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Labor Market Effects of Pensions and Implications for Teachers

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Labor Market Effects of Pensions and Implications for Teachers

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ABSTRACT

While the pension plan landscape has changed remarkably over the last two decades, with most private-sector workers seeing a shift from defined benefit (DB) to defined contribution (DC) plans, DB pension plans remain the overwhelming norm for K-12 teachers employed by state and local governments. With DB plans, teachers typically receive minimal pension benefits if they leave their jobs before their fifties, then large gains for staying a few more years, after which their pension wealth begins to drain away if they do not retire. The resulting jumps and dips in the path of teacher pension wealth accrual have major implications for the staffing of schools, potentially affecting both retirement behavior, the mobility of mid-career teachers, and the characteristics of remaining teachers. Beyond describing the aging of the teacher labor force and the parameters of teacher pensions, this paper outlines lessons from the labor economics literature about the likely implications for teacher labor markets.

LABOR MARKET EFFECTS OF PENSIONS AND IMPLICATIONS FOR TEACHERS

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1. Introduction

The retirement security landscape has changed drastically for most workers over the last twenty years – but much less so for teachers and other public sector employees. Many private-sector employers have stopped offering traditional retirement plans, especially for new employees, replacing them with contributory accounts like 401(k) plans. Figure 1 from Friedberg and Owyang (2005) highlights the trends in pension coverage among all full-time employees. While overall pension coverage declined somewhat, the greater shift was in the type of plan.[2] Among full-time employees with a retirement plan, 69% had a traditional pension (called a defined benefit, or DB, plan) and 45% had a contributory defined contribution (DC) plan in 1983 (with some workers having both types). In 2001, only 39% had a DB plan, and a full 80% had a DC plan.

Traditional defined benefit pension plans, nevertheless, remain the overwhelming norm for K-12 teachers employed by state and local governments.[3] The incentives for teachers in many DB plans to stay in their jobs shift dramatically over the course of their careers. For example, many teachers receive minimal pension benefits if they leave their jobs before their fifties, then large gains for staying a few more years, after which their pension wealth begins to drain away if they do not retire.

Teacher pensions have drawn increasing attention of late for at least three reasons. First, recent media attention has focused on underfunding and murky accounting standards in public sector pensions.[4] The Employee Retirement Income Security Act of 1974 (ERISA), which governs funding standards for private sector pensions, does not apply to public plans. New Governmental Accounting Standards Board standards require pension liabilities to be reported publicly – though not funded. Among the 99 largest teacher retirement systems in the country, 34 have funding ratios at 90% or above, but 39 have funding in the range of 70 to 90%, and 17 have funding ratios below

[1] We would like to thank Robert Costrell and Michael Podgursky for helpful suggestions, Stephanie Demperio for valuable research assistance, and TIAA-CREF for funding.
[2] The statistics in Figure 1 are computed using data from the nationally representative Survey of Consumer Finances. Among the full-time employees in the Figure, 67% had some type of retirement plan in 1983, dropping to 59% in 2001
[3] Among workers with pension coverage, DB plans covered 98% of all public sector employees and 88% of private sector employees in 1975, compared to 92% and 33% in 2005, respectively (Munnell et al 2007).
[4] "Growing Deficits Threaten Pensions," David Cho, *The Washington Post*, May 11, 2008; "Once Safe, Public Pensions Are Now Facing Cuts," Mary Williams Walsh, *The New York Times*, November 6, 2006; "Public Pension Plans Face Billions in Shortages," Mary Williams Walsh, *The New York Times*, August 8, 2006.

70% (NEA 2006).[5] More broadly, the percentage of all state and local pensions with funding ratios below 80% rose from 10.6% in 2001 to 41.5% in 2006 (U.S. Government Accountability Office).

Second, the structure of teacher pensions has major implications for the staffing of schools, as expected retirement behavior governs personnel budgets and hiring requirements. More importantly, understanding how the strong retirement incentives arising from DB pensions influence teachers with different skills in the classroom has important consequences for student learning. Despite considerable recent research on how pecuniary incentives affect the recruitment and early-career retention of high-quality teachers (Podgursky, Monroe and Watson 2004, Stinebrickner 2001), there has been little examination of how the structure of pension plans affects early retirement among the most well-qualified and productive teachers.[6] Moreover, vesting requirements associated with DB plans and limited transferability across districts, as well as between public and private teaching positions, may impede mobility in the teacher labor market.

Third, the attention to both solvency and incentive problems, along with the shift in private pensions, has increased pressure to switch teachers from DB to DC plans. While several states have added on a DC plan, and a handful have shifted all new employees into DC plans, these changes have occurred more often in response to political rather than economic motives (Munnell et al 2008). Understanding the extent to which existing DB plans with "peaks" and "cliffs" in pension wealth distort labor supply and affect the nature of teacher selection into retirement affects the conversation on pension reform and redesign for the teacher labor market.

As a starting point, we provide a brief overview of the current age-structure of the teacher labor market in Section 2. This highlights the centrality of pension policies in governing retirement decisions and replacement demand in the coming decade. The impact of pension plans on teacher behavior and well-being has received very little attention in the economics literature. In order to understand the possible effects of pensions on teachers, Sections 3 and 4 of this paper highlight key features of DB plans and what we know about their general effects on workers. Most notably, traditional DB plans give workers a fixed income after retirement, but many plans pay off fully only if workers stay with the same employer for twenty or thirty years; if a worker leaves early, she may end up with little or nothing. In contrast, 401(k) and thrift plans are portable: the money accumulated in the account belongs to workers when they leave their jobs, perhaps after a vesting period of a few years, but the risk of retirement wealth "leakage" is greater, as some workers drain off funds following job changes or borrowing against plan balances.

Thus, DB plans induce a strong, nonlinear relationship between years of tenure and benefit accrual rates – one that is often referred to along the lines of "peaks, cliffs, and valleys" (Podgursky and Costrell 2007, 2008). Section 3 describes this relationship carefully and Section 4 reviews lessons from the labor economics literature about the resulting effects of this difference on workers and labor markets. Most of the evidence focuses on mobility, as workers with DB plans may stay in a particular job longer while young in order to reach peak pension accrual years and then retire abruptly once benefits peak and, in many plans, start to decline. Workers appear to respond

[5] These funding standards are computed according to GASB criteria, which allow for a range of assumptions about key parameters; the actual assumptions applied in particular plans are chosen by administrators, directors, or state officials.

[6] Costrell and Podgursky's (2007) survey on teacher retirement notes only one published econometric study on teacher pensions and turnover (Ferguson et al 2006).

strongly along these lines, especially in the timing of retirement, and the shift to DC plans with flat accrual rates appears to play a role in explaining recent delays in retirement.

Section 5 poses questions about the possible impact of DB plans that are largely or wholly unaddressed in the literature. Perhaps the most relevant in relation to teachers asks what types of workers respond most readily to pension incentives? Economic theory predicts that teachers who respond most to the retirement timing incentives are likely to consist of two disparate groups – those who value leisure highly and those who have the most productive outside opportunities. While these characteristics are difficult to observe in most data sets, they may be observed somewhat more readily for teachers. Additionally, the literature has yet to examine the effects of other features that differ between DB and DC plans. Of particular importance at the moment is the distinction that DB plans allocate the risk of managing pension fund accumulation and decumulation on employers, while DC plans allocate the risk to employees. We finish with a summary of theoretical explanations that have been offered for the structure of DB pensions as a personnel management tool, though these explanations fall short in explaining the rise in DC pensions.

In Section 6, we conclude by suggesting some directions for future research. We emphasize areas of intersection between broader concerns that the pension literature has failed to address definitively and the specifics of teacher labor markets that can shed new light on those issues.

2. Retirement and Demographics of Teacher Labor Markets

The teaching labor force has aged considerably over the course of the last four decades, as shown in Figure 2. In 1970, the age distribution of teachers was substantially younger than that observed in 2000. The interquartile range of teachers ages spanned the ages 23-48 in 1970, relative to ages 34-51 in 2000. The large cohort of teachers hired in the late 1960s and early 1970s are now approaching retirement decisions.

