vesting period in 1989 are both incorporated in relevant plans of workers in our sample.

8. Samwick (2000) demonstrated that controlling separately for earnings, as we do, captures the key difference between the option value and peak value measures.

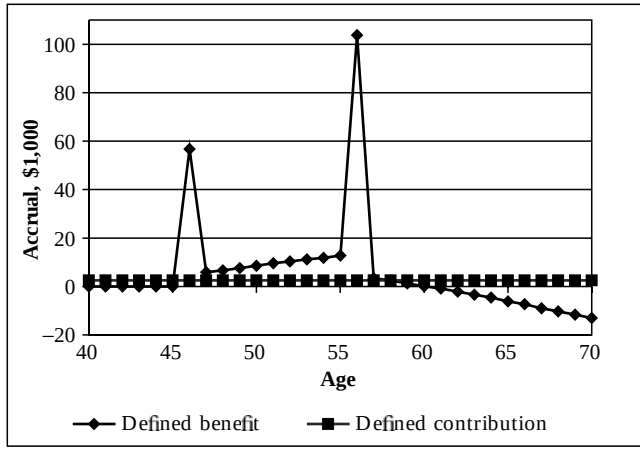

Figure 1
Pension Wealth Accruals

4. DC Pension Wealth Accrual

DC plans function very differently. DC pension wealth is the market value of current assets. The gain to DC pension wealth each period is the return on the initial balance plus this year's contributions from the employee and employer. While contributions to a 401(k) are voluntary, they are mandatory in other DC plans.[9]

An additional year of work has no effect on pension wealth if contributions are zero and raises pension wealth if contributions are positive, while existing assets generate returns regardless of retirement. Consequently, DC pension wealth never reaches a peak, and the peak-value measure is not well-defined without additional assumptions.[10] This is apparent in the pension accruals from a typical DC plan shown in Figure 1. Nevertheless, a portion of DC pension accruals constitute an incentive to delay retirement—employer contributions that will cease at retirement and access to tax-deferred savings that will diminish or cease.[11] There are also two potentially important dates in DC pension wealth accrual. First, some DC plans have vesting dates, though a majority vest within zero to two years (Mitchell 1999). Second, 401(k) funds can be withdrawn without a penalty beginning at age 59½; however, we do not find evidence later of an age-59½ effect on retirement.

9. Other types are money purchase plans, profit sharing plans, target benefit plans, simplified employee pensions, and employee stock ownership plans.
10. Peak value exists if the discount rate exceeds the rate of return and contributions are zero or relatively small. Otherwise, the discounted value of the pension continues to rise forever.
11. We follow the literature in ignoring the present value of future tax relief. DB pension wealth is also tax-deferred, so our treatment of this component of pension wealth is parallel.

Another important point is that voluntary contributions may replace other personal saving and thus depend on retirement plans.[12] Moreover, voluntary contributions generate some, though not all, of the cross-sectional variation in pension accrual. However, we find little effect when we try omitting a measure of voluntary contributions from DC pension wealth in our estimation.

B. Summary of Key Differences

1. DC Pension Wealth Accrues Smoothly

We hypothesize that retirement hazards will smooth out for workers with DC plans, compared to workers with DB plans who experience swings in pension accruals. This could lead to earlier retirement, if DB plans constrained workers to retire later than they would have otherwise on average; or to later retirement, if DB plans constrained workers to retire early when accruals drop off or turn negative. We will distinguish which through simulations based on our estimation results.

2. DC Pension Wealth Includes Voluntary Contributions

Since these may be determined endogenously with retirement plans, we examine whether voluntary contributions affect estimates of the influence of DC pensions.

3. DC Pensions have Shorter Vesting Periods

Quick vesting in DC plans may have made it more attractive for retiring workers to take a new job for a few years. We distinguish in the empirical analysis between people who leave their pensioned job for another job and those who retire fully.

4. Other Differences[13]

DC plans are typically not annuitized (Brown et al. 1999), so a DB plan with actuarially equivalent present value is worth more than a DC plan to risk-averse individuals lacking bequest motives. Workers with DC plans may therefore want to save more or retire later. In addition, the shift to DC plans has transferred investment risk from firms to workers, which may alter both retirement plans and the degree to which plans change in response to rate of return shocks. We lack sufficient information to account directly for these effects on retirement, so instead we control flexibly for different types of pensions and allow different types of pension wealth to have distinct effects on retirement.[14]

12. Note, however, that the debate about whether 401(k) plans raise personal saving is not relevant for our paper. Differences in pension structure can influence retirement in either case.
13. Friedberg and Owyang (2002a) reviewed differences between DB and DC pensions in detail.
14. We tried using information on whether people invested their DC plans mostly in stocks (though this may be endogenous); it caused little difference in the estimation.

C. What Determines the Structure of Pensions?

In theories of deferred compensation, DB pensions solve a contracting problem between workers and firms (Lazear 1986). For example, firms may want to deter shirking but cannot perfectly monitor workers. Deferred pension accruals induce workers to devote optimal effort so that they do not lose their job and pension, and perhaps further to retire at an appropriate age. Similar motives for deferred compensation arise if firm-specific training or hiring is costly.

While various elements of these theories have found support in explaining the use of DB pensions, they offer little insight about the increasing prevalence of DC pensions. Two sets of explanations have been offered for the shift from DB to DC pensions; neither suggests that it occurred in response to changing retirement motives. First, regulatory changes since 1974 have tightened DB funding standards, constrained the structure of DB and DC pensions, and extended tax breaks for DC contributions. Many of these changes were aimed at encouraging and preserving the accumulation of retirement wealth (Clark and McDermed 1990); none were explicitly aimed at influencing retirement ages. Second, Friedberg and Owyang (2002b) argued that the value of long-term jobs has declined, thus reducing the usefulness of DB pensions. The focus of their argument on changes in the nature of jobs held by prime-age workers is consistent with the more rapid change in pension structure among younger workers; a decline in overall job tenure; and the movement of workers from jobs typically covered by DB plans to jobs typically covered by DC plans.[15] If anything, the shift away from DB plans may have increased firms' use of temporary early retirement inducements aimed at older workers.[16]

We recognize nonetheless that pensions and retirement may be endogenously determined. A firm's choice of pension structure may be influenced by factors correlated with the average age and retirement preferences of workers. However, we do not believe it is feasible to estimate the determinants of pension design.[17] We address concerns about endogenous sorting as permitted by our data. We control for observable characteristics (job tenure, firm size, industry, unionization) that are related to pension type; none influence the estimated effect of pension characteristics on retirement. Also, we show that older workers with different pension types are quite similar on other key dimensions like earnings and wealth, along which one might expect observable differences if workers sorted by retirement preferences or related characteristics.

