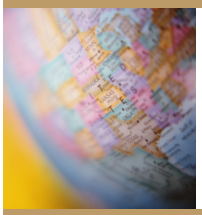

CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

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HOW RETIREMENT PROVISIONS AFFECT TENURE OF STATE AND LOCAL WORKERS

*By Alicia H. Munnell, Jean-Pierre Aubry, Joshua Hurwitz, and Laura Quinby**

Introduction

Public sector defined benefit pension plans are based on final earnings, so those with long careers receive substantial benefits and those who leave early receive little. This pattern of back-loading could reflect an optimal design whereby plan sponsors want to attract and retain workers who will stay with their employer for their entire career. But to the extent that state and local governments benefit from a diverse workforce comprised of both short and long-tenure workers, the current system may be poorly designed. A full career in the public sector may be optimal for both the employer and the employee in some situations, but in other instances shorter periods of employment may be more desirable for both parties. For example, social workers, who face burdensome caseloads and constant stress, are often exhausted long before retirement age. These workers need to move to new jobs in either the public or private sector. Therefore, a plan that disproportionately rewards long-service workers may lead some to stay who would be much better off elsewhere.

This *brief* uses a data set generated from actuarial valuations to see whether back-loading does indeed bind workers to their plans. The analysis exploits the fact that: 1) some public employees are covered by Social Security and some are not; and 2) some public employees are required to also participate in a defined contribution plan and others are not. The question is whether those who have these alternative sources of retirement income – which substantially reduce back-loading – are less likely to stay until the earliest age of eligibility for full benefits.

The discussion proceeds as follows. The first section reviews the nature of retirement arrangements in the state and local sector. The second section describes the derivation of the data used in the analysis.

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The third section reports how the probability of staying until the earliest full retirement age, once vested, is related to Social Security coverage and mandatory participation in a defined contribution plan. The final section concludes that, as in the private sector, the structure of benefits matters and that provisions that reduce the degree of back-loading reduce the likelihood of staying. In other words, when workers have the option to leave back-loaded plans, through retirement income from Social Security or a defined contribution component, they do. The main implication of this finding is that the recent trend towards adding a defined contribution component to state/local systems improves the benefit options for those who need to shift jobs.

Pension Design in the Public Sector

Retirement benefits in the public sector consist of three primary components: 1) a defined benefit plan based on final earnings; 2) Social Security for the 70 percent of state and local workers who are covered; and 3) a compulsory defined contribution plan for those participating in the few systems that have introduced a mandatory hybrid plan. The variation in the structure and level of total benefits among plans offers a unique opportunity to analyze the impact of plan design on participant behavior. The following describes each of the components.

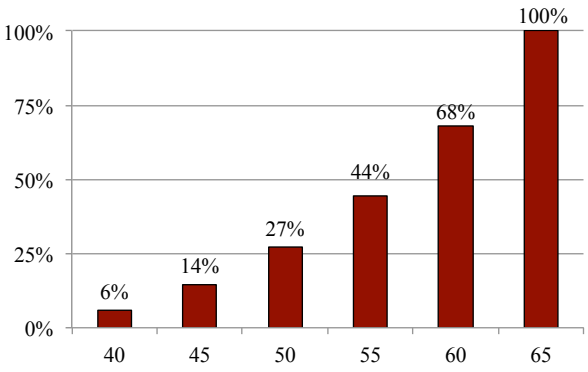
Final Earnings Defined Benefit Plans

Although state and local defined benefit plans vary enormously across states and between states and localities, they share a basic structure.[1] In almost all cases, they calculate the initial benefit at the full retirement age as the product of three elements: the plan's benefit factor (typically 2 percent), the number of years of employee service, and the employee's average earnings (generally based on the three to five years of highest earnings).