Yet, there is considerable variation across states in the age distribution of teachers in the labor market. Table 1 provides information on the distribution by age at the state level. States that with greater growth in population and hence student demand in recent decades have hired more new teachers and, in turn, have a smaller fraction of teachers in their fifties. For example, consider the change in pupils between 1990 and 2000 in relation to the share of teachers under the age of 30.[7] Nevada experienced 40% growth in the student population between 1990-2000 and, 20% of its teachers in 2000 were younger than 40. At the other extreme, in states with contractions in student demand such as West Virginia and Maine, the share of teachers younger than age 30 is less than 10%.

Broadly, the age distribution of teachers in any location reflects the combination of replacement demand and net new demand, where net new demand will depend on both local demographics and policy decisions such as class-size reduction. Meanwhile, replacement demand is a function of exits, both among those relatively early in their careers and among teachers who retire, and retirements reflect the demographic stock of the teaching labor force combined with the incentives

[7] Data on student demand are from *Digest of Education Statistics* (2007), "Table 33. Enrollment in public elementary and secondary schools, by state or jurisdiction: Selected years, fall 1990 through fall 2007."

created by the structure of teachers' pensions. To foreshadow the analysis that follows, the retirement of teachers would be expected follow a relatively smooth age trajectory if not for the changes in pension wealth tied to age and experience. Empirically, specific incentives in pension structures correspond to large discontinuities in the age distribution of teachers in particular states. As Figure 3 suggests for selected states, accrual policies are very likely to be correlated with retirement behavior. Most notably, the unmistakable exit of teachers from the labor force between ages 53 and 54 maps directly to policies that allow for full benefits after 30 years of service. In the subsequent sections, we outline the structure of these incentives and then consider empirical evidence about their impact on behavior.

3. The Structure of Defined Benefit Pensions

We begin this section by describing how DB pensions are typically structured, while including some examples from teacher pension plans. We focus first on the accumulation and payout phase of DB pensions, and then we compare them to DC pensions. Much of this material is based on Friedberg and Owyang (2002). While the basic structure of teacher pensions is not atypical of the plans that private-sector employers used to offer commonly, it is also common in both cases that specific parameters vary idiosyncratically and sometimes substantially from plan to plan.

3.1 How DB benefits are determined. DB pensions typically pay retired workers an annuity – that is, an income flow until death.[8] We can represent the claim to annual benefit b_t, b_{t+1}, b_{t+2}, …, paid out until the retiree dies at some unknown future date $\tilde{T}$, in terms of an asset held today. To do so, we define pension wealth B_t as the real expected present value of the worker's future pension benefits if the worker retires in year t:

$$B_t^{DB} = E\left[\sum_{j=0}^{\tilde{T}} \frac{b_j}{(1+\tilde{r})^j}\right] \approx b_t + \frac{\pi_{t+1} b_{t+1}}{1+r} + \frac{\pi_{t+2} b_{t+2}}{(1+r)^2} + \ldots = \sum_{j=0}^{\bar{T}} \frac{\pi_j b_j}{(1+r)^j} \cdot$$

The future values of b_t are discounted actuarially by the probability π_t, $0<\pi<1$, that one survives until each future age t and thus receives a payment. They are also discounted by the interest rate $\tilde{r}$, representing the opportunity cost of receiving, say, b_{t+1} a year after retirement instead of immediately at t.[9] In some plans, benefits are adjusted automatically for inflation, while in many teacher plans, these adjustments are considered on an ad hoc basis each year; if inflation adjustments are not automatic, then this adds another element of uncertainty to the formula above.

Thus, pension wealth represents the value of leaving one's job today and claiming the resulting pension benefits. In order to decide whether to retire this year or to delay, one needs to consider the value of waiting to claim benefits. We do so by computing pension wealth accrual as the difference between B_t and the discounted value of waiting one more year and then retiring, $\frac{1}{1+r} B_{t+1} - B_t$, where

[8] Some private sector DB plans now offer the option of cashing out at retirement via a lump-sum distribution that is actuarially equivalent to the annuity promised value of payouts.

[9] In the expression for the expected value of future benefit payments, uncertainty over the date of death T is dealt with through the π terms, which can be taken from life tables or based on an individual's own life expectancy up until death occurs with certainty at some great age $\bar{T}$. One generally assumes a fixed interest rate r.

the discounting again stems from the fact that receiving a dollar today is more valuable than receiving a dollar next year.

To understand how pension wealth evolves in typical plans as job tenure rises, Figure 4-A shows pension wealth B_t in typical DB and DC plans observed in the Health and Retirement Study and highlighted in Friedberg and Webb (2005).[10] Figure 4-B, in turn, shows pension wealth accrual in the same plans.

As people work longer in a job offering a DB pension, DB pension wealth rises, but in a starkly nonlinear fashion, with occasional jumps upward and, in many cases, a late drop-off – generating the "cliffs" and "valleys" alluded to earlier. There are often 2-3 crucial dates when the path of DB pension accrual spikes upward, with the plan in Figure 4-B exhibiting two spikes and then a decline in pension wealth.

The first cliff occurs at the vesting date, when a worker first qualifies for future benefits. This is limited by law to a maximum of ten years of tenure and is five years in many plans. The plan in Figure 4-A vests after a worker spends ten years on the job, after which she begins to accrue a claim to future benefits, though she does not yet qualify for an immediate benefit upon leaving the job. At that point, pension wealth in 4-A leaves the horizontal axis and jumps up to a value of almost $60,000. For teachers, there is considerable variation in the vesting period. Loeb and Miller (2006, Table 30) tabulate a modal vesting period of five years, although a few states (Indiana, Ohio, Oregon, West Virginia and Wisconsin) vest immediately while thirteen states have vesting windows of ten years.

The other spike in Figure 4-B occurs when someone reaches full years of service at the plan's "normal retirement age" (NRA) – in Virginia, the NRA is either age 65 with 5 year of service or age 50 with 30 years of service, whichever is reached sooner. If a worker retires at the NRA, then her DB plan will start to pay out benefits immediately. The initial full benefit is typically a proportion of the worker's recent salary, with the proportion increasing in tenure. Thus, the annual benefit is typically defined by a formula like

$$b_t^{NRA} = \text{years of service} * \text{final average salary} = \alpha_t \bar{Y}_t$$

$$\alpha_t = \alpha(t-\theta), \quad \bar{Y} = \frac{\sum_{s=t-\tau}^{t} y_s}{t-\tau} .$$

Here, the benefit b_t is proportional to the "final average salary" $\bar{Y}_t$, average earnings in the τ years before retirement, where τ generally ranges between 1 and 5 years (NEA 2006). The proportional factor α_t that multiplies final average salary usually rises with "service credits," measured as each year of service since the starting year θ in the job. The Virginia Retirement System, for example, pays 1.7% multiplied by each year of service multiplied by the average salary over the three highest consecutive years.

[10] These pension plans are based on information in the Health and Retirement Study (HRS) and have been slightly altered, as described in Friedberg and Webb (2000), to protect confidentiality. The HRS is a nationally representative study of households with at least one member aged 50-62 in 1992. The HRS obtained detailed information about pension plans directly from employers of survey respondents.

Retiring at the NRA generally yields peak pension wealth compared to retiring earlier or later. Retiring before the NRA reduces pension wealth for a few reasons. Some plans have an "early retirement age" (ERA); upon reaching that age, one can immediately receive benefits, but they will be reduced from the value in the formula above. Plans with an ERA exhibit a middle spike between vesting and the NRA. In Virginia, retiring at the ERA of age 55 with 5 years of service reduces annual benefits for the first five years by 6% and for the next five years by 4.8%. Whether or not a plan offers early retirement, retiring before the NRA erodes pension wealth because fewer service credits are accumulated (so α_t is smaller) and because final average salary is not adjusted for inflationary gains after retirement and before benefits begin (so $\overline{Y}_t$ is smaller, whereas staying in the job would yield those gains). These factors account for the gradual increase in pension wealth after the vesting date.