III. Data

A. The Health and Retirement Study

The Health and Retirement Study (HRS) is a detailed longitudinal survey of over 7,600 households with a member born between 1931 and 1941. The HRS began in

15. Clark and McDermed (1990); Gustman and Steinmeier (1992); Ippolito (1995); Kruse (1995); Papke (1999).

16. Lumsdaine, Stock, and Wise (1990); Brown (1999).

17. Filer and Honig (1998) failed to find useful exclusion restrictions in a joint model of DB pensions and retirement. Their identifying variables (the inflation and unemployment rates at the hiring date) did not have a statistically significant impact on the DB early retirement date.

1992 and surveys people every two years. We use data from the first four waves, through 1998.[18] The HRS collected detailed data about household and job characteristics from individuals and, when possible, about pensions from employers and about earnings from Social Security. The latter are available on a restricted basis, together with a program to compute private pension wealth at all ages. We have written a similar program to compute Social Security wealth.[19]

Gustman and Steinmeier (1999) studied the quality of the pension data. In the first wave, 65 percent of workers who reported a pension in their current job were matched to their pension data.[20] Match failures arose when someone refused permission to contact their employer or when the employer did not respond. Gustman and Steinmeier found that some variables significantly affect a match but with relatively little explanatory power.[21] In our judgment we lack sufficient information to impute or control for selection due to missing pension data.

For people who say they have a pension, we use employer data to determine their pension type—DB, DC, or both types combined. We classify people as having a DB plan if their employer offers one, since participation is rarely voluntary. We classify them as having a DC plan if their employer offers one and they participate in it. We focus on participation rather than eligibility because the HRS did not contact employers of people who said they had no pension, so we likely miss some who are eligible but did not participate.[22] This might bias the results if, for example, people who intend to retire later do not contribute to their 401(k); we address concerns about endogenous participation by estimating a specification that omits a measure of voluntary DC contributions and find little difference in the results.

Employers reported the parameters that determine DB pension wealth. The HRS imputed DC plan balances from data on employer contributions, match rates, and compulsory and voluntary employee contributions. Gustman and Steinmeier recommended using imputed rather than self-reported plan balances, which are reported with major errors. Still, because imputed values tend to overstate pension wealth when plans allow voluntary contributions, they proposed a correction which does not yield a substantive difference in our estimation results.[23]

18. Third and fourth wave data were from the early releases.

19. We modified the HRS program to discount DB pension wealth by age-specific survival probabilities. We used earnings records and current rules to compute the present value of Social Security benefits without dependent and survivor benefits.

20. Since the match rate for earlier pensions was only 35 percent, we do not focus on exit from earlier jobs. If DB pensions encouraged some HRS respondents to leave their main job before they were first observed in 1992, sample selection would bias our estimates downward.

21. In a probit of the likelihood of getting pension data, the pseudo R-squared was 0.1164. The likelihood rose with education, firm size, self-reported pension assets, and working in a nonmanufacturing firm and fell with personal assets and earnings.

22. Poterba, Venti, and Wise (1995) and Webb (2002) estimated the effect of 401(k) *eligibility*, rather than the endogenous effect of participation, on saving. If we attempted this by limiting the sample to workers with DB plans and comparing those who are additionally eligible or not for a DC plan, we would learn little about retirement because, as we find later, the identifying variation is driven by the presence or absence of a DB, not a DC, plan.

23. The correction is based on regressing the ratio of self-reported to employer-reported values on the employer-reported value. Another concern with the self-reported data is that it reflects the history of contributions and rates of return, which result from endogenous choices.

B. Characteristics of Workers and Pensions

We select our sample as follows. Beginning with 12,652 individuals in the 1992 HRS, we keep 11,493 of them who appear in Wave 2. Of those, we keep 5,532 who work at least 30 hours per week and are not self-employed in 1992. We eliminate 1,052 who had a sample weight of zero and then 46 who provided no financial data, for a sample of 4,434. We will refer to the sample of full-time employees as "workers" in the rest of the paper for ease of exposition.

Table 1 compares these 4,434 workers by pension status in 1992. Our estimation will focus on individuals in Columns 1, 2, and 3; these are 1,528 people who have a DB and/or a DC plan in which they participate and for whom the HRS obtained private and public pension data.[24] Among them, 62 percent have only DB plans, 20 percent have only DC plans, and 18 percent have both types or a combination plan.

People with different types of pensions are quite similar except in three ways; controlling for these differences does not influence our estimates of the effect of pensions. First, people with only a DC plan have average job tenure of 14 years, compared to 18–19 for others. This disparity is related to the recent spread of DC plans in new jobs. Second, 55 percent of stand-alone DB plans occur in professional services or public administration, compared with 29–33 percent of DC or combined plans. Third, pension wealth differs systematically across plans. Combined plans offer the highest pension wealth, with a median of $345,156 if everyone retires at age 65—higher than the sum of the median stand-alone DB and DC plans. In contrast, financial assets are quite similar across pension type, with medians in the range of $22,000–26,300. We would not expect this similarity if workers select into pension type based on retirement preferences, which should also lead to different life-cycle saving behavior. In other dimensions as well, people with different pension types are otherwise similar. Median earnings across pension type lie in the range of $30,000–33,000, and education and occupation are comparable.

Another 1,527 people reported having a pension but were not matched by the HRS to either their pension or Social Security data.[25] They are slightly less educated and more likely to be in blue-collar jobs. 1,332 people reported having no pension. They are even less skilled and are substantially poorer. We omit both groups from the analysis because we do not feel confident explaining who has a pension or who has pension or earnings data.

Pension characteristics at selected retirement ages are reported in Table 2. In Tables 2 and 3 and in our estimation, we convert data on individuals in Columns 1–3 of Table 1 into person-age cells, so each observation represents an individual at a given age.[26] As expected, DC pension accruals are very smooth. In the top part of Table 2, the median of pension accruals for men is consistently around $4,000–5,000, regardless of retirement age, or $3,000–4,000 when an estimate of voluntary contributions is excluded. Women with DC plans have lower contributions.