A simple model, which calculates the change (relative to the gross salary) in the present value of the promised pension benefit less the pension contribution, can illustrate the extent to which final pay plans are back-loaded.[2] This calculation, which is based on typical public plan characteristics, assumes a 2-percent benefit factor, a three-year averaging period, a full retirement age of 65, actuarially fair adjustments for early retirement, and a COLA that compensates for 1.5-percent inflation after the start of benefits. The calculation also assumes 4.5-percent nominal earnings growth (faster at young ages and then slowing) and 3-percent inflation.[3] Employees may claim a pension as early as age 55, provided they have accumulated at least 10 years of service. Those who leave prior to age 55 and have accumulated at least 10 years of service are assumed to claim a pension at the full retirement age. No cap is imposed on the replacement rate. Employee pension contributions are 5.5 percent of salary, the most typical rate in the Center's *Public Plans Database* (PPD).

The results of the calculation are shown in Figure 1. An employee starting at age 35 with a 30-year career will earn more than 30 percent of their lifetime pension benefits in the last five years of employment; those leaving with 10 years of service receive only about 14 percent of the possible lifetime benefits.[4] Thus, participants face a very strong incentive to keep working until full benefits are available.

Figure 1. Percent of Lifetime Pension Benefits Earned over an Employee's 30-year Career, Starting at Age 35



Source: Authors' calculations from the *Public Plans Database* (2010).

Social Security

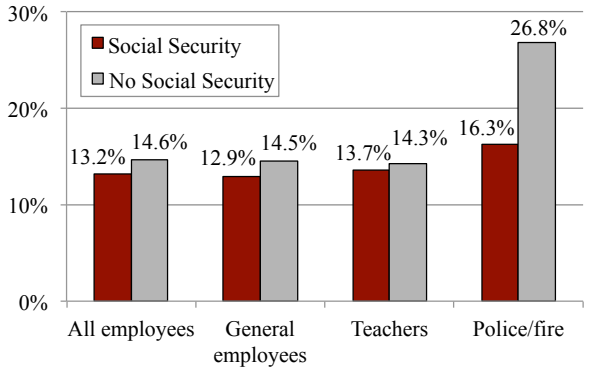
The second component is Social Security, to which the employer and employee each contribute 6.2 percent of earnings toward an inflation-indexed lifetime benefit with actuarial adjustments for early and late claiming between age 62 and 70. When Congress enacted the Social Security Act in 1935, it excluded all state and local workers from mandatory coverage due to constitutional concerns about whether the federal government could impose taxes on state govern-

ments. As Congress expanded coverage to include virtually all private sector workers, it also passed legislation in the 1950s that allowed states to elect voluntary coverage for their employees.[5] Today, only 70 percent of state and local workers are covered by Social Security.

In those systems that participate, Social Security's more even accrual rate and portability changes the pattern of benefit accruals. The combined Social Security/defined benefit structure is significantly less back-loaded than the defined benefit pension alone, so the two plans together reduce the ratio of total accruals in later years relative to those earned in earlier years.

Interestingly, joining Social Security also substantially increases the total size of the retirement package. One would have thought that those sponsors opting for Social Security coverage would have cut back on their defined benefit plans, but the normal cost of covered plans is only slightly lower than that for non-covered plans (albeit a significant difference exists for the small sample of police and fire plans in the PPD) (see Figure 2). It appears that the decision to join or not to join the Social Security program was not based on benefit design considerations.

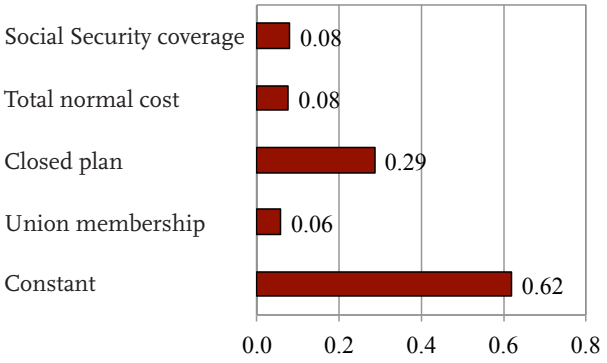
Figure 2. Total Normal Cost as a Percentage of Payroll, by Plan Type and Social Security Coverage, 2010



Sources: *Public Plans Database* (2010); and U.S. Government Accountability Office (2010).