Lastly, retiring after the NRA reduces the number of years that full benefits are received and hence reduces the present value of benefits at retirement. In other words, one gives up current pension benefits income without replacing them later on, as benefits cease upon death. Further, many plans halt the accumulation of service credits after the NRA, so α_t no longer grows. These factors account for the "valley" after the NRA.

3.2 How DC benefits are determined. At this point, we contrast the features of pension wealth accrual in DB plans versus DC plans like 401(k) accounts. As is apparent from Figure 4, DC plans are simple: an annual contribution is made to a retirement account and that account belongs to the worker whenever she leaves her job, possibly after a 1-5 year vesting period.[11] While access to those funds are limited before age 59 ½, the funds grow at the rate of return $\tilde{r}$ nonetheless. Assuming the same rate of return as above, then DC pension wealth after vesting is simply

$$B_t^{DC} = B_{t-1}^{DC}(1 + r_t) + c_t^{DC},$$

where c_t is this period's contribution.[12] The smooth path of DC pension wealth accrual shown in Figure 4 stands in stark contrast to the path of DB accrual.

4. The Impact of Pensions on Worker Mobility and Retirement

The "peaks and valleys" generated by the features of DB plans may influence worker mobility in distinct ways over the course of one's career. Workers have an incentive to stay in their jobs until reaching the late-tenure peaks. The present value of those peaks is relatively small early in a career, however, attenuating the incentive to stay. Still, the present value grows with years of service, as do the year-to-year gains in pension wealth arising from the accumulation of service credits and higher average earnings. Thus, mobility should be increasingly inhibited as tenure rises. Later, the incentives abruptly reverse inducing retirement after the last peak is reached and continued tenure tends to erode pension wealth.

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[11] 30-35% of DC plans vest immediately and another 20% vest in two years or less, while most DB pensions take five years to vest, according to Mitchell (1999).

[12] Contributions are tax-deductible (as are a firm's contributions to fund a DB pension), and returns accumulate tax-free. Withdrawals from DC pensions, like DB pension benefits, are taxable. Thus, the tax treatment of DB and DC plans is equivalent.

As there is little direct analysis of teacher responses to these mobility incentives, this section reviews evidence from the labor economics literature about general responses of workers. The timing of retirement appears to respond strongly to the timing of DB pension wealth peaks, while evidence about earlier reductions in mobility in advance of the peaks is suggestive but not definitive. It is not surprising to find, then, that the recent spread of DC plans with flat accrual rates appears to be generating delays in retirement.

In a later section, we will discuss important issues of selection into retirement that are largely unaddressed in the literature: what types of workers respond to these mobility incentives, possible motives for employers to design pension plans in this way, and the implications for labor markets of other important differences between DB and DC plans.

4.1 Evidence about employer-specific DB pension plans and retirement

Early evidence about the impact of DB plans on retirement came from case studies of employer plans, based on the only type of data available at the time. The spikes and dips highlighted in Figure 4 were if anything more extreme in many of these plans.[13] Such plans were carefully described in a series of papers by Kotlikoff and Wise (1985, 1987, 1989), Stock and Wise (1990a, 1990b), and Lumsdaine, Stock and Wise (1992).[14] Those papers emphasized that DB pension incentives are often substantially sharper than similar incentives arising through Social Security, which had previously received most of the research attention.

Stock and Wise (1990a) developed the most sophisticated econometric analysis to date in the pension literature to estimate the impact of the DB pension incentives. The central feature of their analysis was the "Option Value" of continued work. In contrast, previous pension research had focused on annual accrual rates in DB pensions, although it is clear that annual accruals do not capture the fact that early retirement eliminates the option to gain later spikes like those in Figure 4-B. The Option Value approach captures the effect that deciding not to retire today has on the full future path of pension accruals.

To understand the importance of the option to continue work, Stock and Wise did not rely on simple financial accounting, but rather parameterized a utility function to weigh the dynamic tradeoff between leisure and consumption that is implicit in the retirement decision.[15] Thus, a person who retires today raises his or her current and future leisure but may surrender the option to gain future pension peaks that augment consumption later on. This highly structural approach trades off, as usual, the wide applicability of the resulting estimates to many different situations against the reliance on strong assumptions that underlie the structure.

Stock and Wise estimated their retirement model using longitudinal personnel records for 1,500 salesman in a large Fortune 500 firm and controlling for the Option Value of continued work. The salesman were aged 50 and over as of January 1, 1980, so the results may be somewhat dated. Their estimates show that most workers in their sample retire before age 62, when Social Security

[13] The Employee Retirement Income Security Act of 1974 (ERISA) limits some of these provisions, like setting a maximum on vesting periods. ERISA does not apply to public sector plans, however.

[14] Perhaps the first paper pointing out the link between pensions and retirement was Burkhauser (1979), but early work was hampered by a lack of precise data documenting the worker-specific timing of pension wealth peaks.

[15] Their formulation of the retirement problem did not reach the complexity observed in the retirement literature that had focused on Social Security, but the latter papers lacked detailed information about employer pensions.

benefits first become available – suggesting that pension rather than Social Security incentives drive retirement, especially due to the plan's early retirement age (ERA) of 55. Simulating an ERA of 60 instead of 55 results in a predicted drop in the percentage of workers leaving the firm before age 60 from 65% to 42%. In fact, the percentage leaving between ages 50 and 54 rises, as the pension wealth spike at the ERA grows more distant at those ages, but the percentage leaving between ages 55 and 59 drops substantially, from 46% to 14%, with almost no one leaving at age 59.

These results brought new prominence to the issue of employer pensions. However, the estimates are limited in two ways. First, by using personnel records, Stock and Wise had very accurate pension and earnings data but no other information, for example about Social Security wealth, other assets, or health status. Second, by using data from a single firm, their results may not generalize to the whole population. A related concern that is more difficult to deal with is that the sample of workers at the firm they examine may be selected – they may choose to work at a firm like this because they value retirement security as opposed to a higher salary upfront. This concern is sometimes dismissed by arguing that workers are unlikely to sort based on very specific pension parameters that vary idiosyncratically across firms. Yet, it is difficult to put this argument to any convincing empirical test.[16]

4.2 Evidence from nationally representative surveys about retirement

Subsequent papers made advances on the concerns raised in the earlier work by using data from large, broadly representative surveys. The difficulty in using such surveys, which are the workhorse of retirement research, has been their lack of careful information on pension plan structure – a key ingredient for measuring incentives like those that appear in Figure 4. Early data sets recorded, at best, whether an individual had an employer pension. Later data sets began to ask individuals about the parameters of their plans, but Gustman and Steinmeier (1999) noted that individuals make serious mistakes in reporting this information, including reporting whether their employer-provided plan is DB or DC.

The solution has come from efforts by some surveys to contact each participant's employer directly, obtaining pension details via the Summary Plan Description that employers are legally required to provide to the U.S. Department of Labor and to plan participants. Such data are still limited because a significant minority of survey participants do not give permission for survey officials to contact their employers or do not provide information that allows a match of individuals to their pension documents. A similar problem would not arise in an analysis of teachers, as state and local pension information is available publicly. Nevertheless, using pension data of this type, involving individual plan descriptions for up to several thousand respondents, is a laborious process, although the recent Health and Retirement Study centralized this effort, providing a pension calculator for each respondent.

Two data sets used for retirement research, the Survey of Consumer Finances (SCF) and especially the Health and Retirement Study (HRS), offer pension information collected directly from

[16] Friedberg and Webb (2005) found that typical pension wealth differs systematically for workers in the HRS with DB versus DC plans, yet other wealth does not. While the difference in pension wealth may be suggestive that heterogeneous workers sort into different types of plans, possibly on the basis of their retirement preferences, the similarity in other wealth is not consistent with the same possibility. Meanwhile, along other observable dimensions, including earnings, demographics, and education level, workers with different pension types are generally similar.

employers. Samwick (1998) used the SCF, which obtained pension data for respondents in 1983. The SCF also had a short panel that re-surveyed respondents in 1986, making it possibility to observe some retirements.[17] Using the SCF allowed Samwick to compare the importance of Social Security and DB pensions in influencing early retirement trends.

