THE IMPACT OF LONG VESTING PERIODS ON STATE AND LOCAL WORKERS

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

INTRODUCTION

Stories abound regarding the generous pension benefits provided to state and local government workers, but two aspects of plan design leave many of these workers with little or no accrued benefits. First, state/local plans are based on final earnings, under which those who leave early receive little. Second, employee vesting – the period of service needed to qualify for any pension benefit – takes five or ten years. In most cases, participants who leave before vesting receive only their own contributions plus some low rate of interest. Even once vested, benefits under the final earnings plan are trivial for many years. This arrangement raises a basic question of fairness, since it is not possible to identify early leavers and compensate them with higher wages. Fairness is a particularly important issue in states like California, Connecticut, Massachusetts, Illinois, Louisiana, and Ohio,

where one or more of the large retirement systems do not participate in Social Security. With no Social Security and long vesting periods, short-service workers can leave with no benefits of any kind for their time spent in public employment. This *brief* explores how long vesting periods reinforce the adverse effects of a back-loaded benefits structure on state/local workers.

The discussion proceeds as follows. The first section describes the typical state and local plan and documents the extent of back-loading and vesting provisions. The second section explains the construction of the data used in the analysis, which reveal that nearly half of workers leaving state and local employment depart without any promise of future benefits. The third section presents an equation that relates the probability of vesting to the length of the vesting period. The final section concludes that back-loaded

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benefits and long vesting periods deprive short-term workers of retirement protection. The finding suggests that the recent trend towards the introduction of a defined contribution component in state/local systems provides for a more equitable distribution of benefits between short-term and career employees.

THE DESIGN OF PUBLIC SECTOR DEFINED BENEFIT PLANS

Public defined benefit plans vary enormously across states and between states and localities, because these plans cover three different sets of workers – general government employees, teachers, and public safety personnel – each of whom have different career paths (see Table 1).

TABLE 1. STATE AND LOCAL FULL-TIME EQUIVALENT EMPLOYEES BY FUNCTION, 2010, IN MILLIONS

| Activity	State	Local	Total
Education	1.8	7.1	8.9
Elementary and secondary	0.1	6.8	6.9
Higher education	1.7	0.3	2.0
Protective services	0.8	1.7	2.4
Health	0.6	0.8	1.4
Community development*	0.6	0.8	1.4
Transportation	0.3	0.5	0.8
Administration	0.2	0.5	0.7
Public welfare	0.2	0.3	0.5
Public utilities and waste management	0.0	0.5	0.5
Total	4.4	12.2	16.6

* Includes Libraries, Housing, Community Development, Environment, Recreation, and All Other.
Source: U.S. Census Bureau, *Annual Public Employment Survey*, 2011.

Nevertheless, the defined benefit plans share a basic structure. In almost all cases, they calculate the initial benefit at the full retirement age as the product of three elements: 1) the plan's benefit factor, 2) the number of years of employee service, and 3) the employee's average earnings, which are generally based on the three to five years of highest earnings

(see Figure 1).[1] As a result, a worker in a plan with a 2-percent benefit factor retiring after 25 years with a $50,000 final salary would receive a pension benefit of $25,000.

FIGURE 1. DISTRIBUTION OF STATE AND LOCAL PLANS, BY YEARS IN AVERAGING PERIOD, 2009
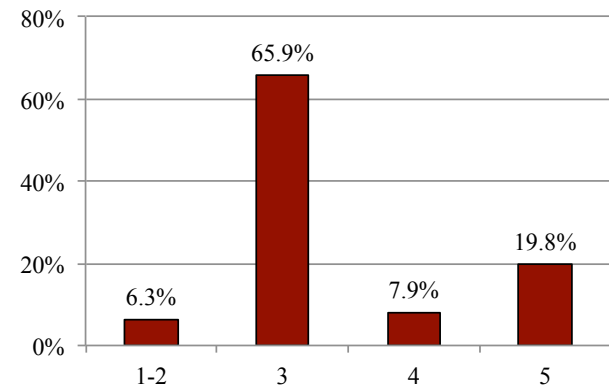
Source: *Public Plans Database* (2009).

