Pensions in the Public Sector

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III
Challenges to Public Pensions

Chapter 12

Going Private in the Public Sector

The Transition from Defined Benefit to Defined Contribution Pension Plans

Douglas Fore

The transition from private sector defined benefit to defined contribution pension plans has been underway in the United States for over a quarter-century, since the passage of the Employee Retirement Income Security Act (ERISA) in 1974 and especially since the introduction of 401(k) accounts in 1982. By contrast, in the state and local government sector, pensions have been and continue to be overwhelmingly defined benefit in type, perhaps because ERISA does not apply to these plans. Additional factors contributing to the continuation of public sector defined benefit pensions likely include the relatively high degree of unionization of state and local government employees, and the fact that early retirement features commonly associated with defined benefit plans have meshed well with many public employer personnel goals in the past.

Nevertheless, there is evidence that the public sector pension environment is beginning to evolve. A small but growing number of state and local governments have switched or are contemplating switching from a defined benefit to a defined contribution plan. If these pioneers prove successful, in terms of employee and employer satisfaction, the public sector may follow the transition trend experienced in the private sector over the last quarter-century. If this transition process spreads, it will mark a major shift in the way in which retirement income is provided for a substantial number of American workers and retirees. And if more state and local government pension plans transition to a defined contribution format, this could potentially have a profound impact on capital markets, given the substantial size of public pension assets.

Key Aspects of Public Sector Defined Benefit Pensions

As noted elsewhere in this volume, public pension benefit formulas vary widely within a state, and between states. My goal here is to highlight several issues pertinent to the public sector transition from defined benefit (DB) to defined contribution (DC) pension plans. I focus on benefit formulas, coverage and vesting rules, and funding patterns, derived from data contained in the PENDAT97 survey described above (see Hustead and Mitchell this volume; Zorn 1997, 1998).

Vesting requirements of public DB plans. Vesting refers to how long an employee must work to earn a legal right to an eventual retirement benefit under a plan. In public sector DB plans, a worker is generally vested after either five or ten years of employment; just under half of all plans vest employees after five years, with a similar percentage vesting after ten years. Only a very few plans grant pension rights immediately, and likewise few delay vesting for more than ten years. It should be noted that one plan can have different vesting rules for workers hired at different points in time, as well as different benefit rules. Eligibility for non-duty-related disability and survivors benefits typically requires the same vesting period as for pension benefits; duty-related disability and survivors benefits generally vest immediately, although some plans do require the same vesting period as for pension rights.

DB plan benefit formulas. Public pension benefit formulas vary widely within a state, and also between states (Hustead and Mitchell this volume). But despite this diversity, retirement benefits are calculated as a percentage of final average salary in most defined benefit plans. Final average salary may be defined as the worker's salary in the last year of employment, or an average of the last three or five years of work. Many plans also establish minimum age and service requirements (e.g., fifty years of age and twenty years of employment) in order to qualify for a pension with full credit for accrued benefits; these are commonly associated with police and fire department plan criteria.

Benefit accrual patterns for public employees covered/not covered by social security appear in Figure 1. Corresponding pension benefits received after 30 years of service, as a percentage of final average salary, are given in Figure 2. In the California State Teachers' Retirement System (calsters), employees accrue benefits at a constant 2.0 percent per year, which happens to be the average annual benefit accrual rate for all public sector workers. In 1996, the average DB benefit for state and local government workers covered by social security and with thirty years of service was 57.8 percent of final average salary; for workers not covered by social security, it was 68.5 percent of final average salary.

Constant-rate accrual of benefits appears to be the exception rather than

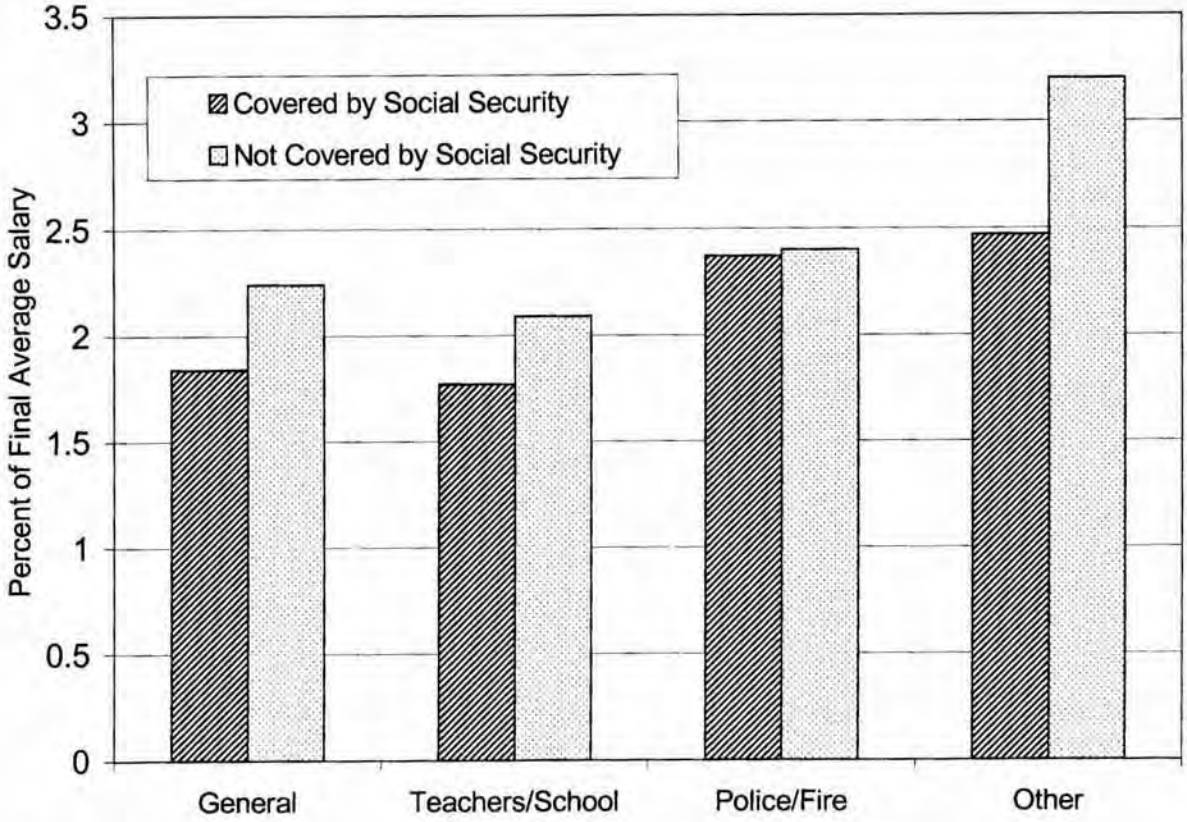

Figure 1. Benefit accrual rates by category of covered employee. Source: author's calculations.