Samwick used the Option Value measure developed by Stock and Wise to estimate the retirement impact of pension wealth accruals, as measured by the utility received from the option to gain later accruals relative to retiring today.[18] He found that the level of pension wealth does not significantly affect retirement, while the path of accruals strongly does. This result has been confirmed in later papers, discussed next. Samwick also confirmed that the Option Value measure, capturing the path of future pension accruals, does a superior job in explaining retirement as compared to the one-year pension wealth accrual measure, in this case for a large sample of workers instead of workers from a single firm. His estimates suggest that extending DB pension coverage, using a representative plan, to all workers in the SCF would lead to a 4.9% increase in the probability of retirement between ages 50-70. As this corresponds to roughly the increase in DB coverage observed in the postwar period, it suggests further that DB pensions account for over ¼ of the total decline in the average retirement age. In contrast, Samwick's estimates indicate that altering Social Security incentives would have smaller effects on retirement

Coile and Gruber (2007) and Friedberg and Webb (2005) used data from the Health and Retirement Study (HRS), the most up-to-date and comprehensive data set that follows workers into retirement.[19] Each emphasized distinct aspects of the relationship between retirement and the accrual of retirement wealth.

The innovation in Coile and Gruber was to move away from the complicated utility-based Option Value measure from Stock and Wise, in favor of a simpler measure of retirement incentives that they termed "Peak Value". The Peak Value measure of Coile and Gruber is similar to the annual pension wealth accrual measure introduced earlier. But, instead of subtracting this year's pension wealth upon retirement from the discounted value of next year's pension wealth, it is subtracted from the discounted value of peak pension wealth, corresponding to a spike like the one occurring at a plan's Normal Retirement Age, as marked in Figure 4-B. Thus, the Peak Value of pension wealth is defined as

$$PV = \frac{1}{(1+r)^m} B_{t+m} - B_t \quad \text{if } m > 0$$

where m represents the number of years from today until the peak in pension wealth is reached. If a person has reached or passed their peak, then Coile and Gruber define Peak Value as simply the annual pension wealth accrual, as calculated earlier.

The attraction of Peak Value is that, first, it abstracts from numerous functional form assumptions that Stock and Wise imposed on the utility function and, second, it avoids directly incorporating earnings into the same measure as pension accruals, which Option Value does. Coile and Gruber

[17] Both of the components that facilitated Samwick's research – pension information from employers and the panel aspect of the SCF – were subsequently discontinued.

[18] The version in Samwick assumes rather than estimates values for the discount rate and relative value of leisure due to identification problems.

[19] While Coile and Gruber was published after Friedberg and Webb, it was begun a little earlier.

control separately for earnings and job tenure, so these possibly endogenous variables only influence pension wealth through the idiosyncrasies of the pension formula and do not generate spurious correlation between controls for pension accrual and retirement outcomes.

Coile and Gruber focused primarily on using Peak Value to measure Social Security incentives, though in some specifications they controlled for employer pension accruals as well. In their probit estimates, controlling for either the Peak Value or Option Value measures of Social Security wealth accrual yield statistically significant estimates. The estimation with Option Value raises the log likelihood, but not by a great deal; Coile and Gruber argued that this may occur because earnings do in fact add explanatory power, though it may be spurious, in the model. They estimated that Social Security and employer pension accruals have similar effects on retirement. Specifically, a one standard-deviation increase in someone's Peak Value from either Social Security or their employer pension raises their likelihood of retirement by one percentage point, or 14% of the baseline retirement hazard.

Friedberg and Webb (2005) built on the work by Samwick in focusing on DB pension incentives in a large data set and extended it by exploring the impact on retirement of the major shift from DB to DC plans that began in the early 1980s. They built on the work by Coile and Gruber in using the HRS and applying the Peak Value measure of pension wealth and extended it by clarifying the definition of Peak Value and by exploring the possible impact of numerous institutional features of pension plans. Friedberg and Webb only defined Peak Value for DB plans, as DC pensions never reach a peak as long as DC plan contributions remain constant and as long as the individual time discount rate does not exceed the interest rate. As long as these conservative assumptions hold, then simply controlling for DC pension wealth incorporates the full information about the path of DC pension wealth accruals. They also defined Peak Value as zero after the peak is passed, adding a separate dummy variable indicating that the peak has past, and explored the sensitivity of the empirical specification to additional related pension controls.[20]

The estimates in Friedberg and Webb indicate that having the mean Peak Value for stand-alone DB plans, rather than a Peak Value of zero (which happens upon reaching the peak or if one has a DC plan) reduces the annual retirement hazard by 1.7 percentage points at ages 55-59, a 29% reduction compared to the observed hazard. They used the estimates to simulate the effect of the observed shift in pension structure from DB to DC plans, which has affected some older workers in the HRS but is increasingly affecting younger workers. The results 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.

[20] They normalized Peak Value by annual earnings while controlling separately for earnings and explored whether the ERA or NRA matter independently of Peak Value (the NRA does), whether a separate control for years to reach the peak matters independently of Peak Value (it does not), whether a control for being offered a temporary early retirement "window" plan matters (it does a little), and whether passing age 59 ½, when DC withdrawals become penalty-free upon retirement, influences the retirement age (it does not). They also allowed for separate effects of DB Peak Value depending on whether someone has a stand-alone DB plan or a DC plan too and found that the estimated effects of DB incentives in either situation are quite similar; this is another piece of evidence against endogenous sorting of heterogeneous workers based on their ex ante preferences for DB or DC plans.

4.3 Teacher pension plans and retirement

For teachers, it is possible to compute pension wealth accruals – the change in pension wealth B_t for each additional year of work – that are analogous to those used by Friedberg and Webb for HRS respondents. Much of the necessary data is available from the National Education Association, which issues biannual reports tabulating pension plan parameters in the 100 or so largest teacher pension plans. In future work, we plan to adapt the empirical approach of Friedberg and Webb (2005) to study teachers. Using the *Teacher Follow-Up Survey* component of the *Schools and Staffing Survey*, which has been undertaken in multiple years, we will estimate a probit model of job exit among those working as teachers.

The key independent variables will be the DB Peak Value, along with pension wealth and a dummy variable for the presence of a DC plan. At the same time, we will control for a variety of other influences on retirement, including earnings, imputed Social Security wealth, on-the-job and post-retirement health insurance coverage; demographic characteristics, including age, marital status, race, and ethnicity; and characteristics of the school system, like size, urban location, and unionization. This analysis will shed light on the magnitude of teacher responses to retirement incentives.

4.3 Evidence about worker mobility at younger ages

Some important questions remain unanswered about the impact of pension structure on younger teachers in the labor market. One such question is whether the long delay in substantive pension wealth accrual for new teachers impedes optimal mid-career entry into the teaching labor force by people who have built up private-sector experience. Another is whether the lack of portability across pension programs for schools operating under different organizational control impedes entry of young teachers or encourages their rapid exit. These questions involve not just mobility across public school systems but also across public, private, and charter schools.

However, the labor economics literature offers only limited answers that relate to mobility effects of DB pensions on younger workers, as compared to older workers. While it has been relatively straightforward to study the extent to which DB pension structure alters the timing of retirement, given the right data, it is more difficult to gauge whether DB pensions also depress worker mobility at younger ages. DB pensions generate sharp incentives around retirement age, and those incentives vary idiosyncratically across plans, facilitating identification of retirement effects. The deterrents to mobility at younger ages start out small (Gustman and Steinmeier 1993), likely having little effect on mobility early in one's tenure. While these deterrents then grow, with an average pension loss associated with switching jobs for workers aged 35-54 reaching approximately half a year's earnings (Allen, Clark, and McDermed 1988), they do so smoothly and gradually. Another difficulty is that job changes and pension coverage are rarely observed in the same data set, and, when job changes are observed, they are much more difficult to explain empirically than retirement.