A simple model based on typical public plan characteristics can illustrate the extent to which final pay provisions produce back-loaded benefits.[2] The measure used to calibrate the degree of back-loading is the change (relative to the gross salary) in the present value of the promised pension benefit less the pension contribution at each age.[3] This measure increases markedly throughout a worker's career and particularly at older ages (see Figure 2).

FIGURE 2. INCREASE IN LIFETIME PENSION BENEFIT AS A PERCENTAGE OF ANNUAL EARNINGS
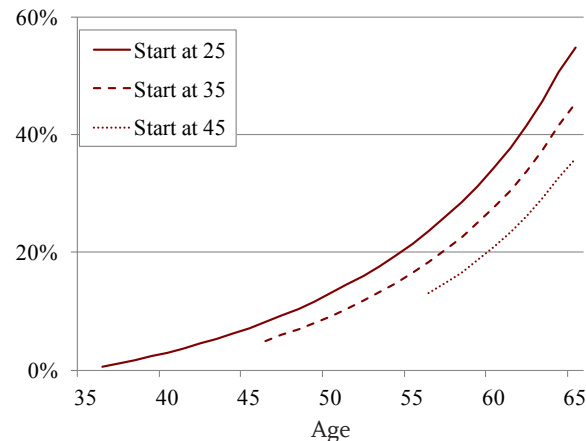
Source: Authors' calculations.

As a result, an employee starting at 35 with a 30-year career will earn more than 30 percent of lifetime pension benefits in the last five years of employment; those leaving with 10 years of service receive about 14 percent of the possible lifetime benefits (see Figure 3). Thus, participants face minimal benefits if they leave early and a very strong incentive to keep working until full benefits are available.[4]

Figure 3. Percent of Lifetime Pension Benefits Earned over an Employee's 30-year Career, Starting at Age 35
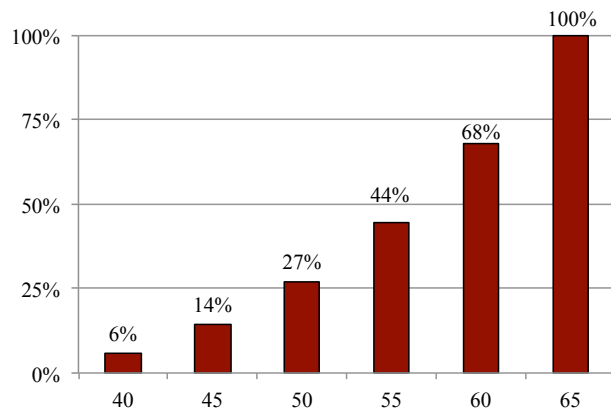
Source: Authors' calculations from the *Public Plans Database* (2010).

In addition to back-loaded benefits, public plans have very long vesting periods (see Figure 4). Nearly a quarter of plans require 10 years of work for full vesting. In contrast, in the private sector, the Employee Retirement Income Security Act (ERISA) requires either graduated vesting beginning after 3 years of service or cliff vesting after 5 years for defined benefit plans.[5] In the public sector, those who leave before they are vested generally receive back only their own contributions plus some low rate of interest. The question is whether delayed vesting increases the likelihood that people leave with nothing or whether they remain with the plan until vested.

The Data

To assess the impact of vesting on public employees, it would be lovely to have data on each individual in each plan in the *Public Plans Database* (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 vest.

Figure 4. Distribution of State and Local Plans, by Years in Vesting Period, 2010
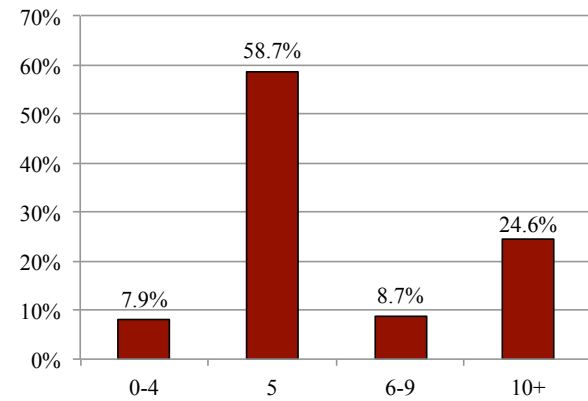
Source: *Public Plans Database* (2010).