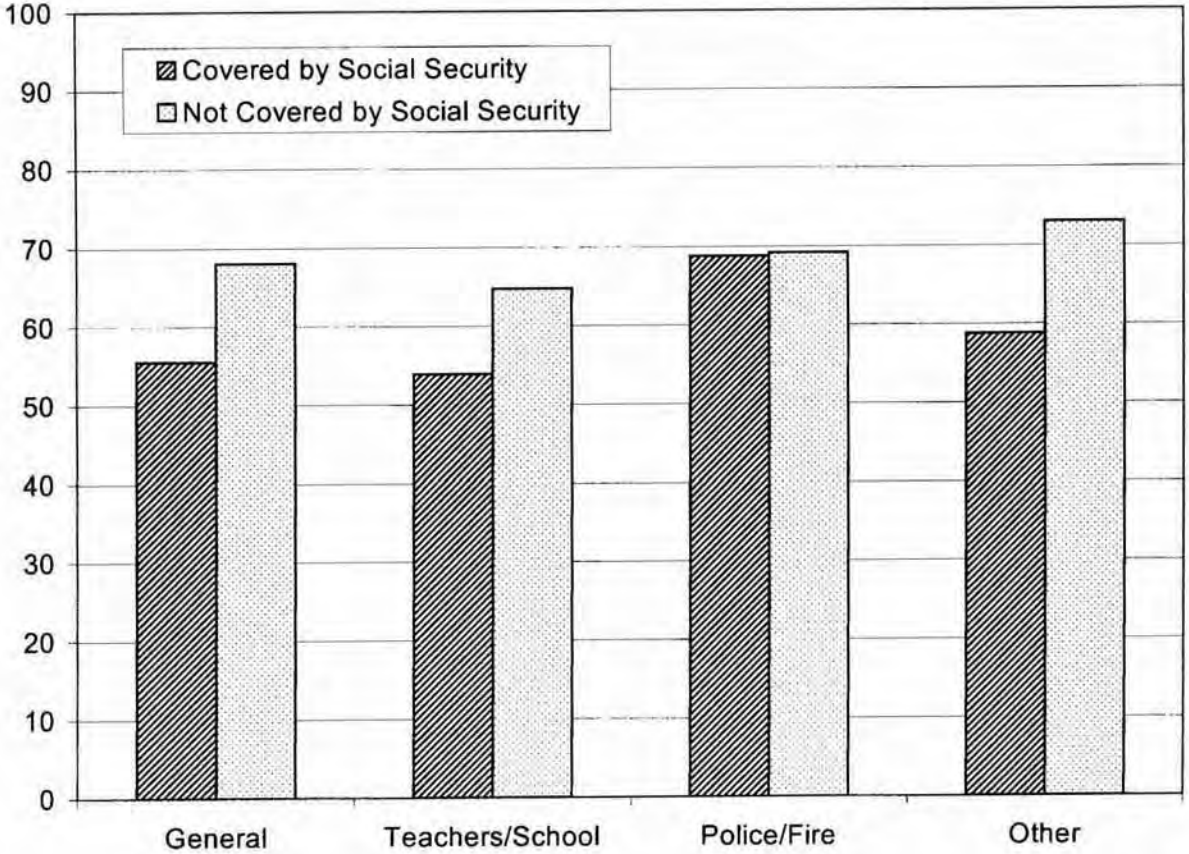

Figure 2. Average benefit after 30 years of service as percent of final average salary. Source: author's calculations.

the norm, however, in the public sector. Most public DB plans have differential accrual rates, usually on either side of twenty years of service. For example, the Alaska Teachers' Retirement System benefit accrual rate is 2.0 percent of final average service for the first 20 years of service, and 2.5 percent per year thereafter. By contrast, the City of Fresno Employees' Retirement System accrual rate is 2.0 percent of final average salary for the first twenty-five years, then falls to 1.0 percent per year thereafter. Some teachers, school employees, and general employees in public DB plans not covered by social security have annual benefit accrual rates rise by 0.30–0.40 percent per year of service on average, but plans for workers not covered by social security do provide lower benefit accrual rates. For example, workers in the California Public Employee Retirement System (Calpers)—who are not in social security—accrue benefits at a constant 1.25 percent per year; their resulting pension equalling only 37.50 percent of final average salary after thirty years of service, the lowest level of benefits offered by any major public plan in the country. This relatively low benefit level provided by Calpers may explain why many counties and municipalities in California have established their own distinct plans with different DB formulas.

Benefit formula design in the public sector appears to be motivated by three factors, the most important of which appears to be whether or not the employee group is covered by social security. Only a minority of plans covering workers covered by social security explicitly integrate their benefit formulas with expected social security benefits by, for example, offering higher benefit accrual rates for salary ranges above the social security earnings threshold. It must also be acknowledged that about a quarter of state and local government employees are not covered by social security; nevertheless as of 1983, state and local governments no longer have the option of opting out of social security.[1] In any event, as noted above, workers outside the social security system have more generous benefit accrual formulas than do workers included in social security. A second apparent factor in benefit formula design has to do with the employee group covered: local government plans are almost always more generous than state plans. For example, the accrual rate in the City of San Jose Federated City Employees' Retirement System is a flat 2.5 percent per year of final average salary, so a worker with thirty years of service would retire with a benefit of 75 percent of final average salary. This is double the benefit of an otherwise similar employee in the state-level Calpers plan. A third factor influencing public plan design is public employee unions, which tend to bargain over pension accrual rates with state and local governments.