While early attempts (Allen, Clark, and McDermed 1988) compared mobility of workers with and without pensions, the spread of DC pensions offers a new chance to study mobility differences among workers who are observably more similar but face different pension incentives. This is the strategy of Friedberg and Owyang (2005). They estimated the relationship between pension type and job tenure using multiple data sets, including the 1983-2001 releases of the Survey of

Consumer Finances (SCF) and data from the final pension supplement of the Current Population Survey (CPS) in 1993.[21]

Friedberg and Owyang found that workers with DB pensions in the SCF have significantly longer job tenure, as measured by both current tenure and expected future tenure, than do workers without pensions and workers with DC pensions. Workers with a DB pension have total expected tenure that is 5.0-7.0 years longer on average than workers without a pension, while workers with a DC pension have total expected tenure that is 2.5-4.0 years longer, with very similar findings in the CPS. They found further that workers with higher DB pension wealth (though imperfectly measured, as it is based on self-reported and not employer-reported pension parameters) have longer tenure, controlling for the level of earnings. Thus, workers with DB plans stay in jobs considerably longer than do other workers, though it is puzzling to find that workers with DC plans also stay in jobs somewhat longer than workers without pension coverage – possibly reflecting some unobserved heterogeneity in worker type.

The results from Friedberg and Owyang differ importantly from the earlier estimates of Gustman and Steinmeier (1993). Gustman and Steinmeier found similar mobility rates for workers with DB and DC pensions, apparently undermining the hypothesis that DB plans deter mobility relative to DC plans. The Gustman and Steinmeier results arise in a different data set, the Survey of Income and Program Participation (SIPP). They used a short panel from the first SIPP, observing job changes from 1984 to 1985 – a much earlier time period when DC plans were only beginning to proliferate, possibly one reason why they do not find mobility differences across pension types. The SIPP, also, does not query respondents as carefully or persistently about pension coverage as the SCF does, generating concerns about measurement error, especially in light of the evidence, mentioned earlier, that people have imperfect knowledge about their pension. Another difference is that Gustman and Steinmeier attempted to control for compensation in the likeliest alternative job to whatever the worker currently had. They did so by using compensation changes associated with observed job switches to impute alternative compensation for workers who did not change jobs, with an adjustment to this imputed measure for selection bias. The results then hinge on specifying this relationship correctly. A possible signal of problems with their estimates is their anomalous finding that a dollar of delayed pension compensation has a much greater effect in deterring mobility than does a dollar of current compensation; Friedberg and Owyang obtain a less surprising result, with current earnings having a greater effect than pension wealth on job tenure.

To sum up, the evidence that DB pensions deter worker mobility at younger ages is less definitive than evidence about their influence on the timing of retirement. Friedberg and Owyang find indicative results, but without as strong a case for identification as has yet been possible in the retirement literature. Hence, this remains an open question, one that may be possible to answer by studying teachers' careers.

[21] The SCF, a repeated cross-section occurring every three years, is the only survey that was undertaken regularly since the early 1980s, when DC plans began to supplant DB plans; that reports both current and expected remaining job tenure; and that reports pension type for a large, nationally representative sample.

5. Unanswered Questions about Pension Plans and Their Effects

While mobility effects of pensions have been explored in the economics literature, other questions about the possible impact of DB plans have been largely unaddressed, generally because of thorny data problems. Perhaps the most relevant in relation to teachers asks about the types of workers that respond most readily to pension incentives. Additionally, the literature has overlooked the effects of other features of pension plans, especially related to the reallocation of financial risk from employers, who bear the risk as DB plan funders, to employees, who bear the risk as DC plan holders. Lastly, a theoretical literature has proposed reasons for the delayed accruals common to DB plans that have to do with optimal personnel practices, but these explanations do not readily account for the shift to DC plans. The dominance of DB plans in teacher retirement systems may shed light on some of theses explanations.

5.1 Characteristics of workers who respond

The literature provides little insight about what types of workers respond to DB pensions. Economic theory predicts that those responding most strongly to retirement incentives are people who have the highest value of time outside of their current job. This is composed of two disparate groups. One group consists of those who value leisure highly – and it may well be optimal for this group to retire, especially to the extent that they are less productive in their current jobs than other workers are. A possible reason for this preference for retirement may be health concerns that do not rise to the level of disability claims but are nonetheless burdensome. The other group most likely to respond to retirement incentives consists of employees who have the most productive opportunities outside of the current job. As this group is likely to be relatively productive in the current job as well, it may be suboptimal for them to retire in response to pension incentives.

In the case of teachers, each group is of concern in terms of managing personnel, and yet dealing with one group optimally makes it more difficult to deal with the other. One of the challenges faced by school administrators is in identifying poor teachers and moving them out of the classroom. Pension incentives that encourage retirement at an age when this concern may be growing can help in this regard. However, the same rules will encourage productive teachers to leave too, especially if there outside options are good. Retaining productive workers at older ages remains a difficult challenge, and compensation structures in school systems function as particularly blunt tools to employ in this regard.

In our planned research, we will address some of the issues raised here by analyzing how retirement responses differ among teachers with various characteristics. The *Schools and Staffing Survey* and administrative data sources afford some opportunities to quantify the extent to which responses to DB pension incentives relate to observable features of the working environment and of teacher qualifications, productivity, and satisfaction. This crucial issue, of which educational administrators are very aware, has not been addressed in the broad pension and retirement literature because worker quality and tastes for leisure are extremely difficult to observe. By interacting key pension variables with indicators of teacher productivity and school characteristics, there are opportunities to assess whether retirement responses are greater among teachers who are more or less qualified and who are more or less satisfied with their jobs.

5.2 Other features of pension plans

The pension literature has not yet provided evidence about the impact of other differences between DB and DC plans. Table 2, adapted from Friedberg and Owyang (2002) offers a comprehensive review of these differences. Besides those related to accrual patterns and portability, a key distinction is that, under DB plans, employers bear the risk of managing pension fund accumulation and decumulation, while employees bear these risks under DC plans.

The issue of risk has received enormous attention during the recent turmoil in financial markets, as financial market volatility has been transmitted to pension plans. On the one hand, employers who run DB plans have sounded alarms about managing the effects of asset market declines on pension funding levels. The regulatory necessity of making large contributions to pension funds at a time when capital is particularly scarce has raised concerns that some employers will shed their insured pension obligations to the federal government and that even more will stop offering DB plans altogether. The situation among state and local government pension plans is more severe, as the option to turn over plans to the federal Pension Benefit Guaranty Corporation is unavailable, and funding concerns have grown acute just as states have been hit by declining tax revenue.

On the other hand, private sector workers and retirees are newly exposed to financial market gyrations through their DC plans, which have lost substantial value over the last year. While the expected rate of return on DC pension wealth in Figure 4 is assumed to be constant, unpredictable changes in the actual return will shift the realized path of pension wealth accrual. These shifts appear to be putting a damper on worker enthusiasm for DC plans, whose portability was previously seen as appealing. Moreover, current predictions are that many older workers will delay retirement in order to recoup the value of their DC accounts. A broader prediction is that the shift from DB to DC plans will increase the correlation between financial market realizations and the timing of retirement.[22]

Another issue in need of study is how retirees will manage decumulation of their DC plan assets. DB plans, by offering annuities, provide lifespan insurance, reducing the risk that someone who is lucky enough to live to a very old age will be unlucky enough to outlive their saving. DC plans do not offer this insurance, though they are, instead, bequeathable to one's heirs. Workers with DC plans, lacking lifespan insurance, may choose to save more or retire later. The lack of annuitization should also lead retirees to consume their pension wealth more slowly, even if it is equal to a DB annuity in present value terms. The lessons of behavioral economics raise a different concern, though, that DC plan holders may consume their pension wealth too rapidly. It may be possible to study this issue in the HRS as it follows retirees with different types of pensions through old age.