The alternative to cutting back on the defined benefit plan would be a reduction in wages to offset the increase in benefits from joining Social Security. But a regression that relates the wages of public sector workers (relative to private sector workers) to both Social Security coverage and the total normal cost of the plan shows no offset. If anything, generous pension coverage appears to have a statistically significant positive relationship with wages (see Figure 3). (For full regressions and summary statistics, see Appendix Tables A1 and A2.)

Figure 3. Impact of Pension Provisions on Ratio of Average Plan Wage to Average State Private Sector Wage, Excluding Police/Fire Plans, 2010



Notes: All results are statistically significant at the 10-percent level or better. The bars represent a change from zero to one for dichotomous variables, and a one-standard-deviation change for continuous variables.
Sources: Authors' estimates from the *Current Population Survey* (2011); Hirsch and Macpherson (2010); and the *Public Plans Database* (2010).

Thus, the variation in Social Security coverage means that the public sector has two types of systems – those without Social Security in which the total retirement package is modest and extremely back-loaded and those with Social Security in which the package is much more generous and considerably less back-loaded.

Hybrid Defined Benefit/Defined Contribution Plans

The final component of the retirement package that affects the degree to which pension accruals are back-loaded is the existence of a mandatory hybrid plan, in which employees are required to participate in both a defined benefit and a defined contribution plan.[6] Sponsors of these plans generally reduce the accrual rate in their defined benefit plan to about 1 percent, so, unlike the case with Social Security, they do not add to the value of the package. But hybrid plans do make the package significantly less back-loaded in that participants accrue benefits in the defined contribution component at an even rate over their worklives.

The question under consideration is the extent to which the presence of alternative sources of retirement income and the reduction in back-loading affects the likelihood that participants will, once vested, stay until the age of earliest eligibility for full benefits.

The Data

To assess the likelihood of staying to retirement once vested, it would be lovely to have data on each individual in each plan in the PPD. Unfortunately, such data are not readily available. But it is possible, using each system's actuarial valuation, to engineer a representative population of plan participants and estimate the percentage of those who remain until retirement.

The valuations provide "decrement tables" that contain the rate at which plan members of a given age and tenure are expected to terminate or retire within the next year.[7] One minus these decrement rates is approximately the probability of an individual plan member of a given age and service remaining one additional year.

The probabilities of an individual remaining one additional year can be used to generate the probability of an individual staying in the plan for multiple years. For example, as shown in Table 1, an individual with a starting age of 25 and zero years of service has an 82-percent chance of staying for one year. In addition, the table shows that a year from now, when that individual is 26 with one year of service, he has an 88 percent chance of staying one more year. These 1-year probabilities can be multiplied to calculate the cumulative probability of the 25-year-old staying multiple years. That is, he has an 82.0 percent probability of remaining for one year, a 72.1 percent probability of remaining for two years, a 67.7 percent probability of remaining for three years and so on. This process is replicated for each age (roughly 30) and length of tenure (roughly 35) and for each plan in the PPD (roughly 120), producing about 126,600 probabilities.

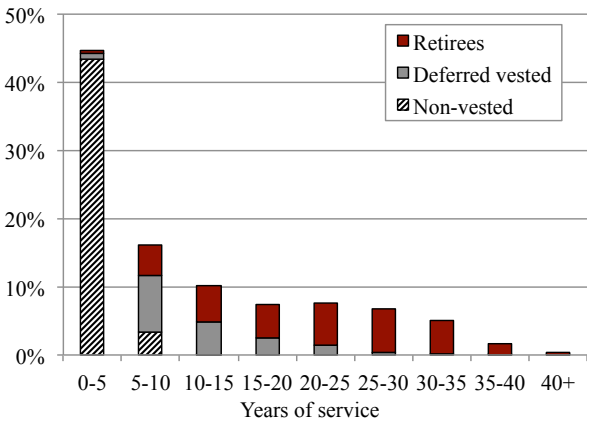
The projected distribution by tenure and benefit status of participants leaving the plan is shown in Figure 4. The important point for this analysis is that participants leave with various tenures. The question under consideration is how the structure of the plans' retirement program affects the decision to remain.