DB plan funding status. The U.S. Government Accounting Standards Board has required state and local government pension plans to compute liabilities using a common set of methods to produce a pension benefit obligation (PBO) figure for each plan since 1987. In practice, public pension plan ad-

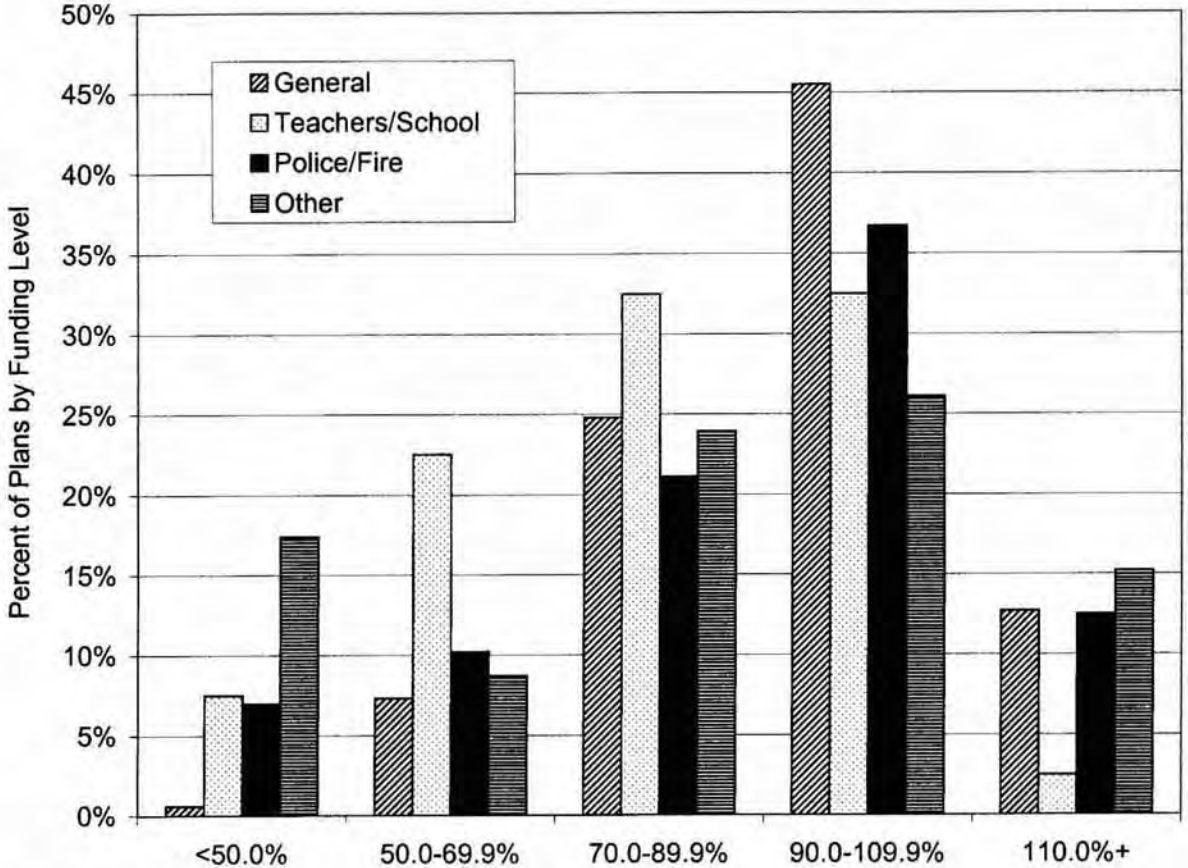

Figure 3. Funding status of plans by category. Source: Zorn (1997).

ministrators have wide latitude in terms of the assumptions used for future real salary increases and turnover rates, as well as future inflation and investment income return rates (Hustead this volume). As Mitchell and Smith (1994) note, the spread between expected investment returns and the expected growth rates of employee compensation is equal to the real discount rate of future pension liabilities, and a larger gap implies a lower present value of future liabilities. Mitchell and Smith found funding status in public DB plans negatively related to the degree of employee unionization and state fiscal pressure, and they also found persistence in past funding patterns.

Public sector defined benefit plans are fairly well funded in the 1990s (Mitchell et al. this volume), but plan funding status varies according to plan type. For example, when we compare teacher/school employee plans, police and fire department plans, and general plans, we find that the general plans have the highest funding ratios and teacher/school employee plans the lowest (in the case of teacher/school employee plans, roughly a third have funding ratios below 70 percent). This is depicted in Figure 3. Where public plans are less than fully funded, the amount is substantial: the mean time to amortization of the unfunded liability is approximately twenty-three years at current funding rates. We find no correlation between a state's per capita income or tax burden and the funding status of its defined benefit plans in the 1996 data.[2] This is perhaps surprising, because different patterns of state income and population growth generate different incentives in terms of funding levels. For example, rapidly growing sun-belt states and municipalities might be expected to underfund their plans relative to slowly growing Northern states. States attracting large numbers of migrants, whether from within or without the United States, might experience more rapid growth in their tax bases than in their actuarially accrued pension liabilities. In this case, DB plan underfunding might be anticipated, since rapid tax base growth could amortize unfunded actuarial liability without changing tax rates. Conversely, states and municipalities with static or declining tax bases have an incentive to fully fund or overfund their plans in order to avoid very large tax increases at some point in the future.

DB plans and mobility within a state. Public pension DB plans diverge concerning how readily they permit employees to transfer their pension rights to other public sector DSB plans *within the same state.* Roughly a third of these pension plans have reciprocal agreements with other plans in the same state for transferring or combining worker benefit rights accrued elsewhere. Where reciprocal agreements do not exist, employees may still have the option of transferring service credits. For example, roughly 40 percent of plans allow veterans to purchase service credits for military service at either full cost or less than full cost. Table 1 shows the matrix of options available to employees. Approximately 60 percent of all public defined benefit plans disallow transfer of any accrued benefit rights across plans; furthermore, fewer

TABLE 1. Defined Benefit Plan Portability Method for Determining Purchase of Service Credits Earned Elsewhere

Type of service	*Full cost*	*Less than Full cost*	*No cost*	*Purchase not allowed*
State government	22%	15%	4%	59%
Local government	27%	14%	2%	57%
Out-of-state government	15%	6%	1%	78%
Federal government	14%	8%	1%	77%
Military	24%	23%	6%	47%
Other	12%	5%	0%	82%

Source: Author's calculations from PENDAT97 database.

than 20 percent of plans allow workers to purchase service credits earned in either the federal government or other state governments. Plans which do permit employees to purchase service credits are approximately twice as likely to require them to purchase credits at full cost rather than at less than full cost.