5.3 Why Do Pensions Exist?

Why is part of compensation deferred in the form of a pension? Individuals should prefer cash up-front, if all else is equal; the prevalence of pensions suggest that they must raise welfare or

[22] See, for example Crary, David, "Market Turmoil Clouds Retirement Hopes of Many Investors." *AP Online,* 18 March, 2001, Sunday Financial pages. *Lexis-Nexis Academic Universe: News: Wire Service Reports*. Online 23 April, 2001. Coile and Levine (2006) did not find evidence that the stock market downturn of 2000 led to delays in retirement, as stock market investments in 401(k) plans of older workers were relatively small at the time.

productivity in some way.[23] The existing theory of pensions was developed in a series of papers summarized in Lazear (1986), when DB pensions were the norm. In Lazear's view, DB pensions are purposely designed to alter the incentives for long-term employment. An alternative view, that DB pensions are designed to attract workers who value stability and are also productive in other unobservable ways, follows directly from the sorting model of Salop and Salop (1976). The sorting motive for DB pensions may be less applicable to teachers than to other professions, though, to the extent that teaching can be thought of as a "calling", where the preference for teaching itself sorts productive workers into the profession.

Lazear viewed pensions as a component of an implicit contract. Employers avoid explicit long-term contracts in order to preserve flexibility, but they may nonetheless wish to encourage workers to stay or to devote greater effort to their job. Several possible explanations lie behind the "implicit contract" theory of pensions. One reason to encourage longer tenure is if searching for a new hire is costly. Another reason is if employers gain from making human capital investments that cannot be transferred to other workers. The expectation of longer tenure then raises the rate of job training and results in higher productivity and profits, which the employer can share with the worker in the form of a DB pension. Both of these features of jobs apply to teachers as well as many other occupations. Alternatively, in an efficiency wage framework, deferred compensation encourages workers to devote greater effort to their jobs. In some jobs it is difficult or costly for employers to monitor workers, who may shirk their responsibilities. Employers may find it useful in such cases to pay an "efficiency wage", higher than the going wage in other jobs. This deters shirking, since a worker will lose her high-wage job if shirking is detected. Deferred compensation can also function as an efficiency wage, since a worker who shirks may lose her job before qualifying for a pension.

The most common form of deferred compensation is the implicit promise of future wage increases. If a fixed amount of wages are to be paid over some duration, wages can be structured to rise over time by paying a worker less than her marginal product early on and more than her marginal product later. However, two problems arise with this element of an implicit long-term contract. First, it encourages workers to stay on *too* long. An aging worker will choose to retire when her marginal utility of leisure, which probably increases with age, exceeds her wage; the rising wage profile therefore leads her to retire later than the efficient date. Second, the rising wage profile creates an incentive for employers to violate the implicit long-term contract by firing workers, since employers will get the benefits of the increased productivity sooner than workers. This credibility problem undermines the implicit contract; workers will not agree to a rising wage profile if they anticipate getting fired when their wages rise.

DB pensions help resolve both of these problems. A DB pension encourages the worker to retire at the "right" age, since the real value of her pension accruals turn negative after a certain point. And that, in turn, reduces the incentive of employers to fire older workers, which helps maintain the credibility necessary for the implicit contract. Again in this case, the employer may wish to fire a worker before the major spikes in pension wealth accrual. But, as argued above, that undermines the implicit long-term contract that promised workers a pay-off for long tenure. Furthermore, age discrimination laws and union rules make it difficult to fire older workers systematically. In relation to this, Loeb and Miller (2006), in their review of the literature on teacher compensation,

[23] Much of the following discussion is based on Friedberg and Owyang (2002), which offers other related points as well.

find consistent references to the use of pensions to "increase the efficiency of the public schools by retiring teachers of long service."

However, consider the contrast between DB plans and the DC plans which have replaced them. As we have emphasized throughout this paper, DC plans do not offer the same incentives for long-term employment. This implies two things. First, it implies that whatever motives governed the use of DB pensions in the first place, perhaps along the lines that Lazear suggested, have diminished Second, it implies that pensions must serve an additional purpose besides influencing worker mobility. While the tax preferences accorded to retirement saving through the form of pensions offers an apparent explanation, a good explanation for the tax preferences is also lacking. One possibility is that they are designed to facilitate optimal long-term saving, which might otherwise be neglected due to the type of self-control and planning problems that have been emphasized in behavioral economics (Thaler and Sunstein 2008).

6. Conclusion and Future Work

While the study of pension incentives in labor markets is well-advanced, there has been little direct analysis of the behavioral effects of the "peaks, cliffs, and valleys" associated with defined benefit pension plans in the teacher labor market. Given that the current teaching force includes an increasing share of teachers approaching peak pension wealth, understanding how pension incentives affect the labor supply decisions is central to education policy discussions.

Perhaps more significantly, the possibility that the strong financial incentives tied to DB programs have a differential impact on the retirement choices of low- versus high-productivity teachers is particularly important for teacher labor market policies. Efforts to link teacher personnel and pension records with classroom-level achievement data to better measure the relationship between outcomes in the classroom, financial incentives for retirement and retirement decisions may be highly productive in this regard.

Beyond focusing on retirement decisions, future work should consider how variation in pension options across different employment arrangements (charter schools, private schools, and other non-teaching jobs) may affect mobility across sectors and the recruitment and retention of highly productive teachers in the classroom.

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Table 1: Age Distribution of Teacher Labor Force by State, 2000

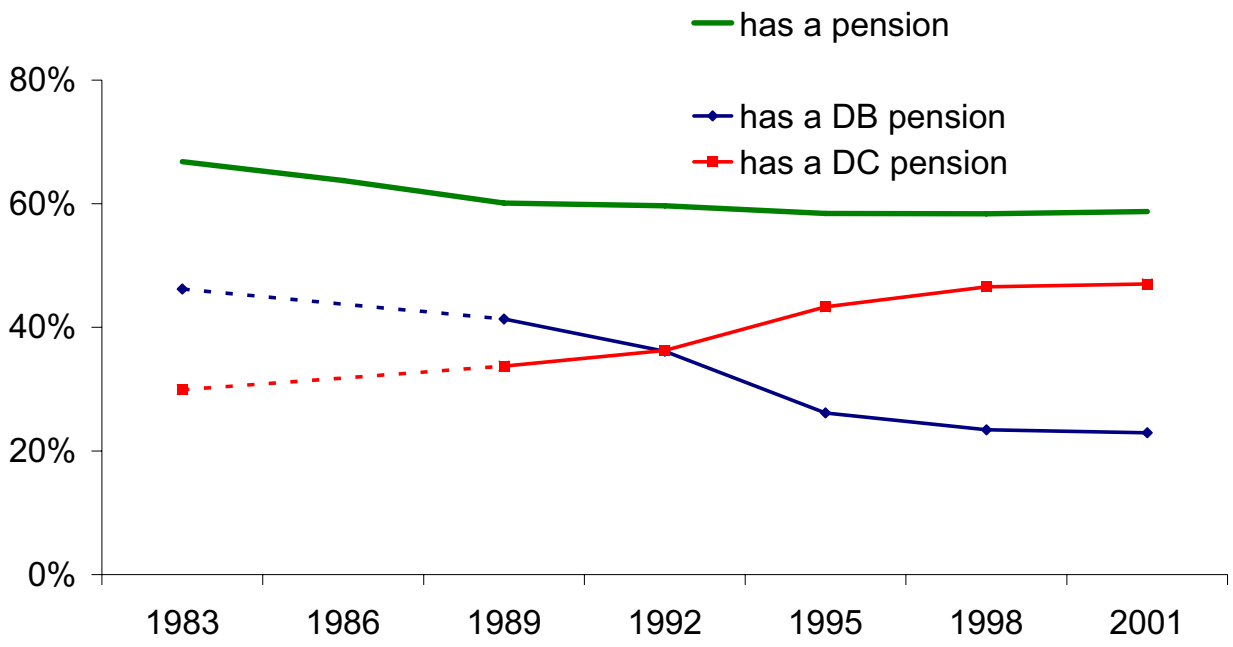
State	Mean	% < 30	% > 55	Median	25th	75th
Alabama	41.18	0.18	0.09	42	32	49
Alaska	41.34	0.16	0.07	42	33	49
Arizona	42.59	0.16	0.11	44	34	51
Arkansas	42.40	0.15	0.11	43	34	50
California	42.66	0.18	0.15	43	33	52
Colorado	42.56	0.15	0.11	43	34	51
Connecticut	44.10	0.14	0.14	46	36	52
Delaware	41.56	0.17	0.11	42	32	50
District of Columbia	41.38	0.24	0.14	42	30	52
Florida	43.05	0.15	0.13	44	34	51
Georgia	41.63	0.17	0.09	42	33	50
Hawaii	43.54	0.15	0.15	44	34	52
Idaho	43.53	0.11	0.12	44	36	51
Illinois	42.61	0.18	0.12	44	33	51
Indiana	43.18	0.14	0.11	45	35	51
Iowa	43.00	0.13	0.11	44	35	51
Kansas	42.46	0.16	0.12	43	34	51
Kentucky	41.95	0.16	0.09	43	33	50
Louisiana	42.52	0.15	0.12	43	34	51
Maine	43.87	0.09	0.11	45	37	51
Maryland	42.65	0.18	0.13	44	33	52
Massachusetts	43.97	0.15	0.14	46	35	52
Michigan	42.97	0.14	0.12	44	34	51
Minnesota	42.81	0.14	0.11	44	34	51
Mississippi	42.29	0.15	0.11	43	34	50
Missouri	41.90	0.17	0.10	42.5	33	50
Montana	43.19	0.12	0.10	44	36	51
Nebraska	42.86	0.15	0.12	43	34	51
Nevada	41.24	0.20	0.11	41	31	50
New Hampshire	43.68	0.13	0.11	45	37	51
New Jersey	43.44	0.17	0.13	45	34	52
New Mexico	43.57	0.10	0.11	44	36	51
New York	42.93	0.16	0.12	44	34	52
North Carolina	41.88	0.18	0.11	43	33	50
North Dakota	42.85	0.13	0.12	44	35	50
Ohio	42.34	0.17	0.10	44	33	51
Oklahoma	41.84	0.16	0.09	42	34	50
Oregon	43.65	0.12	0.10	45	36	51
Pennsylvania	42.74	0.16	0.10	45	34	51
Rhode Island	43.05	0.16	0.11	45	35	51
South Carolina	41.96	0.17	0.11	43	33	50
South Dakota	42.32	0.15	0.12	43	33	51
Tennessee	42.17	0.17	0.11	43	33	50
Texas	42.00	0.17	0.11	42	33	50
Utah	43.28	0.15	0.13	44	36	51
Vermont	43.36	0.12	0.09	44	36	51
Virginia	42.39	0.16	0.11	43	33	51
Washington	43.35	0.13	0.11	45	35	51
West Virginia	44.45	0.09	0.11	46	38	51
Wisconsin	42.99	0.13	0.11	44	35	51
Wyoming	42.58	0.12	0.09	44	35	49