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24. This sample is considerably larger than in earlier pension studies. Most had data on one or a handful of firms, while Samwick (1998) had a sample of 520 from the 1983 SCF.

25. Of those, 1,018 had no pension data, and 509 had pension data (323 DB, 62 DC, 90 combined) but no Social Security data.

26. We exclude observations aged 51–52 for computational ease; few at that age retire or reach key swings in pension accrual in our sample period. We exclude job exits that were involuntary (hence not governed by a pension) or to another job (we report separate estimates for them later).

Table 1
Characteristics of Workers in the HRS, 1992

	(1) DB only	(2) DC only	(3) Combination, DB and DC	(1)–(3)	(4) DC-eligible Nonparticipants	(5) Has Pension, No Data	(1)–(5)	(6) No Pension
N	948	304	276	1528	47	1527	3102	1332
Female	0.45	0.42	0.37	0.43	0.47	0.42	0.43	0.50
Married	0.76	0.77	0.76	0.76	0.82	0.73	0.75	0.67
High school	0.37	0.36	0.36	0.37	0.42	0.39	0.38	0.42
Some college	0.52	0.49	0.57	0.52	0.49	0.45	0.49	0.30
Occupation[a]								
Unskilled	0.37	0.31	0.32	0.33	0.30	0.39	0.36	0.54
Semiskilled	0.23	0.25	0.26	0.25	0.30	0.25	0.25	0.26
Skilled	0.40	0.44	0.42	0.43	0.40	0.36	0.39	0.21
Industry								
Mining, agriculture, construction	0.04	0.07	0.03	0.04	0.08	0.07	0.06	0.10
manufacturing, transportation	0.32	0.29	0.44	0.33	0.19	0.38	0.35	0.24
professional services, public	0.55	0.33	0.29	0.46	0.54	0.32	0.39	0.23
trade, nonprofessional services	0.09	0.31	0.24	0.17	0.19	0.24	0.20	0.43
Mean job tenure	19	14	18	18	10	16	17	8
Median earnings	32,000	30,000	33,000	31,500	28,000	29,000	30,000	15,500
Median financial assets	22,000	25,500	26,300	23,100	25,000	22,000	23,000	5,000
Pension wealth at age 65								
25% quartile	89,920	49,109	160,354	—	—	—	—	—
Median	203,949	102,298	345,156	—	—	—	—	—
75% quartile	384,378	230,946	647,207	—	—	—	—	—

Notes: Sample from Wave 1 of the Health and Retirement Study, consisting of those who were 51–61 in 1992, worked 30 hours or more per week, were not self-employed, were in households with a financial respondent, and were observed in Wave 2. Column 4: respondents said they had a pension but had zero DC assets and no DB pension. Column 5: respondents said they had a pension, but the HRS was unable to obtain their pension or earnings data. Column 6: respondents said they had no pension. Means computed using person-level analysis weights.

a. Skilled: management, professional, technical. Semiskilled: clerical, sales. Unskilled: others.

Table 2
Quartile Values of Pension Wealth Accruals, at Selected Retirement Ages

	Median Values of Pension Wealth Accruals					
	DB only	DC only		Combination		
Selected Retirement Ages	Total	Total	Excluding Voluntary Contributions	Total	DB Component	DC Component
Men						
53	6,381	4,811	3,114	12,276	6,079	4,353
56	5,275	5,542	3,474	13,882	7,137	5,069
59	4,595	5,755	3,848	12,690	6,407	5,471
61	2,614	5,972	4,086	8,683	3,020	5,745
63	−798	5,973	3,982	6,622	−104	5,747
65	−3,267	5,612	3,745	2,483	−3,237	5,174
Women						
53	5,155	1,903	1,443	8,834	4,920	2,114
56	5,716	2,192	1,922	8,537	4,092	2,933
59	5,956	2,946	2,136	9,923	5,556	2,760
61	3,656	3,174	2,290	6,336	3,340	2,824
63	1,927	3,385	2,358	5,520	2,201	2,908
65	424	3,552	2,463	3,702	604	2,960

	25th and 75th percentile values of pension wealth accruals					
	DB only		DC only		Combination	
Men	25th	75th	25th	75th	25th	75th
53	2,083	14,454	3,017	10,413	6,592	20,767
59	239	10,236	2,892	10,703	6,403	27,330
65	−9,008	369	3,000	9,625	−1,721	7,288

Notes: Sample from the HRS, consisting of person-age observations of individuals from the sample appearing in Columns 1–3 of Table 1, excluding observations below the age of 53 and excluding job exits that were involuntary due to layoff or plant closure or that were to another job, rather than to full retirement. Pension wealth is computed as the value of the pension if workers leave their jobs at each particular age; pension wealth accrual is the discounted change in pension wealth for one additional period of work.

In contrast, the median DB pension accrual is highest at age 54, when the early retirement date is reached in many plans, and turn increasingly negative after age 61. Women experience positive DB accruals at later ages because of shorter job tenure and longer life spans. Patterns of accrual in the DB and DC components of combined plans resemble those of stand-alone plans. The bottom part of Table 2 illustrates considerable variation in these patterns across the sample, as indicated by the 25th and 75th percentile values of DB pension accruals.

Table 3 shows the proportion of the same sample, at selected ages, who voluntarily leave their 1992 job and retire by 1998. Altogether, 39 percent of those in our sample leave their job. Workers with DB or combined plans exit at higher rates than workers with only a DC plan. At ages 55–59, 4.4 percent with a DB plan and 5.2 percent with a combined plan leave their job each year, on average, compared to 2.2 percent with a

Table 3
Annual Retirement Hazard Rates, at Selected Retirement Ages (Percent)

Selected Retirement Ages	(1) DB Only	(2) DC Only	(3) Combination, DB and DC	(1)–(3)	(4) DC-eligible Nonparticipants	(5) Has Pension, No Data	(1)–(5)	(6) No Pension
Men								
53	2	0	0	1	0	2	1	2
56	4	1	6	4	0	4	4	1
59	6	2	9	6	5	5	5	4
60	5	3	6	5	0	7	6	3
61	11	7	9	10	17	5	7	2
62	27	15	11	22	0	18	20	14
63	23	31	22	25	0	16	21	9
64	19	0	10	13	0	8	10	7
65	24	19	48	26	0	19	22	15
66	18	0	0	12	0	0	6	4
All ages	37	25	33	34	8	25	30	16
Women								
53	3	0	0	2	0	1	1	0
56	5	2	5	4	0	1	3	1
59	7	3	2	5	0	3	4	1
60	7	2	6	6	12	6	6	2
61	9	5	7	8	0	6	7	4
62	15	12	18	15	36	14	15	8
63	20	10	9	16	7	14	15	12
64	13	8	27	14	0	22	17	2
65	29	20	21	25	48	27	27	7
66	21	28	32	24	0	38	29	5
All ages	40	19	25	26	39	16	23	9

Notes: Same sample as in Table 2. Retirement hazard rates are computed as the percentage of the sample of people who are working at one birthday and leave their pensioned job and retire fully by the next birthday.