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.[6] 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 2, an individual with a starting age of 25 and zero years of service has an

Table 2. 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.

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.

Applying the probabilities to a representative population of plan members generates a distribution of leavers by age and tenure. Figure 5 shows the projected distribution, by tenure and benefit status, of participants leaving the plan. The important point for this analysis is that, of those who leave state and local pension plans, 47 percent depart without any promise of future benefits (see Figure 6).[7] The probability data were then used to estimate how the length of the vesting period affects the likelihood of becoming vested.

FIGURE 5. DISTRIBUTION OF LEAVERS IN *PUBLIC PLANS DATABASE,* BY TENURE AND BENEFIT STATUS, 2011
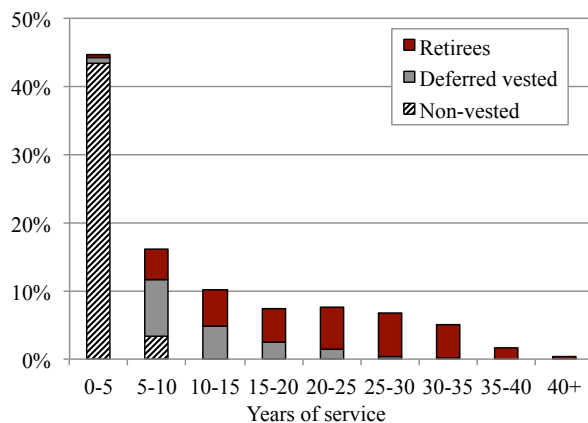
Source: Authors' estimates from various actuarial reports.

FIGURE 6. PERCENT OF LEAVERS IN *PUBLIC PLANS DATABASE,* BY BENEFIT STATUS, 2011
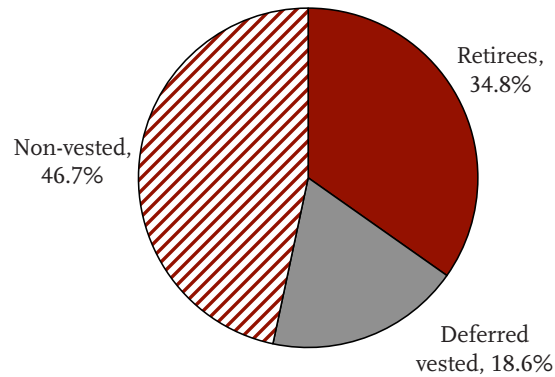
Source: Authors' estimates from various actuarial reports.

THE IMPACT OF VESTING

The analysis on the probability of staying with the plan long enough to vest involves estimating an equation of the following form:

$$P_i\,(v|a) = \beta_0 + \beta_1 SS_i + \beta_2 V_i + \beta_3 DC_i + \beta_4 W_i + \beta X + \varepsilon$$

where the probability of staying in the plan long enough to vest, for a member at a given starting age, is related to whether the plan has Social Security coverage, SS_i, the number of years required for vesting, V_i, and participation in a defined contribution plan, DC_i.[8] An additional variable is the ratio of average annual salaries in the plan divided by the average annual private sector salary in the state, W_i.[9] Finally, a vector of eight dichotomous variables, X, captures the member's age at hire, broken into five-year brackets, from 20 to 54.

The coefficient of interest is that for the vesting period. The intuition here is that the longer the plan's vesting period, the less likely the participant is to vest. The impact of Social Security coverage could have either a positive or negative effect on tenure, while the presence of a defined contribution plan should reduce the incentive to stay until vesting since participants have something to take with them should they leave. Higher wages should encourage people to stay, as should age.