Table 2: Summary of Defined Benefit and Defined Contribution Pension Characteristics

	Defined benefit	**Defined contribution**
Key pension characteristics		
determined by formula	pension benefit	pension contribution
depends on rate of return on funds	pension contribution	pension benefit
influences timing of retirement later	yes	no
Differences during employment		
Pension design		
median vesting period	5 years	0-2 years
timing of pension wealth accruals	most of pension wealth accrues late in career	smooth accrual
portable	no	yes
Administrative control		
controls investment of assets	firm	worker, firm [a]
can borrow against assets [b]	possibly the firm	possibly the worker
bears costs of administration	firm	worker, firm
bears costs of regulatory compliance	firm	firm
Risk		
interest rate risk	firm	worker
underfunding risk	firm [b]	worker [c]
risk of early job severance	worker	-
Differences after employment		
Pension design		
form of pension benefit	annuity	lump-sum
Administrative control		
controls investment of assets	firm	worker
bears costs of administration	firm	worker
bears costs of regulatory compliance	firm	worker [e]
Risk		
interest rate risk	firm	worker
risk of exhausting funds due to long life	firm	worker/heirs
claimant to excess funds due to early death	firm, possibly heirs [d]	worker/heirs

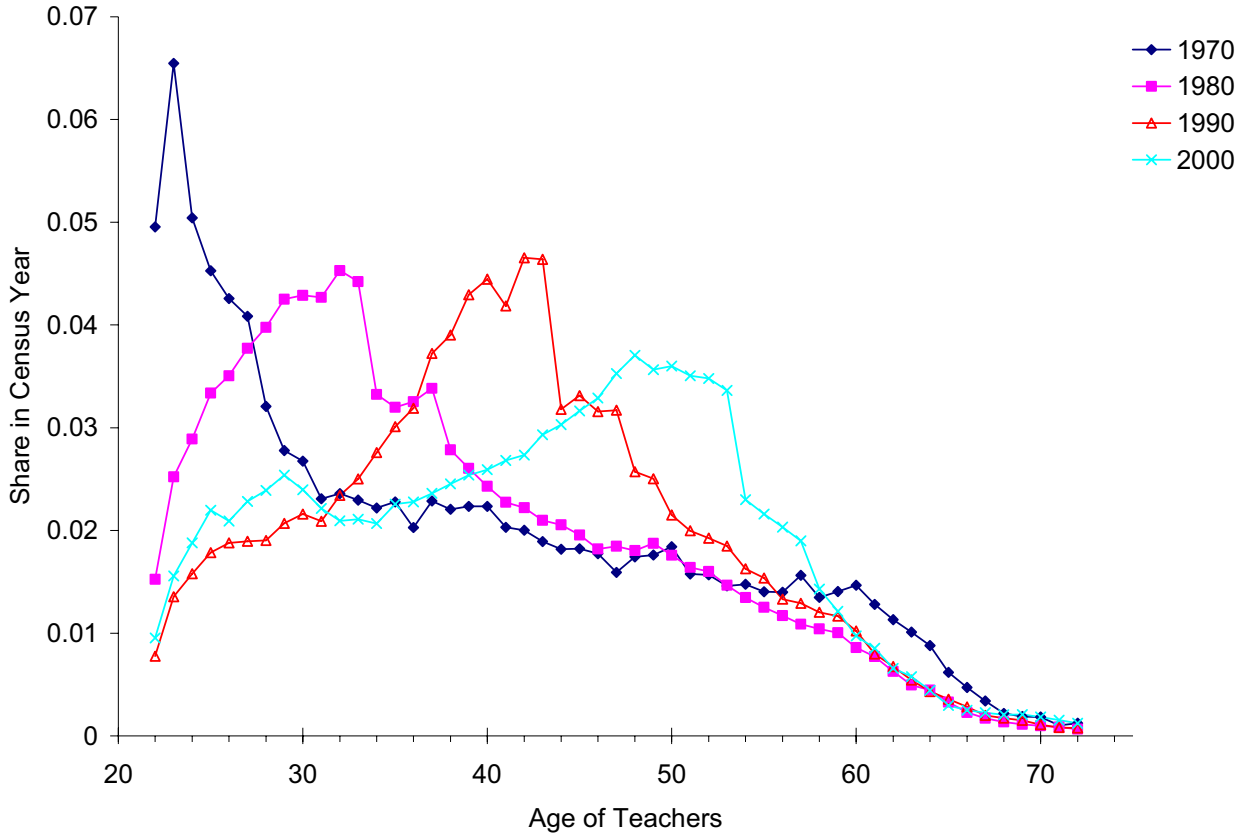
Notes to Table 1:
Source: Friedberg and Owyang (2002)
[a] Employers choose which investment options to offer, usually including investment in company stock and several different mutual funds.
[b] Government regulations constrain both under- and over-funding of DB pensions by firms.
[c] Contributions to 401(k) plans are voluntary and hence are subject to underfunding risk, but contributions to other types of DC plans are mandatory. Workers can withdraw DC assets in case of financial hardship or separation from the firm; if they do so when under age 59 ½, they owe a 10% penalty to the government. Some firms allow 50% of worker contributions to the 401(k) (up to $50,000) to be used as collateral for loans with a term of no more than 5-10 years.
[d] Many DB pensions allow retirees a choice between a larger annual benefit payable until the retiree dies, or a smaller annual benefit payable until both the retiree and his or her spouse die.
[e] Individuals are required to make regular withdrawals of assets from their DC plans beginning at age 70. If they do not, they or their heirs face tax penalties, limiting the extent to which DC assets can be saved for a bequest.