DC plan. At ages 60–62 the statistics were 11.8 percent with a DB plan, 8.7 percent with a combined plan, and 6.3 percent with a DC plan. This key distinction across pension types emerges in the estimation results below.

IV. Estimating the Impact of Pensions on Retirement

Descriptive statistics confirm that both pension wealth accruals and job exit vary with pension type. This section reports estimates of the effect of pension accruals on retirement, controlling for pension wealth and other characteristics.

A. Estimation Strategy

We have chosen a straightforward estimation approach. This has the advantages that we avoid strong assumptions about the functional form of utility and that the source of identifying variation from pension incentives is clear. We pool observations on full-time employees with pensions at each age between the years 1992 and 1998.[27] In most of our specifications, our left-hand side variable is a binary indicator for whether a worker leaves a pensioned job voluntarily (not due to layoff or plant closure) from one age to the next and fully retires; we focus later on exits to another job. We estimate probits with Huber-White standard errors adjusted for person-level clustering and use the HRS-provided person-level analysis weights.[28]

On the righthand side, our key variable is the peak value of DB pension accrual (peak minus current pension wealth, or zero if past the peak), as in Coile and Gruber (2000a). We add, further, a quadratic effect of peak value and an indicator for being at or past the peak, when peak value is set to zero. We allow separate effects of peak value in DB and in combined plans. We add indicators for employers matching worker contributions to DC plans, which discourages retirement, and offering temporary "window plans" to encourage retirement.[29] Accumulated pension assets generate a wealth effect encouraging retirement, and we allow for separate effects of pension wealth from DB, DC, and combined plans in case differences in pension structure discussed earlier cause different responses to the same value of pension wealth. We normalize peak value and pension wealth by earnings.[30] We include dummies for each pension type, in case other pension characteristics are correlated with retirement. Lastly, we experiment with indicators for institutional details like being at the early or normal DB retirement dates.

We also control for firm size, industry, unionization, occupation, and tenure, which are correlated with pension structure. Additional controls for earnings, health insurance coverage, and other financial and nonfinancial influences on retirement are listed in Table 4 and its notes.

27. In contrast to our annual approach, Gustman and Steinmeier (1999) tracked individuals by wave (over two years), which is less precise since pension accruals vary annually.

28. Coile and Gruber (2000b) also estimated probits in their study of Social Security. They reported that results from a Cox proportional hazards model gave virtually identical results.

29. As noted earlier, employer contributions to DC plans in any form constitute an incentive to delay retirement, but we do not have a good way to distinguish nonmatching versus matching employer contributions, which depend on potentially endogenous employee contributions.

30. The "option-value" measure of pension accrual in Samwick (1998) implicitly weighs pension income by earnings. We also control for earnings separately.

Table 4A
Regression Results: Coefficient Estimates on Pension Variables

Dependent Variable: Leaves One's Job	4.1	4.2	4.3
Has a			
DB plan	0.0131	0.0090	0.0114
	(0.0121)	(0.0124)	(0.0124)
Combination plan	0.0213	0.0254	0.0324
	(0.0223)	(0.0232)	(0.0251)
Peak value/earnings			
DB plan	–0.0084**	– 0.0068**	–0.0106**
	(0.0034)	(0.0034)	(0.0044)
DB portion of combination plan	–0.0163**	–0.0171**	–0.0284**
	(0.0076)	(0.0078)	(0.0110)
(Peak value/earnings)^2			
DB plan	—	—	0.0008**
			(0.0004)
DB portion of combination plan	—	—	0.0041*
			(0.0022)
At or older than peak value			
DB plan	—	0.0140	0.0121
		(0.0100)	(0.0098)
Combination plan	—	0.0096	0.0060
		(0.0211)	(0.0200)
At normal retirement date			
DB plan	—	0.0227**	0.0221**
		(0.0133)	(0.0132)
Combination plan	—	–0.0230	–0.0234
		(0.0118)	(0.0115)
Pension wealth/earnings			
DB plan	0.00315**	0.00270**	0.00259**
	(0.00101)	(0.00106)	(0.00107)
DB (combination plan)	0.00151	0.00105	0.00073
	(0.00265)	(0.00294)	(0.00293)
DC plan	0.00085	0.00084	0.00086
	(0.00192)	(0.00192)	(0.00192)
DC (combination plan)	0.00282*	0.00252	0.00253
	(0.00156)	(0.00158)	(0.00159)
DC, employer matches own contributions	0.0031	0.0032	0.0037
	(0.0072)	(0.0072)	(0.0072)
Early-out incentive offered	0.0087	0.0094	0.0096
	(0.0106)	(0.0107)	(0.0108)
Log likelihood per observation	–0.198	–0.198	–0.197

Table 4B
Regression Results: Coefficient Estimates on Selected Other Variables, Specification 4.3

Social Security peak value/earnings		
Private pension is DB only	–0.0140**	(0.0050)
Private pension is DC only	–0.0206**	(0.0091)
Private pension is combination plan	–0.0173**	(0.0087)
At or older than peak value		
Social Security	0.0029	(0.0102)
Social Security wealth/earnings	–0.00118	(0.00136)
Earnings/10,000	–0.0025**	(0.0011)
Log financial assets	0.0061**	(0.0014)
Financial assets = 0	0.0918**	(0.0415)
Not a homeowner	–0.0012	(0.0067)
Industry		
Agriculture, mining, construction	–0.0095	(0.0091)
Manufacturing, transport	–0.0037	(0.0057)
Professional services, public admin	–0.0057	(0.0081)
Firm size		
100–500 employees	0.0077	(0.0101)
>500 employees	0.0044	(0.0054)
Tenure		
Joined employer 1974–85	–0.0024	(0.0051)
Joined employer 1986+	–0.0063	(0.0067)
Occupation		
Administrative, professional, technical	0.0006	(0.0070)
Sales, clerical	0.0048	(0.0074)
Union member	0.0043	(0.0051)
Has pay and promotion responsibility	0.0102	(0.0067)