DB pension plans' impact on mobility more generally. Lack of portability is one of the well-known drawbacks to defined benefit pension plans. Under a defined benefit pension regime, workers who stay with the same employer retire with larger pensions than similarly compensated workers in similar defined benefit schemes who change employers over the course of their careers. This can be illustrated with a simple numerical example where we assume that pension rights are fully acquired after five years. Consider a worker who begins employment at age 35 with a salary of $25,000, receives annual raises of four percent, and retires at age 65. The worker faces two alternative career path options. On the first path, the worker can remain with the same employer for thirty years, accruing pension benefits at a rate of 2 percent per year that are paid as a percentage of final salary. On the second path, the worker quits his first job after either ten or twenty years. The pension benefits earned under the two paths are shown in Table 2.

Remaining with the first employer until retirement at age 65 would produce an annual pension benefit corresponding to the first year's service of $1,622, two percent of the last year's salary. The annual benefit corresponding to the first ten years of service would be $16,217. However, if the worker quit after ten years, at age 45, the benefit eventually payable at age 65 from the first employer would be only $7,401, corresponding to 2 percent of salary at age 45 for each year of service to the time he quit. Discounted at a rate of 6 percent for twenty years, the present value of the benefit received by staying with the first employer is roughly $2,800 per year larger. This may not seem to be much for a forty-five-year-old worker contemplating a job switch, but at age 65 with expected longevity of twenty more years the future

TABLE 2. Impact of Job Changes on Retirement Benefits in Defined Benefit Pension Plans

Worker's age	*Salary*	*Benefit based on current salary*	*Benefit based on final salary*
35	$25,000	0	$1,622
45	$37,006	$7,401	$16,217
55	$54,778	$21,911	$32,434
65	$81,085	$48,651	$48,651

Source: Author's calculations.

value of this benefit would be approximately $28,000 larger. A worker who switched at age 55 after twenty years of service loses even more.

Several factors could exacerbate this benefit differential. For instance, high inflation during the latter part of the worker's career could erode the real value of the benefits accrued during prior years, and severely penalize the worker who changes jobs. Additionally, if the benefit formula were back loaded, so that the benefit accrual rate rises at some point (e.g., after twenty years), then changing jobs would also be disproportionately penalized.

DB plan impacts on labor supply. Public DB pension benefit formulas influence older workers' labor supply decisions because of the very nonlinearity of their structure.[3] These plans generally permit early retirement as early as age 55, although required service varies widely: some plans subsidize early retirement by minimizing or even eliminating actuarial reductions for early retirement, while other plans levy "full" or more than full reductions (i.e., over 5 or 6 percent) per year of retirement below age 60 or 65. Not surprisingly, plans covering police and fire department workers tend to have the most liberal early retirement policies. Many of these plans do not specify a minimum retirement age, instead basing the availability of retirement benefits on years of service. These provisions are presumably intended as a means of shedding workers as their physical fitness declines. Hence police and fire department workers may be able to retire with full or (partially) actuarially reduced benefits at age 40, after twenty years of service. Since many of these plans also offer workers the option of purchasing service credits for time spent in the military, many of these workers can earn significant pension rights by their early 40s. This is analogous to the situation in the federal government, where special agents of the Federal Bureau of Investigation can retire with full pensions at age 52 with twenty years of service, and face mandatory retirement at age 55. Similarly, FBI agents receive full credits for military or prior federal government service.

As mentioned above, benefit accrual patterns are rather jagged, with some plans front-loading benefits, others back loading, and still others offering constant benefit accrual rates. Changes in the rate of benefit accrual are typi-

cally service related, with changes after twenty years of service, and usually not age related. Additionally, some plans cap benefits at a certain percentage of final average salary. These differing benefit formulas would be expected to impact the labor supply decisions of older workers at several points in time. For example, where the plan does not call for actuarial reductions for early retirement, we would expect to see a spike in retirement at the twenty years of service mark for police and fire department workers, or at age 55 for other state and local government workers. We would expect to see similar spikes at the thirty years of service mark and especially at age 62, the age when three-quarters of state and local government workers become eligible for social security. Researching the empirical links between public plan retirement rates and benefit formulas is a task for future research.

Changes in benefit accrual rates after twenty years of service but before thirty years are also intended to influence the retirement decision. In front-loaded plans, which typically reduce the accrual rate to one percent per year of service after twenty or twenty-five years, employees have an incentive to leave early. Similarly, plans with absolute caps on benefit replacement rates are probably designed to stimulate older workers' withdrawal. This would be expected for the Fire and Police Pension Fund of San Antonio, where plan members are not covered by social security; the benefit accrual rate is 2.0 percent of final average salary for the first twenty years, 4.0 percent for years 21–25, 3.5 percent for years 26–30, and then a modest 1.0 percent of final average salary for each additional year of service past thirty years.[4]

These patterns of benefit accrual rates parallel those of private-sector employers who also tend to want to induce retirement after twenty to thirty years of employment. For instance Gustman, Mitchell, and Steinmeier (1994) show that private DB plans offering subsidized early retirement increased dramatically between 1960 and 1980. The observed heterogeneity in benefit formulas also suggests endogeneity in public plan design. It must also be acknowledged that it is more difficult to fire or lay off a worker with many years of service in the public sector, versus in the private sector. In this light, DB plans offering early retirement incentives provide a substitute method of discharging lower productivity employees. We also recognize that some employers prefer incentive provisions that tie workers to their jobs, especially workers receiving specialized training such as police and fire department personnel and teachers. And for safety workers in particular, early retirement provisions are important to employers where worker productivity may be expected to eventually decline due to physical demands.

The manner in which employee and employer contributions are credited with interest can also impact retirement and mobility decisions. Approximately three-fourths of public DB pension plans currently credit employee contributions with interest.[5] Of those plans that do this, roughly 60 percent use interest rates greater than or equal to 5 percent. Of course, contribu-

tions would still compound relatively slowly for most employees at the nominal risk-free interest rate or below. Even where pensions are portable within the public sector of a state, limits on pension accumulations would deter mobility in cases where service credits must be purchased.