Figure 1: Pension Coverage of Full-Time Employees



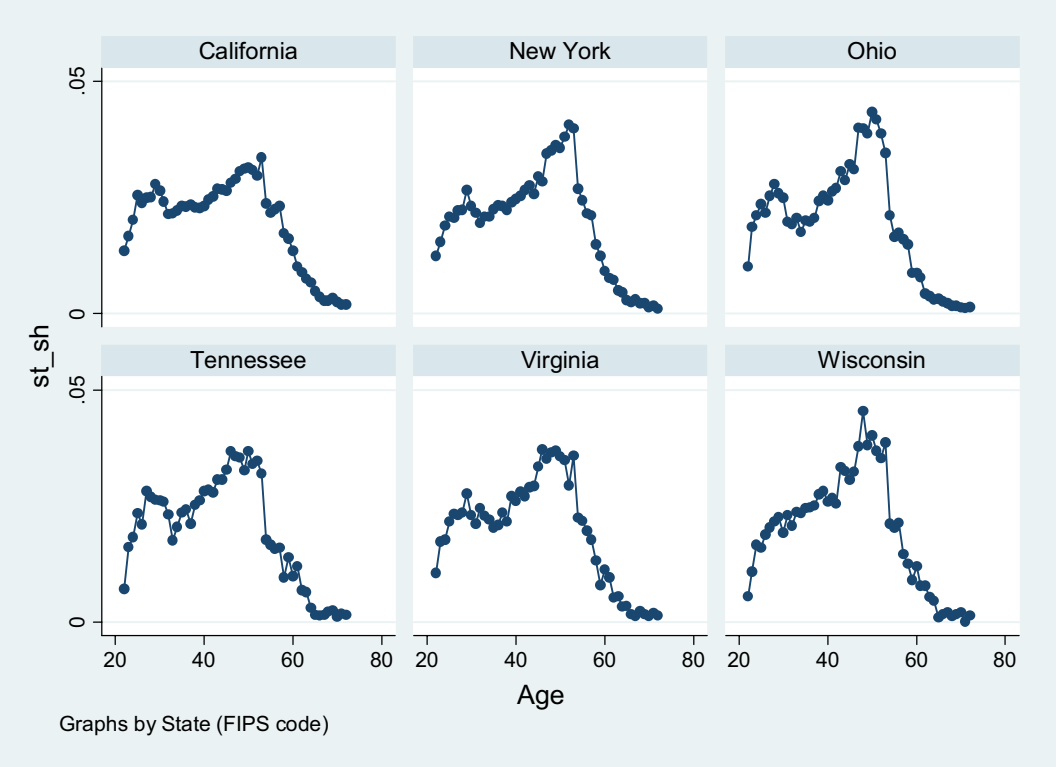
Source: Survey of Consumer Finance, Friedberg and Owyang (2005).

Figure 2. Age Distribution of Elementary and Secondary School Teachers



Source: Authors' tabulations from IPUMS Decennial Census files.

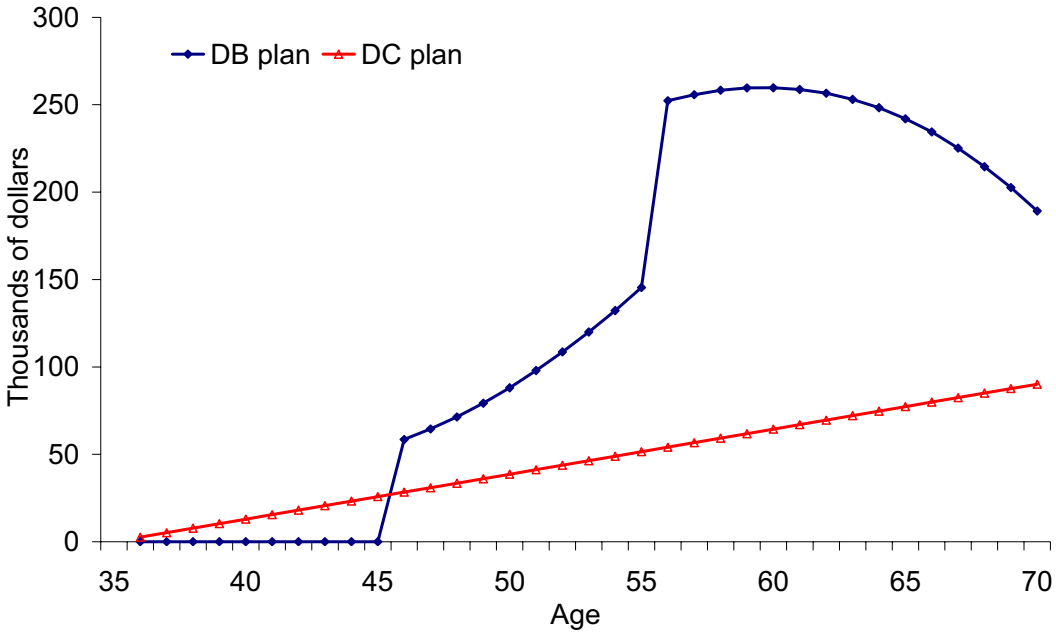
Figure 3: Age Distribution of Elementary and Secondary Teachers by State, 2000 Census



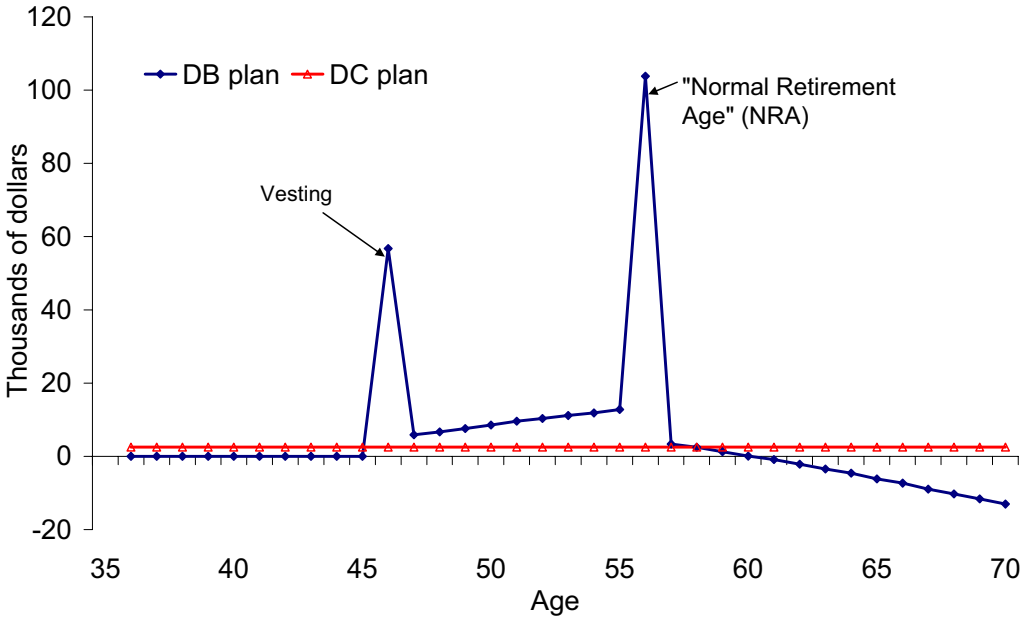
Source: Authors' tabulations from IPUMS Decennial Census files.

Figure 4: Pension Wealth Stock and Accrual under Defined Benefit and Defined Contribution Plans

Panel A: Pension Wealth



Panel B: Pension Wealth Accrual



Note: The plans in Figure 4 were observed in the 1992 Health and Retirement Study and are reproduced from Friedberg and Webb (2005).

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