Table 1. Probability of Remaining in the Plan by Starting Age and Years of Service

Starting age	Years of service					
	0	1	2	3	4	5
25	**82.0**	87.0	92.0	93.0	94.0	94.2
26	83.0	**88.0** *72.1**	93.0	94.0	94.2	94.5
27	84.0	89.0	**94.0** *67.7 **	94.2	94.5	94.8
28	85.0	90.0	94.1	**94.5** *64.0 **	94.8	95.0
29	86.0	91.0	94.3	94.7	**95.0** *60.8 **	95.2
30	87.0	92.0	94.5	95.0	95.2	**95.5** *58.0 **

* Numbers in italics represent cumulative probabilities.
Source: Authors' calculations from actuarial valuation reports.

Figure 4. Distribution of Leavers in *Public Plans Database*, by Tenure and Benefit Status, 2011



Source: Authors' estimates from various actuarial reports.

Impact of Alternative Benefit Structures

The synthetic data are used to analyze the probability of staying with the plan long enough to be eligible for full benefits, once vested.[8] The analysis involves estimating an equation of the following form:

$$P_i(v|a) = ß_0 + ß_1 SS_i + ß_3 DC_i + ß_2 V_i + ß_4 W_i + \mathbf{ßX} + \boldsymbol{\varepsilon}$$

where the probability of staying for a member of a given starting age is related to whether the plan has Social Security coverage, SS_i, and mandatory participation in a defined contribution plan, DC_i.[9] Addition-

al variables include the number of years required for vesting V_i, the ratio of average annual salaries in the plan divided by the average annual private sector salary in the state, W_i; and a vector of eight dichotomous variables, $\boldsymbol{X}$, that captures the member's age at hire, broken into five-year brackets, from 20 to 54.

The coefficients of particular interest are those for Social Security coverage and a mandatory defined contribution plan. Social Security coverage means that the combined Social Security/public plan benefit structure is less back-loaded than the public plan alone, because Social Security benefits accrue at a more even pace over the employee's work life. Thus, Social Security coverage would be expected to be associated with a lower likelihood of staying until earliest eligibility for full benefits.[10] A similar rationale applies to mandatory defined contribution participation.

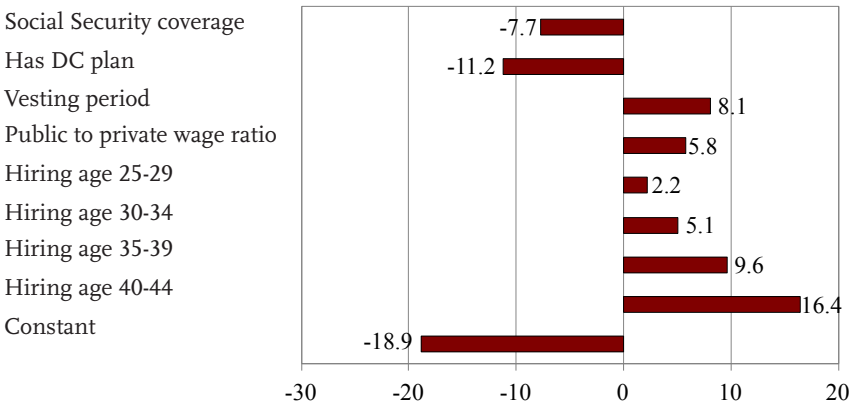
In terms of vesting, a longer vesting period is likely to increase the probability, once vested, of staying until eligible for full retirement benefits, because the longer the vesting period, the older the participant will be and, therefore, the closer to retirement eligibility. The ratio of public to private wages should also be related positively to remaining on the job. Finally, the probability of staying should increase with age.