Notes: Same sample as in Table 2, N = 7,965. The tables report marginal effects from probits estimated using person-level analysis weights, computed at sample means of righthand side variables; Huber-White standard errors in parentheses that have been adjusted for person-level clustering; and significance at 90 (*) and 95 percent (**) levels. The dependent variable is a dummy for leaving one's job and retiring from one age to the next between 1992 and 1998. Additional coefficient estimates are reported in Friedberg and Webb (2003) for the following covariates: recent hospitalizations (none; once; twice or more in last year); education (less than high school, high school, some college); race (black; nonblack); Hispanic; gender and marital status (male/female interacted with married/not married); health insurance coverage (provided by an employer; Medicaid; Medicare or VA; privately purchased); health insurance provided by an employer for retirees; single-year age dummies.

B. Estimation Results

Table 4 reports marginal effects from probit estimates for several specifications. A positive coefficient indicates a higher probability that a person voluntarily left his or her 1992 job and retired. The basic specification in 4.1 follows the literature by including pension wealth and a measure of pension accrual. The specification in 4.2 adds dummies for being at or past the age of peak pension wealth and the pension's

normal retirement date. Our preferred specification in 4.3 adds a quadratic in peak value.

We find that both private and public pension accruals influence retirement. In all three specifications, peak value is significant at the five percent level for workers with DB plans and workers with combined plans. Peak value has a larger effect in combined plans, but the difference across pension type is not statistically significant. In Specification 4.2, having the mean DB (combined) peak value instead of a peak value of zero reduces the annual retirement hazard by 1.1 (3.6) percentage points for ages 55–59, or a 20 (36) percent reduction compared to the observed hazard. The quadratic terms in peak value are significant in 4.3 and raise the overall effect of peak value, both at the center and the first and third quartiles of the distribution. Now, having the mean DB (combined) peak value reduces the retirement hazard by 1.7 (3.8) percentage points for ages 55–59, or a 29 (37) percent reduction compared to the observed hazard.[31] Since we control for tenure, age, and earnings, which are key determinants of peak value, the estimated effect of peak value does not reflect their impact on retirement.

Peak value is not economically meaningful after pension wealth peaks, so it is set to zero. We add dummy variables in 4.2 and 4.3 to capture this disincentive effect of declining pension wealth. Being at or older than the DB peak raises the retirement hazard by 1.21 percentage points in 4.3, but the estimate falls a little short of statistical significance, and it is far from significant for combined plans.

We find that institutional elements of DB pensions sometimes affect retirement. In estimates that are not shown, we found no spike in exits at the early retirement date (ERD) when reduced pension benefits are first available; the ERD generally occurs early, often around age 55, when we observe few retirements. On the other hand, being at the normal retirement date (NRD) significantly raises exits among DB people; it lowers exits among combined people, though not significantly. These findings suggest that institutional factors and social norms involving the NRD play a role for people with stand-alone DB plans.[32]

We also allow the effect of pension wealth to vary by pension type. We find a significant and positive, though economically quite small, effect of DB wealth on DB people and, in 4.1, of DC wealth on combined people. Coefficients on the other pension wealth variables have similar magnitudes but are not statistically significant.[33] Samwick (1998) and Coile and Gruber (2000b) also found weak effects of pension wealth. The results suggest that differences in other pension characteristics that we are not controlling for directly (the lack of annuitization in DC pensions, for example) do not significantly affect retirement.

Other pension characteristics which we control for do not have a major impact. Notably, coefficients on the pension type dummies are not small but are far from significant, so the impact of pension type is captured primarily by the differences in

31. Cubic terms in peak value are not statistically significant. When we tried normalizing peak value by years to peak, the resulting coefficients were insignificant, as peak value and years to peak are highly correlated. This shows that peak value captures the key pension incentives.

32. Stand-alone DB plans occur disproportionately in public administration and professional services, and they have an earlier average NRD. Nevertheless, controlling for industry did not affect the estimation results.

33. Adjusting DC pension wealth in plans that allow voluntary contributions, as proposed by Gustman and Steinmeier (1999), leads to larger but still insignificant coefficients.

accrual and wealth patterns. Other specifications we tried did not yield significant results and are not shown. We find no evidence of a spike in retirement at ages 59 or 60, when 401(k) withdrawals no longer suffer tax penalties, or of other pension-related differences in retirement by age.[34] Retirement hazards of people who report investing their DC plan partly or mostly in stocks (which may be endogenous) do not significantly differ. A measure of subjective life expectancy was not significant and did not alter the estimated effect of DB plans, although annuitization makes DB pensions more valuable.

As with private pensions, Social Security incentives significantly affect retirement. Social Security peak value reduces the retirement hazard by one to two percentage points for people in their late 50s, evaluated at the sample means. Our specification is more general than Coile and Gruber (2000b) in allowing distinct effects of public and private pensions on retirement, and we find that the coefficient estimates are not statistically different.[35] We also allow the effect of Social Security accruals to vary by private pension type, and they do not significantly differ—revealing that people with DC plans react in the same way when faced with DB-type incentives as people with DB plans react.

It is important to note that industry, unionization, job tenure, and firm size are related to pension type but do not significantly influence retirement. Omitting these variables from the regression also has little effect on the pension estimates. This reduces concerns of endogenous selection into pensions. Briefly, other control variables have the same qualitative impact found in a great deal of previous research.[36] A 10 percent increase in financial assets significantly raises the retirement hazard by about 0.6 percentage points.[37] Higher earnings lead to significant but small delays in retirement; $10,000 more in earnings reduces the hazard by about 0.25 percentage points.[38] When an employer provides health insurance for workers but not retirees, a worker is about a percentage point less likely to retire.

In sum, the estimates demonstrate that differences in pension accrual patterns alter retirement, as we hypothesized. We discuss some additional specifications next and then analyze whether the shift in pension structure led to earlier or later retirement.