There have recently been a variety of legislative proposals introduced, with the aim of increasing portability among different types of pension plans. Most aspects of these proposals refer to DC plans. For example, one proposal would permit rollovers between 401(k) and 403(b) plans which are disallowed under current law. Specifically, this would allow workers with 403(b) and 457 plan assets to use those assets for the purchase of service credits in public sector DB plans. Another proposal allows rollovers from IRAs to defined contribution and defined benefit plans.

The Transition to Defined Contribution Pensions

There are several appealing aspects about DC plans in the public sector. We enumerate these next.

Defined contribution pensions and mobility. When contemplating a job offer, prospective employees must form expectations about job tenure and eventual pension benefits, among other factors. The decision matrix can be expected to vary with the worker's age at time of employment, expected date of retirement, and degree of risk aversion. Younger workers, in particular, may expect to change employers multiple times over the course of their careers, particularly in light of evidence that there has been a trend toward increased employment mobility between the 1980s and the 1990s. For instance, Jaeger and Stevens (1998) report a statistically significant increase in the probability of employees having fewer than ten years of job tenure, over time.

In this environment, defined benefit plans become substantially less attractive, especially those with ten-year vesting periods, and DC plans have increased appeal when long job tenure is not expected due to their enhanced portability. Employee contributions vest immediately, and employer contributions usually vest either immediately or after a wait of one year (a few require vesting periods of up to five years). Employees who change jobs and move from one DC plan to another face only the potential loss of pension rights of nonvested employer contributions. Furthermore, DC pension rights are neutral with respect to job tenure. Thus workers with vested rights in a DB plan who leave the firm after five to ten years see their pension benefits frozen in nominal terms based on their salaries at that time, but similar workers with DC plans continue to accumulate interest income, dividends, and capital gains in their pension portfolios.

Of course, to receive the benefits of tax deferral, employees who change jobs and pension plans must either roll their DC balances into new DC plans,

or else leave their original balances untouched to accumulate over time. There is evidence that many workers take partial or full lump-sum distributions from their plans when changing jobs and use the proceeds for investment in housing assets, consumer durables, or immediate consumption (Samwick and Skinner 1996). Restrictions on rollovers between different types of defined contribution plans may well contribute to this phenomenon. Under current law, rollovers are not allowed from 401(k) to 403(b) plans or in the other direction from 403(b) to 401(k) plans. Currently, service credits cannot be purchased with defined contribution plan assets.

Defined contribution pensions and investment risk. In state and local DB plans, taxpayers of each jurisdiction bear two types of investment risk. (Participants do bear default risk, but in the United States, this risk is seen to be low in comparison to the risks borne by taxpayers). First, they bear the risk of underfunding, which could necessitate a higher tax burden. Taxpayers could avoid this risk by moving to another jurisdiction in advance of the future tax increase, but this works only if they move to an area with a better-funded plan. Second, taxpayers face the risk that the DB plan assets will generate inadequte investment performance, again producing a need for higher taxes. Conversely, taxpayers enjoy the upside risk that if investment performance and funding progress are greater than expected, resulting in overfunding of the plan, future contributions may be reduced.[6]

In DC plans, of course, investment risk is borne by plan participants, in exchange for which they receive flexibility in terms of investment choice. This flexibility permits individuals to tailor their portfolios in accordance with their time and risk preferences. While the appeal of a DC approach is obvious, there remains the concern that financially unsophisticated participants may choose portfolios either too conservative or too risky, putting retirement income security in jeopardy. It should also be said that there is no a priori reason to believe that DC plans automatically offer a menu of choices suitable for the varied tastes of plan participants, since investment choices available in defined contribution plans vary widely.

The appeal of DC investment options has been pointed out in a recent study of faculty pension plan choices by Clark, Harper, and Pitts (1997), who examined the choices of new faculty hires at North Carolina State University. These faculty members were given the option of joining either the state government defined benefit plan, or one of three defined contribution plans including TIAA-CREF. Over the subsequent five-year period (1990–94), 75 percent chose TIAA-CREF, 17 percent chose the DB plan, and 8 percent chose one of the other two defined contribution plans.

Defined contribution pensions and labor supply. One key way in which DC plans influence labor supply concerns the interaction between duration of coverage and total accumulations. Older workers continue to receive the same interest accruals on their account balances as do younger workers, subject to

portfolio composition. Unlike defined benefit plans, with their reductions in benefit accrual rates after a set number of years of service, or explicit caps on benefits, defined contribution plans have no early retirement incentives. Indeed, as total accumulations continue to accrue with compound interest, employees may have a strong incentive to work longer in order to enjoy higher incomes in retirement. However, once total accumulations are such that retirement income security is assured, employees must then weigh the tradeoffs of continued employment against their desire for leisure.

Trends to DC Pensions at the State Level

As noted above, several states recently introduced DC pensions for particular groups of employees, and more states are studying the idea of making the transition from defined benefit to defined contribution plans. Several factors prompt the increased interest. One is term limits: in states where legislators face limitations on tenure in office, standard DB plans do not provide the legislators with retirement income security. Indeed, this is the main reason why the state of Colorado switched to a defined contribution plan for its state legislators in 1998. A second motivation is the desire to shift risk from the taxpayers to employees; this is related to the goal of cutting total pension contributions and the state's total pension cost burden. Another rationale is the desire of state and local government employees for superior pension portability and investment choice, linked to private employee enthusiasm for investing in 401(k) plans.