The regression results are shown in Figure 5. (For full regressions and summary statistics, see Appendix Tables A3 and A4.) Both Social Security coverage and mandatory participation in a defined contribution plan have negative coefficients that are statistically significant. The obvious interpretation is that these alternative sources of retirement income moderate the back-loading of the plan and reduce the likelihood that people will remain. That is, despite the fact that plans with Social Security are significantly more generous, when participants have the opportunity to leave, they take it.

Conclusion

It is not news that benefit design affects retirement patterns; numerous studies of private sector pensions have documented such a relationship. Much less is known, however, about patterns in the public sector. This analysis shows that final earnings defined benefit plans keep workers longer than plans with less back-loaded pension benefits. Career employment might be the right answer for some public employees, but is unlikely the right answer for all. Therefore, the movement toward hybrid arrangements is likely to improve outcomes for state and local workers who need to change jobs.

Figure 5. Impact of Selected Factors on Probability of Remaining in Plan until Earliest Normal Retirement Eligibility Once Vested, Excluding Police and Fire Plans, 2010



Notes: All results are statistically significant at the 10-percent level or better. The bars represent a change from zero to one for dichotomous variables, and a one-standard-deviation change for continuous variables.
Sources: Authors' estimates from the *Current Population Survey* (2011); and the *Public Plans Database* (2010).

Endnotes

1 Nebraska is an exception to this generalization since it has a cash balance plan for general state employees. Nebraska still provides a traditional pension benefit for its public school teachers and state police. The Texas Municipal Retirement System, Texas County and District Retirement System, and California State Teachers' Retirement System (for part-time employees of community colleges) also provide a cash balance plan.

2 This model is based on Diamond et al. (2010).

3 Salary increases average 4.5 percent annually over the course of the worker's career, declining from 6 percent at age 25 to 3 percent at age 65. This pattern is consistent with the graded salary scales provided in most actuarial valuations.

4 Present values are computed using a real interest rate of 3 percent, similar to the 2.9 percent rate used in the 2012 *Social Security Trustees Report*. Mortality rates are formed as a 50-50 gender mix of the RP-2000 combined healthy tables, projected to 2012 using Scale AA. The calculation is pre-tax; it ignores the role of both income and payroll taxes, as well as promised Social Security benefits, in determining the level of compensation.

5 Specifically, amendments to the Social Security Act in 1950, 1954, and 1956 allowed states, with the consent of employees in the pension plan, to elect Social Security coverage through agreements with the Social Security Administration (making their taxation voluntary). The amendments also allowed states to withdraw from the program after meeting certain conditions, although this option was eliminated in 1983.

6 Georgia ERS, Indiana PERF, Indiana Teachers, Michigan Public Schools, and Oregon PERS all have mandatory hybrid plans. Washington PERS 2/3, Washington School Employees' Plan 2/3, and Washington Teachers 2/3 each have a hybrid tier and a defined contribution tier. Alaska PERS and Alaska Teachers defined benefit plans were considered hybrids because both these plans have a mandatory supplemental defined contribution component. Florida RS was considered a hybrid because defined benefit members are permitted to switch to the optional defined contribution system at any point in their career. Finally, South Dakota PERS was also categorized as a hybrid because terminating members receive not only their own contributions back, but 85 percent of employer contributions on their behalf. This feature makes South Dakota PERS more portable than traditional defined benefit plans.

7 Within a given plan, benefit generosity and plan design often vary by occupation and date of hire, creating "tiers." Whenever possible, demographic tables were collected by plan tier and gender, and the relevant decrement rates applied to each group. When detailed demographic information was not available, the rates of the largest demographic subgroup were applied to the whole population; for example, female rates were often applied to the entire membership of teachers' plans. The rates presented in the decrement tables are based on the plan's actual experience over some length of time and are typically updated by the plan's actuaries every five years, when the plan performs an experience study.

8 This analysis builds on a recent brief (Munnell et al. 2012b) that examined the factors associated with staying until vested. A key finding is that the longer the vesting period, the less likely an employee will remain long enough to vest.