C. Additional Specifications

This section reviews additional results shown in Table 5. We build on specification 4.3 and try using a higher discount rate, excluding voluntary DC contributions, focusing on people who take a new job, and separating the sample by gender. In Specification

34. Allowing for distinct age dummies by pension type does not alter the estimated effect of peak value. A spike in DB retirements at age 55 is the only significant difference by age; it is apparently related to the importance of the NRD in stand-alone DB plans, mentioned earlier.

35. Social Security might have distinct effects from DB pensions because it offers fuller inflation protection and spousal benefits, as well as the government's backing in case of underfunding.

36. Coefficient estimates on personal characteristics that do not appear in Table 4 are reported in Friedberg and Webb (2003).

37. Omitting the wealth variables on the argument that they are endogenously determined does not alter the estimated effect of the pension variables.

38. We tried including a measure of recent earnings growth in order to capture how the shape of the earnings profile might affect the incentive to stay; it did not have a significant effect.

Table 5
Regression Results, Additional Specifications: Coefficient Estimates on Pension Variables

Dependent Variable: Leaves One's Job Pension Variables	5.1 5 Percent Discount Rate	5.2 Excludes Voluntary DC Contributions	5.3 Dependent Variable: Takes a New Job
Has a			
DB plan	0.0113	0.0112	0.0016
	(0.0104)	(0.0132)	(0.0105)
Combination plan, only voluntary contributions in DC plan	—	0.0714*	—
		(0.0519)	
Combination plan	0.0422**	0.0243	–0.0114
	(0.0252)	(0.0284)	(0.0109)
Peak value/earnings			
DB plan	–0.0086**	–0.0102**	0.0049
	(0.0038)	(0.0045)	(0.0056)
DB portion of combination plan, only voluntary contrib. in DC plan	—	–0.0323*	—
		(0.0166)	
DB portion of combination plan	–0.0253**	–0.0148	0.0177
	(0.0104)	(0.0258)	(0.0140)
(Peak value/earnings)^2			
DB plan	0.0007	0.0008*	–0.0011
	(0.0004)	(0.0004)	(0.0011)
DB portion of combination plan, only voluntary contrib. in DC plan	—	0.0045*	—
		(0.0027)	
DB portion of combination plan	0.0059**	–0.0004	–0.0059
	(0.0021)	(0.0090)	(0.0047)
At or older than peak value			
DB plan	0.0242**	0.0129	–0.0087
	(0.0124)	(0.0101)	(0.0068)

Combination plan, only voluntary contributions in DC plan	—	0.0142	—
		(0.0283)	
Combination plan	0.0110	0.0058	0.0139
	(0.0182)	(0.0374)	(0.0246)
At normal retirement date			
DB plan	0.0215**	0.0223*	0.0028
	(0.0119)	(0.0134)	(0.0116)
Combined plan, only voluntary contributions in DC plan	—	–0.0366**	—
		(0.0049)	
Combination plan	–0.0243*	–0.0086	—[a]
	(0.0071)	(0.0252)	
Pension wealth/earnings			
DB plan	0.00330**	0.00299**	–0.00030
	(0.00085)	(0.00111)	(0.00105)
DB (combination plan), only voluntary contribution in DC plan	—	0.00063	—
		(0.00393)	
DB (combination plan)	0.00042	0.00216	0.00242
	(0.00294)	(0.00474)	(0.00254)
DC plan	0.00217*	0.00077	–0.00054
	(0.00117)	(0.00357)	(0.00171)
DC (combination plan)	0.00143	0.00170	0.00021
	(0.00114)	(0.00479)	(0.00133)
DC, employer matches own contributions	–0.0030	0.0060	0.0087
	(0.0060)	(0.0078)	(0.0066)
Early-out incentive offered	0.0163*	0.0128	0.0117
	(0.0104)	(0.0117)	(0.0097)

Notes: Specifications are the same as in Table 4 except as follows. In 5.1, the discount rate used to compute DB pension wealth was set at 5 percent instead of 3 percent. In 5.2, DC pension wealth excludes an estimate of voluntary contributions, as described in the text; consequently, we chose to distinguish in the estimation between combination plans with a DC component that only has voluntary contributions and other combination plans. In 5.3, the sample excludes exits to full retirement and includes exits to another job. Additional covariates are the same as in Table 4; some are reported in Friedberg and Webb (2003).

a. Not included in this specification because it is collinear with other variables.

5.1 we use a discount rate of 5 instead of 3 percent in case people behave impatiently.[39] A high discount rate reduces the present value of future pension accruals and hence the age of peak value. Because retirement hazards are low at younger ages, this reduces the magnitude of the peak value coefficients and increases those of pension type and past-the-peak variables. Therefore, this approach reduces the explanatory power of the pension accrual variables.

Another concern is that voluntary DC contributions are endogenously determined with retirement. Since the HRS does not distinguish between voluntary and compulsory contributions, we overcorrected by subtracting all employee contributions from DC pension wealth when plan rules allow for voluntary contributions. In the resulting estimates in 5.2, DB variables continue to have a similar effect, whether or not someone has voluntary contributions in a DC plan. Thus, later retirement by workers with DC plans is not explained by endogenous voluntary contributions but rather, as we saw before, by the absence of DB pension accruals.

In this sample, 73 percent of exits result in retirement. In 5.3, the dependent variable is redefined as a job change, and retirements are excluded. The pension variables are insignificant for this sample, suggesting that a fuller understanding of job changes awaits an investigation of the new jobs taken by those who quit.

Lastly, retirement patterns differ somewhat for men and women in estimates that are not shown. The influence of peak value is similar by gender, but it is more statistically significant for women. Pension wealth tends to have smaller effects for women. Women react more strongly to the DB normal retirement date, which accounts for its significance in the earlier regressions. Simply having a DB or combined plan also leads women to retire earlier. Obviously, career paths of men and women clearly differ along many dimensions—only some of which are captured by differences in pension wealth—and warrant future investigation.

D. The Aggregate Impact of the Decline in DB Plans

Since DB pensions encourage people to work until a certain date and then retire, the shift toward DC pensions may lead to earlier or later average retirement. We undertake simulations for our sample, based on our preferred specification in 4.3, to understand the impact of pension structure on retirement.[40] We compare the simulation results to recent trends in retirement.