Several state and local governments sponsor DC pensions as either their sole plan or as a supplement to their DB plan. In Colorado, in addition to the legislators' defined contribution plan, several municipalities offer defined contribution plans as the only pension plan. In Michigan, newly hired state and local government employees (excluding teachers K-12) may join a defined contribution plan; existing employees were offered the choice of staying in the DB plan or switching to the DC plan. The state of Washington offers a hybrid defined benefit/defined contribution plan. The state of Indiana has a defined contribution supplement to its defined benefit plan for teachers, consisting of 3 percent of salary. Growing interest in making a transition from defined benefit to defined contribution plans is reflected in the number of state legislatures where bills have been introduced to enable the transition. Legislation is currently under consideration in Florida, Georgia, Ohio, South Carolina, Tennessee, and Texas.[7]

The decision to switch from DB to DC is often made in the context of a funding discussion. Ceteris paribus, making the transition is easier when a plan is fully funded or overfunded. The closer a plan becomes to a pay-as-you-go system, and the greater the unfunded actuarial liability, the more expensive the transition and the lower the probability that taxpayers will

choose to bear the burden of transition. For example, in Michigan when the new defined contribution plan was introduced, legislation was passed that explicitly stated that K–12 employees could not make the transition until the $3 billion plus unfunded liability of the Michigan Public School Employees Retirement System was erased by December 31, 1997. The liability was not paid off and K–12 employees do not, as yet, have the option of a defined contribution plan. If plan sponsors overestimate the public plan's actuarial liability, perhaps because expectations of future inflation are too high, then the funding status of the plan will be better than it seems at first glance and the transition will seem easier. For instance, some plan administrators are using long-term inflation assumptions in excess of 4 percent, which probably gives an overly pessimistic view of the growth of future liabilities.

When to Stay and When to Go in Defined Benefit Plans

One method of making the transition between a defined benefit to a defined contribution plan is to grandfather existing employees in the old DB system and move new employees into a new DC scheme. This eases the administrative burden, but does not benefit current employees, especially those with limited tenure, who may wish to participate in the defined contribution plan. One way in which costs could be reduced in a transition is if employees assign a high value to the portability, investment choice, immediate vesting, and other features offered by the DC plan. In this case, employees might be willing to accept a lower expected value of future benefits in return for the other advantages of a defined contribution plan. A closer analysis of such trade-offs is facilitated using a simulation model that computes the expected future benefits from either staying in a defined benefit plan or switching to a defined contribution plan after five, ten, fifteen, or twenty years of coverage in a defined benefit plan. First, we assume that the worker begins employment at age 35 with a starting salary of $25,000. The worker receives annual real wage increases of 1.0, 1.5, or 2.0 percent per year. In the DB plan, pension rights are vested after five years of service. Defined benefit pension rights accrue at 1.5, 1.75, 2.0, or 2.25 percent per year. In the DC plan, the overall employee and employer contribution rate is 10.0, 12.5, or 15.0 percent of salary. The investment portfolio in the DC plan is assumed to be 60 percent equities and 40 percent long-term U.S. Treasury bonds, returning 1926–97 historical average real returns of 7.2 and 2.0 percent, respectively (Siegel 1998). The real annual portfolio return is accordingly 5.12 percent. Workers who leave the defined benefit plan with vested rights after five, ten, fifteen, or twenty years of service have their eventual defined benefit pension rights valued based on their nominal salaries at that time. Workers who retire at age 65 in the defined benefit plan have their pension rights valued based on the salary at age 65. Workers who transition to the

defined contribution plan eventually receive two pensions. The first is based on their accrued defined benefit rights as of the date they elected to make the transition. The second is based on their final defined contribution accumulations. These accumulations are the basis for a single life annuity based on TIAA annuity rates as of June 1998 that pays a monthly amount of $759 per $100,000 accumulation (Poterba and Warshawsky 1999).

Given these assumptions, we compute the pensions received under the different assumed accrual rates and investment return patterns. The annual pension benefit for a worker who elects to transition to a DC plan after five years of service in a DB plan appear in Table 3. The table shows the importance of high contribution rates in the DC plan. When the contribution rate is 12.5 percent transition is favorable under most combinations of real wage growth and defined benefit accrual rates. However, if the contribution rate is 15.0 percent, then transition is unambiguously favorable under all states except one. Conversely, if the contribution rate is lower, at 10.0 percent, transition generates higher retirement incomes under only a few states.

The simulations also show the interaction of real wage growth with both DB and DC accumulations. For example, in Table 3, when real wage growth is 2.0 percent per year DB pensions after thirty years are higher with accrual rates of 1.75 percent per year than when benefit accrual rates are 2.25 percent per year but real wage growth is only 1.0 percent per year. Similarly, DC accumulations and subsequent annuity payments are an increasing function of real wage growth and contribution rates. Of the two factors contribution rates are more important for parameter values used in these simulations.

Projected DB and DC pension payments if an employee transitions to a DC plan after ten years are shown in Table 4. For mid-range contribution rates of 12.5 percent transition results in unambiguously higher incomes only for low rates of real wage growth and defined benefit accrual. If the contribution rate is 10.0 percent then transition results in lower simulated incomes in all states. However, if the contribution rate is 15.0 percent transition produces higher projected incomes in more than half of the real wage growth/defined benefit accrual states.

Simulation results for transition after fifteen years are shown in Table 5. If the contribution rate is 12.5 percent then transition generates higher retirement income only if real wage growth is 1.0 percent and the benefit accrual rate is 1.5 percent. However, if the contribution rate is 15.0 percent then transition results in higher incomes regardless of real wage growth if the defined benefit accrual rate is 1.50 percent. If the accrual rate is 1.75 percent then transition produces higher income if real wage growth is 1.0 percent, and approximately equal income if real wage growth is 1.50 percent. Transition after twenty years results in lower expected incomes given parameter values simulated here.[8]

Two other significant factors are involved in the determination of pension

TABLE 3. Transition After Five Years in Defined Benefit Plan: Results From Real Simulation

	Real wage gain 1.0% contribution rates of			*Real wage gain 1.5% contribution rates of*			*Real wage gain 2.0% contribution rates of*		
DB plan accrual rate	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*
DC pension	14,457	18,071	21,685	15,601	19,501	23,401	16,851	21,064	25,276
DB benefit	1,971	1,971	1,971	2,020	2,020	2,020	2,070	2,070	2,070
Combined	16,427	20,041	23,655	17,621	21,521	25,421	18,921	23,134	27,347
1.50% DB pension		15,163			17,585			20,378	
DC pension	14,457	18,071	21,685	15,601	19,501	23,401	16,851	21,064	25,276
DB benefit	2,299	2,299	2,299	2,357	2,357	2,357	2,415	2,415	2,415
Combined	16,756	20,370	23,984	17,957	21,857	25,757	19,266	23,479	27,692
1.75% DB pension		17,690			20,515			23,774	
DC pension	14,457	18,071	21,685	15,601	19,501	23,401	16,851	21,064	25,276
DB benefit	2,628	2,628	2,628	2,693	2,693	2,693	2,760	2,760	2,760
Combined	17,084	20,698	24,312	18,294	22,194	26,094	19,611	23,824	28,037
2.00% DB pension		20,218			23,446			27,170	
DC pension	14,457	18,071	21,685	15,601	19,501	23,401	16,851	21,064	25,276
DB benefit	2,956	2,956	2,956	3,030	3,030	3,030	3,105	3,105	3,105
Combined	17,413	21,027	24,641	18,630	22,531	26,431	19,956	24,169	28,382
2.25% DB pension		22,745			26,377			30,567	

Source: Author's calculations.