9 Social Security coverage is a dichotomous variable equal to one if a majority of plan members are covered by Social Security, and zero otherwise.

10 On the other hand, Social Security coverage means that the accruing retirement income is much more substantial than under a public plan alone. More substantial accruals create both an income and substitution effect. The income effect means that the participant has more purchasing power and, therefore, the ability to buy leisure at older ages and to be more mobile at younger ages. That is, the variable would be expected to have a negative coefficient. However, the large accruals also raise the price of leisure and, perhaps, moving jobs, which suggests that coverage might encourage staying until eligibility and would have a positive coefficient.

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APPENDIX

Table A1. Regression Results for Ratio of Average Plan Wage to Average State Private Sector Wage, Excluding Police and Fire Plans, 2010

Variable	Coefficient
Social Security coverage	0.0795 *
	(0.045)
Total normal cost	0.0170 ***
	(0.004)
Closed plan	0.2856 ***
	(0.091)
Union membership	0.0029 ***
	(0.009)
Constant	0.6190 ***
	(0.074)
R-Squared	0.2963
Number of observations	113

Notes: Robust standard errors are in parentheses. Coefficients are significant at the 10-percent (*) or 1-percent (***) levels.
Sources: Authors' estimates from the *Current Population Survey* (2011); Hirsch and Macpherson (2010); and the *Public Plans Database* (2010).

Table A2. Summary Statistics for the Regression on Ratio of Average Plan Wage to Average State Private Sector Wage, Excluding Police and Fire Plans, 2010

Variable	Mean	Standard deviation	Minimum	Maximum
Dependent variable	1.015	0.221	0.508	1.706
Social Security coverage	0.761	0.428	0	1
Total normal cost	12.444	4.404	5.850	32.844
Closed plan	0.053	0.225	0	1
Union membership	36.889	19.438	6.200	72.400

Sources: Authors' calculations from the *Current Population Survey* (2011); Hirsch and Macpherson (2010); and the *Public Plans Database* (2010).

Table A3. Regression Results on Probability of Remaining in Plan until Earliest Normal Retirement Eligibility Once Vested, Excluding Police and Fire Plans, 2010

Variable	Coefficient	
Social Security coverage	-7.6890	*
	(3.900)	
Has DC plan	-11.1948	**
	(4.432)	
Vesting period	3.5384	***
	(0.718)	
Public to private wage ratio	26.9642	***
	(8.826)	
Hiring age 25-29	2.1849	***
	(0.705)	
Hiring age 30-34	5.0819	***
	(1.374)	
Hiring age 35-39	9.6116	***
	(1.697)	
Hiring age 40-44	16.4492	***
	(1.982)	
Constant	-18.8669	**
	(9.143)	
R-Squared	0.2925	
Number of observations	2,550	

Notes: Robust standard errors are in parentheses. Coefficients are significant at the 10-percent (*), 5-percent (**), or 1-percent (***) levels.
Sources: Authors' estimates from the *Current Population Survey* (2011); and the *Public Plans Database* (2010).

Table A4. Summary Statistics for the Regression on Probability of Remaining in Plan until Earliest Normal Retirement Eligibility Once Vested, Excluding Police and Fire Plans, 2010

Variable	Mean	Standard deviation	Minimum	Maximum
Dependent variable	29.404	21.816	0	95.296
Social Security coverage	0.725	0.446	0	1
Has DC plan	0.137	0.344	0	1
Vesting period	6.054	2.283	0	10
Public to private wage ratio	1.012	0.216	0.508	1.706
Hiring age 25-29	0.200	0.400	0	1
Hiring age 30-34	0.200	0.400	0	1
Hiring age 35-39	0.200	0.400	0	1
Hiring age 40-44	0.200	0.400	0	1

Sources: Authors' calculations from the *Current Population Survey* (2011); and the *Public Plans Database* (2010).

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The Center for Retirement Research at Boston College was established in 1998 through a grant from the Social Security Administration. The Center's mission is to produce first-class research and educational tools and forge a strong link between the academic community and decision-makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

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