First, we would like to know the effect directly resulting from the nonlinear pattern of DB pension wealth accrual. We begin with the sample of workers who have DB plans only and predict their retirement hazards from 4.3 and again if we eliminate the effect of peak value (but keep other pension characteristics the same).[41] We find that, at age 55, 41 percent of the sample has a *higher* predicted hazard under the typical DC plan than under their DB plan; this share drops to 27 percent at age 60 and decline further as more DB pensions accruals turn negative. Thus, most DB plans are tilted

39. Samwick (2000) argued that observed patterns of aggregate saving and wealth are consistent with a relatively high discount rate.

40. Recall that the sample consists of people who are in pensioned full-time jobs at ages 51–61 and either stay in their pensioned jobs or retire fully.

41. We also eliminate the coefficients for being at or older than the peak and at the normal retirement date, since these are related to the same DB plan incentives.

toward early retirement; even in their fifties, only a minority of this sample retires later because of their DB plan.

Second, we do a simulation to predict the response in our sample to switching from DB to DC pensions, which reproduces recent trends. We compute retirement hazards for everyone with a DB plan after changing *all* pension characteristics to DC, with the idea that a switch in pension type involves a change in typical pension wealth and so on. Figure 2 compares predicted employment rates by age when the sample has their own DB pensions or instead typical DC characteristics.[42]

Forecasted employment rates in Figure 2 begin to diverge after age 55 as some DB plans reach their early or normal retirement dates, though retirement hazards remain low (less than 5 percent per year) for both pension types until around age 60. At that point, retirement under DB plans accelerates as many pass their peak value. The difference in retirement hazards by pension type exceeds five percentage points at ages 62 and up, resulting in substantially different employment rates. The median retirement age is 62 years, six months (62:6) for workers with DB plans, versus 64:3 if instead they have DC plans, a difference of 21 months. We obtained similar results for workers with combined plans. Retirement hazards predicted under their combined plans yield a median retirement age of 62:8, versus 63:9 if they only retain their DC plans.

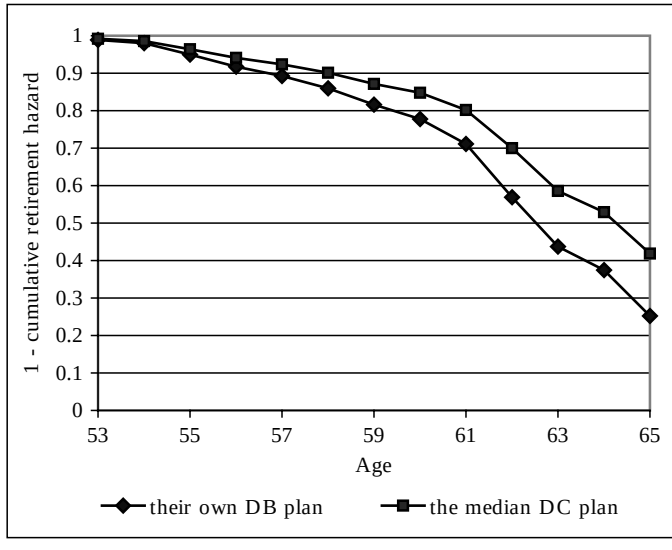

Figure 2
Predicted employment rate of workers if they have...

42. We use median DC pension wealth at age 53 and augment it with median pension wealth accrual at each age. Allowing other characteristics like pension wealth to differ has a very small effect on the hazards. Other righthand side variables are assigned their mean values.

Table 6
Predicted Changes in Retirement

	Change in Retirement Attributable to *Past* Change in Pension Structure			
	Workers Aged		Workers Aged	
	53–57 in 1983	53–57 in 1992	53–57 in 1983	53–57 in 1995
Data Source	SCF	HRS	SCF	SCF
Respondents	Employers	Employers	Employers	Workers
Actual pension structure				
% DB, combination	64.0	55.4	64.0	38.5
% DC only	12.0	13.6	12.0	32.4
% no pension	24.0	31.1	24.0	29.2
Predicted change in median retirement age				
Over the time period	1983–92		1983–95	
Among workers with a pension:	+1 months		+7 months	
Among all workers, if those with no pension behave like:				
Those with no pension today	+3 months		+7 months	
Those with a DC plan today	+2 months		+6 months	

	Change in Retirement Attributable to *Future* Change in Pension Structure			
	Workers Aged		Workers Aged	
	53–57 in 1983	53–57 in 1992	53–57 in 1983	53–57 in 1995
Data Source	SCF	HRS	SCF	SCF
Respondents	Employers	Employers	Employers	Workers
Actual pension structure				
% DB, combination	55.4	22.7	38.5	22.7
% DC only	13.6	35.0	32.4	35.0
% no pension	31.1	42.3	29.2	42.3
Predicted change in median retirement age				
Over the time period	1992–2015		1995–2015	
Among workers with a pension:	+9 months		+3 months	
Among all workers, if those with no pension behave like:				
Those with no pension today	+10 months		+6 months	
Those with a DC plan today	+8 months		+4 months	

Notes: Predictions based on results from Specification 4.3 and on the decline in DB pension coverage reported in the upper half of each panel. See text for details.

Third, we use the results from the previous simulation to analyze the impact on aggregate retirement patterns of the shift from DB to DC pensions. The difficulty here is in quantifying its extent, since we lack a consistent data source on the shift in pension structure by age, and we must make assumptions about pensions of current workers as they age. We will rely on information from a few sources. The best source on older workers early on is the 1983 Survey of Consumer Finances (SCF) Pension Provider Supplement, and on younger workers recently is individual-reported data from the 1995 SCF.[43] These data sets give us endpoints for trends in pension coverage, starting with workers who were aged 53–57 in 1983 and finishing with workers who were aged 33–37 in 1995 and will be 53–57 in 2015.[44] We determine pension coverage of workers aged 53–57 at an intermediate date by using both employer-reported data from the 1992 HRS and individual-reported data from the 1995 SCF. Using the former yields a small past decline in DB pension coverage and a large future decline, while using the latter yields a larger past decline and smaller future decline.