TABLE 4. Transition After Ten Years in Defined Benefit Plan: Results From Real Simulation

	Real wage gain 1.0% contribution rates of			*Real wage gain 1.5% contribution rates of*			*Real wage gain 2.0% contribution rates of*		
DB plan accrual rate	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*
DC pension	10,404	13,005	15,606	11,407	14,259	17,111	12,512	15,640	18,768
DB benefit	4,142	4,142	4,142	4,352	4,352	4,352	4,571	4,571	4,571
Combined	14,546	17,147	19,748	15,759	18,611	21,463	17,083	20,211	23,339
1.50% DB pension		15,163			17,585			20,378	
DC pension	10,404	13,005	15,606	11,407	14,259	17,111	12,512	15,640	18,768
DB benefit	4,833	4,833	4,833	5,077	5,077	5,077	5,333	5,333	5,333
Combined	15,237	17,838	20,439	16,484	19,336	22,188	17,845	20,973	24,101
1.75% DB pension		17,690			20,515			23,774	
DC pension	10,404	13,005	15,606	11,407	14,259	17,111	12,512	15,640	18,768
DB benefit	5,523	5,523	5,523	5,803	5,803	5,803	6,095	6,095	6,095
Combined	15,927	18,528	21,129	17,210	20,062	22,913	18,607	21,735	24,863
2.00% DB pension		20,218			23,446			27,170	
DC pension	10,404	13,005	15,606	11,407	14,259	17,111	12,512	15,640	18,768
DB benefit	6,213	6,213	6,213	6,528	6,528	6,528	6,857	6,857	6,857
Combined	16,618	19,219	21,820	17,935	20,787	23,639	19,369	22,497	25,625
2.25% DB pension		22,745			26,377			30,567	

Source: Author's calculations.

TABLE 5. Transition After Fifteen Years In Defined Benefit Plan: Results From Real Simulation

	Real wage gain 1.0% contribution rates of			*Real wage gain 1.5% contribution rates of*			*Real wage gain 2.0% contribution rates of*		
DB plan accrual rate	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*	*10%*	*12.50%*	*15%*
DC pension	7,086	8,857	10,629	7,888	9,860	11,831	8,780	10,975	13,170
DB benefit	6,530	6,530	6,530	7,033	7,033	7,033	7,571	7,571	7,571
Combined	13,616	15,388	17,159	14,920	16,892	18,864	16,350	18,545	20,740
1.50% DB pension		15,163			17,585			20,378	
DC pension	7,086	8,857	10,629	7,888	9,860	11,831	8,780	10,975	13,170
DB benefit	7,619	7,619	7,619	8,205	8,205	8,205	8,832	8,832	8,832
Combined	14,705	16,476	18,248	16,092	18,064	20,036	17,612	19,807	22,002
1.75% DB pension		17,690			20,515			23,774	
DC pension	7,086	8,857	10,629	7,888	9,860	11,831	8,780	10,975	13,170
DB benefit	8,707	8,707	8,707	9,377	9,377	9,377	10,094	10,094	10,094
Combined	15,793	17,565	19,336	17,264	19,236	21,208	18,874	21,069	23,264
2.00% DB pension		20,218			23,446			27,170	
DC pension	7,086	8,857	10,629	7,888	9,860	11,831	8,780	10,975	13,170
DB benefit	9,796	9,796	9,796	10,549	10,549	10,549	11,356	11,356	11,356
Combined	16,882	18,653	20,424	18,436	20,408	22,380	20,136	22,331	24,526
2.25% DB pension		22,745			26,377			30,567	

Source: Author's calculations.

incomes in these nonstochastic simulations. One is inflation, which erodes the value of the nominal pension benefit earned at the time of transition and may depress nominal investment returns as well. However, where the DB pension formula is computed using final salary, employees are protected until the time of retirement or transition. Income security in retirement is then dependent on the manner in which benefits are indexed, if at all. The second significant factor is the option value of switching to a DC plan. For example, consider the case of an employee in a DB plan, accruing pension rights at the rate of 2.0 percent per year, with real wage growth of 1.50 percent per year, offered the opportunity to switch to a DC plan after five years of coverage under the DB plan. In Table 3 this employee's eventual benefit under the DB plan is $23,446. Assuming a contribution rate of 12.50 percent in the DC plan, and with the small benefit earned under the DB plan, the table gives the eventual pension as $22,194.

Should the employee make the transition or not? That depends on the value the employee assigns to the DC "call option." The value of the option is a positive function of the value to the employee of the advantages such as portability and investment choice offered by the DC plan. Younger workers, in particular, would be expected to prefer DC plans. Additionally, the option value of DC plans would be a positive function of time until retirement. Younger workers can also bear more risk, and may have the ability in DC plans to choose riskier portfolios, with higher expected returns than in the generally conservative simulations shown here. Therefore under reasonable parameters the value of the option would be such that employees would prefer to make the transition to a DC plan even if the simulations show that the transition would result in somewhat smaller incomes in retirement.

The impact of attitudes toward risk on the transition choice is unclear. An extremely risk-averse employee may prefer the status quo and the expected certainty of an eventual DB pension. But at least in the private sector, many employers are converting from conventional DB to cash balance pension plans, a change that may reduce eventual pension benefits of older workers. In the public sector, conventional DB plans may appear more secure, but a jurisdiction which experiences severe fiscal pressure may feel compelled to cut pension contributions and hence future benefits for current workers. Additionally, the DC plan offers control over asset allocation, which often appeals to employees regardless of risk preferences.