The predictions are shown in Table 6. We assume no further change in DB coverage as workers aged 33–37 in 1995 get older, nor any change in typical DB provisions.[45] Between the endpoints of 1983 and 2015, our data sources imply a 41.3 percentage point decline in DB pension coverage among workers aged 53–57, from 64.0 to 22.7 percent, and a 44.9 point decline among pensioned workers. This implies a ten-month increase in the median retirement age of pensioned workers aged 53–57 over the full period; or equivalently, an increase in their predicted employment rate from 59 to 65 percent at age 62 and from 31 to 45 percent at age 65. Based first on intermediate data from the 1992 HRS, the ten-month increase consists of gains of one month between 1983 and 1992 and nine months between 1992 and 2015. Based instead on the 1995 SCF, it consists of gains of seven months between 1983 and 1995 and three months between 1995 and 2015. These forecasts follow directly from the simulation results above—if having a DB plan reduces the median retirement age by about 21 months, and if DB coverage fell by 20 percentage points, it suggests an increase in the median retirement age of about 4½ months.

In order to make projections covering workers without DB pensions as well, we have to recognize that, as DB pension coverage dropped, some workers gained DC pensions and others did not.[46] We report predictions under two assumptions about retirement behavior of those with no pension. One is that they will behave like workers with no pension in the 1992 HRS, who retired later on average than workers with DB or DC plans; this assumption yields a jump of 13 months in the median retirement

43. The SCF has surveyed a cross-section of households every three years since 1983. In 1983 the SCF collected pension data from employers. There is no more recent source of employer-reported data for young workers.

44. The selected age groups help illustrate long-term trends, since those aged 53–57 are representative of older workers but have not yet retired in large numbers and those aged 33–37 are representative of younger workers but have settled into relatively long-term jobs.

45. Again, these are predictions for employees in full-time jobs at ages 51–61. Mitchell (1999) reported only minor changes in DB plan characteristics during the 1990s.

46. Pension coverage in 1995 was lower for workers aged 33–37 than 53–57. This reflects both age effects, since there was an age differential in coverage in 1983, though it was smaller; and time effects, since coverage of older workers fell between 1983 and 1995, though by less.

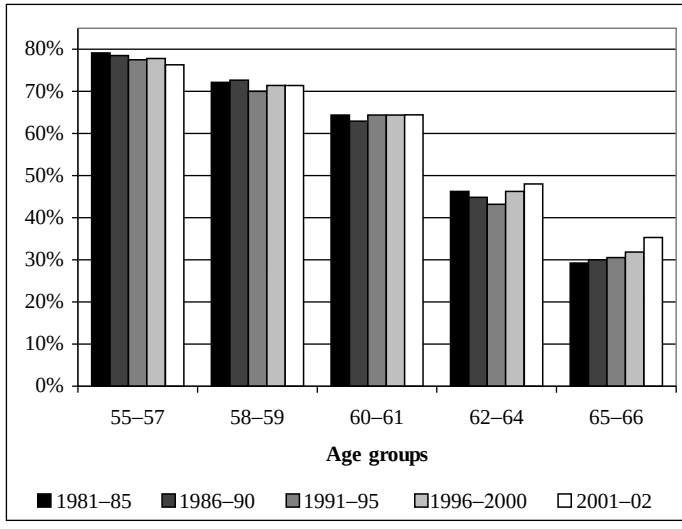

Figure 3
Employment rate, men

age of all workers aged 53–57 between 1983 and 2015, consisting of three (seven) months early on and ten (six) months later, based on the 1992 HRS (1995 SCF). It corresponds to a rise in the predicted employment rate from 61 to 67 percent at age 62 and from 37 to 50 percent at age 65. Another assumption is that the increased number with no pension will behave like workers with DC plans or will get a DC plan as they age; this yields a jump in the median retirement age of all workers aged 53–57 of roughly nine months, consisting of two (six) months early on and eight (four) months later. This corresponds to a rise in predicted employment from 64 to 71 percent at age 62 and from 38 to 52 percent at age 65.

We cannot directly test how our simulated retirement rates match data from other sources, which do not distinguish retirement patterns for the sample in full-time jobs at ages 51–61. Nevertheless, we can observe trends in overall employment rates, shown in Figure 3 for older men in the Current Population Survey.[47] We expect increased employment rates at ages when DB plans typically used to induce retirement; average DB accruals turned negative by age 63 in our HRS sample. This shows up in Figure 3, with the employment rate at ages 62–64 rising from 44.7 percent in the late 1980s and 43.2 in the early 1990s to 46.2 in the late 1990s and 48.1 in the early 2000s. Increases of a similar magnitude, from 29.6 percent in the late 1980s to 35.3 percent in the early 2000s, occurred at ages 65–66. We can contrast those increases with slight declines in employment among men in their late fifties.

47. We focus on men because of confounding secular increases in labor supply of women. Statistics are computed using basic monthly weights from March CPSs. Using adjustment factors that account for the 1994 redesign yields almost the same results (Povlika and Miller 1998).

In sum, major changes in pension structure can be expected to raise the median retirement age of pensioned workers by ten months, and the median retirement age of all workers by 9–13 months, when comparing the cohorts aged 53–57 in 1983 and in 2015. This response can help explain recent increases in employment rates among people in their 60s.

V. Conclusions

While an extensive literature has analyzed the savings effects of 401(k) plans, we focus on retirement. We find substantial changes in retirement patterns resulting from the spread of 401(k) and other defined contribution plans in place of defined benefit plans. Our estimates show that the pattern of pension wealth accruals has a significant effect on retirement, so we attribute these changes to the shift away from the spikes and dips in pension wealth accrual that occur in traditional DB plans and toward smooth accruals in DC plans. While endogenous selection into jobs remains a concern, we find that older workers with different types of pensions are quite similar in their observable characteristics and that controlling for variables that may relate to selection does not alter the estimation results.

However, the estimates do not by themselves reveal whether DB plans constrain workers to retire later or earlier on average than they would otherwise. We answer this question through simulations based on our estimates, which show that workers with DC plans retire substantially later. Retirement patterns begin to diverge at around age 55 and accelerate around age 60, when most workers with DB plans begin to experience negative accruals. Workers with DB plans retire almost two years earlier, on average, compared to workers with DC plans and holding other characteristics constant. Thus, we conclude that the shift in pension structure helps explain why employment rates of older Americans have recently risen after decades of decline.

This study sets the stage for researchers to analyze further effects of the shift in pension structure on retirement and saving. Additional changes can be expected as a consequence of other important differences between DB and DC pensions in annuitization and in the allocation of investment risk.

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