Conclusions

Several issues arise when considering the transition from defined benefit to defined contribution pensions in the state and local government sector. While DB plans offer many advantages, a recent trend to DC plans in several public sector contexts suggests that the private sector trend may be spread-

ing to the public sector. We show that the appeal of moving from DB to DC pensions is partly due to the very different retirement wealth accumulations under the two plan types, such that under many transition scenarios, a worker would have greater retirement income security in a DC than in a DB plan. For those who value the option, employers may be able to induce employees to switch pension plans in a way that saves public plan employers—and taxpayers—money in the long run. The cost savings would come from paying only small future DB pensions to employees who switch, as opposed to large DB pensions based on final average salary to those who stay. Hence a transition option in which employees choose whatever plan was in their best interest might actually lower employer costs while improving employee welfare. Calculating the option value of transitioning from a DB to a DC plan is a direction for future research.

Notes

1. Jurisdictions outside social security generally oppose proposals to include them in the system, for fear it would have an adverse impact on plan funding status.

2. This conclusion is based on the author's perusal of PENDAT97 survey results.

3. Data from Europe suggest that early retirement benefit patterns strongly induce early retirement (Gruber and Wise 1999), and in the United States, Costa (1998) shows that eligibility for reduced and full social security benefits produce upward spikes in retirement rates at ages 62 and 65.

4. Front-loaded plans too may be designed to influence the date of retirement. For example, workers in the Illinois Downstate and Suburban Police Fund (who are not included in social security), have an accrual rate of 2.5 percent of final average salary during the first 20 years of service, falling to 2.0 percent per year from years 21–30, and then falling again to 1.0 percent per year after 30 years of service. Conversely, back-loaded plans do not encourage early retirement, unless they have caps on the maximum benefit replacement rate that can be earned. However, back-loaded plans often have fairly ungenerous benefit formulae. For example, workers in the Teachers' Retirement System of Illinois plan have a benefit accrual rate of 1.67 percent of final average salary during the first 10 years of employment, 1.9 percent per year from years 11–20, 2.1 percent per year from years 21–30, and 2.3 percent per year thereafter. Hence a worker retiring after 20 years of service at age 65 would receive a benefit replacement rate of only 35.70 percent of final average salary. A worker retiring at age 65 with 30 years of service would receive a replacement rate of 56.70 percent of final average salary. Plan members are not covered by social security.

5. No data are available on whether and how employer contributions are credited with interest.

6. Alternatively, unions may lobby for benefit increases.

7. Legislation in draft form also exists in Louisiana.

8. Simulations were also calculated with the following assumptions: The worker begins employment at age 35 with a starting salary of $25,000 and a nominal wage growth rate of 4.0 percent per year. In the DB plan, pension rights are vested after 5 years of service. In the DC plan, the overall employee and employer contribution rate is 12.5 percent of salary. DB pension rights accrue at 1.5, 1.75, 2.0, or 2.25 percent per year. Investment returns in the DC plan are alternatively 3.0, 6.0, 7.5, 9.0,

or 12.0 percent per year. Workers who leave the DB plan with vested rights after 5, 10, 15, or 20 years of service have their eventual DB pension rights valued based on their nominal salaries at that time. Workers who retire at age 65 in the DB plan have their pension rights valued based on their nominal salaries at that time. DC accumulations are converted into an annuity as in the simulations described in the text. These simulations generated results quite similar to those in the text. Details are available from the author on request.

References

Clark, Robert L., Loretta Harper, and M. Melinda Pitts. 1997. "Faculty Pension Choices in a Public Institution: Defined Benefit and Defined Contribution Plans." *Research Dialogues* 50 (March).

Costa, Dora L. 1998. *The Evolution of Retirement: An American Economic History, 1880–1990*, Chicago: University of Chicago Press.

Gruber, Jonathan and David Wise, eds. 1999. *Social Security and Retirement Around the World*, Chicago: University of Chicago Press, 1999.

Gustman, Alan L., Olivia S. Mitchell, and Thomas L. Steinmeier. 1994. "The Role of Pensions in the Labor Market: A Survey of the Literature." *Industrial and Labor Relations Review* 47, 3 (April): 417–38.

Hustead, Edwin C. This volume. "Determining Cost of Public Pension Plans."

Hustead, Edwin C. and Olivia S. Mitchell. This volume. "Public Sector Pension Plans: Lessons and Challenges for the Twenty-First Century."

Jaeger, David A. and Ann Huff Stevens. 1998. "Is Job Stability in the United States Falling? Reconciling Trends in the Current Population Survey and Panel Study of Income Dynamics." National Bureau of Economic Research Working Paper 6650, July.

Mitchell, Olivia S. and Roderick M. Carr. 1995. "State and Local Pension Plans." National Bureau of Economic Research Working Paper 5271, September.

Mitchell, Olivia S., David McCarthy, Stanley C. Wisniewski, and Paul Zorn. This volume. "Developments in State and Local Pension Plans."

Mitchell, Olivia S. and Robert S. Smith. 1994. "Pension Funding in the Public Sector." *Review of Economics and Statistics* 76, 2 (May): 278–90.

Poterba, James M. and Mark Warshawsky. 1999. "The Costs of Annuitizing Retirement Payouts from Individual Accounts." National Bureau of Economic Research Working Paper 6918, January.

Samwick, Andrew A. and Jonathan Skinner. 1996. "Abandoning the Nest Egg? 401(k) Plans and Inadequate Pension Saving." National Bureau of Economic Research Working Paper 5568, May.

Siegel, Jeremy J. 1998. *Stocks for the Long Run.* New York: McGraw-Hill.

U.S. House of Representatives. 1999. Bill 739, Retirement Account Portability Act of 1999. 106th Cong., 1st Sess.

Zorn, Paul, 1997. *1997 Survey of State and Local Government Employee Retirement Systems*, Chicago: Public Pension Coordinating Council, c/o Government Finance Officers Association.

———. 1998. *1997 Survey of State and Local Government Employee Retirement Systems: Data Base Users Guide.* Chicago: Public Pension Coordinating Council, c/o Government Finance Officers Association.