FIGURE 7. IMPACT OF SELECTED FACTORS ON PROBABILITY OF VESTING, EXCLUDING POLICE AND FIRE PLANS, 2010
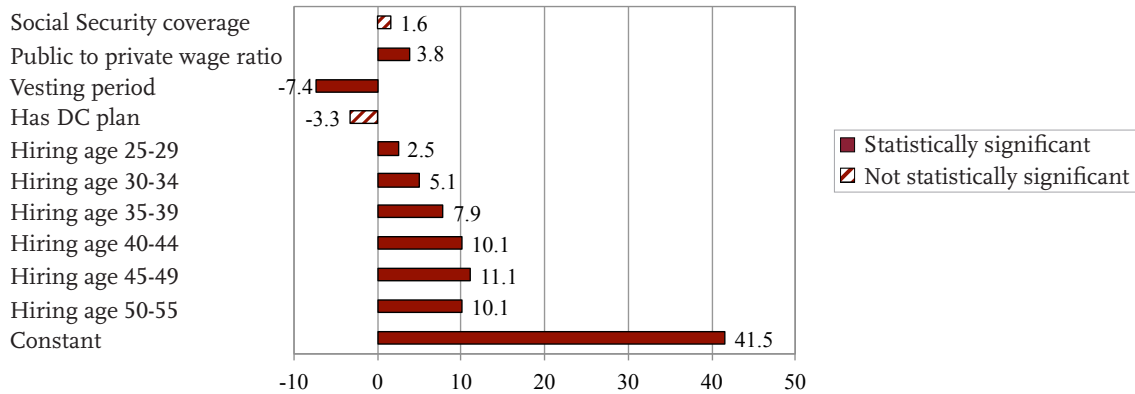
Notes: Solid bars indicate significance at the 10-percent level or better. The bars represent a change from zero to one for dichotomous variables, and a one-standard-deviation change for continuous variables.
Sources: Authors' estimates from the U.S. Department of Labor, *Current Population Survey* (2011) and the *Public Plans Database* (2010).

The results are shown in Figure 7. (Full regressions and summary statistics appear in the Appendix.) As expected, the probability of vesting is negatively related to the vesting period, and has a statistically significant coefficient. A one-standard-deviation increase in the vesting period (2.3 years) reduces the probability of an employee remaining until vested by 7.4 percentage points. This result implies that a vesting period of 10 years instead of five reduces the probability of staying until vested by about 16 percentage points. The results also show that a higher average wage in the plan relative to wages in the private sector is associated with staying and the later the age at which people are hired, the more likely they are to remain until vesting. Neither Social Security nor participation in a defined contribution plan has a statistically significant effect. The main message from the vesting equation is that long vesting periods are likely to lead to participants leaving with no accrued benefits.

CONCLUSION

Sole reliance on final earnings defined benefit plans raises human resource and equity issues. Final earnings plans produce strongly back-loaded benefits and, when combined with delayed vesting, deprive short-term employees of retirement protection, especially for those systems that do not participate in Social Security. Therefore, some mixture of defined benefit and defined contribution plans will produce a better balance between the benefits provided to short- and long-tenure workers.

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 exercise, based on Diamond et al. (2010), uses a plan with a constant 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 average COLA in the *Public Plans Database* (PPD). The calculation also assumes 4.5 percent nominal earnings growth (faster at young ages and then slowing) and 3 percent inflation. Employees may claim a pension as early as 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 found among our PPD sample of plans.

3 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.

4 If the plan caps the replacement rate, the strong incentive to continue working stops when the cap is reached.

5 For 401(k) plans, the predominant retirement plan offering for private sector workers, ERISA requires either graduated vesting beginning after two years of service or cliff vesting after three years.

6 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.

7 This pattern is similar to that found by the State of Maine Unified Retirement Plan Task Force (2010).

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

9 The average plan wage was obtained by dividing total payroll in the PPD by the number of active members in the PPD. The average private sector wage was produced by the March Supplement of the 2011 *Current Population Survey*. The private sample was limited to non-military workers between the ages of 16 and 75 who earn more than $9,000 per year.

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APPENDIX

TABLE A1. REGRESSION RESULTS ON PROBABILITY OF
VESTING, EXCLUDING POLICE AND FIRE PLANS, 2010

Variable	Coefficient
Social Security coverage	1.5870
	(3.205)
Public to private wage ratio	17.5768 ***
	(6.548)
Vesting period	-3.2257 ***
	(0.642)
Has DC plan	-3.2853
	(3.325)
Hiring age 25-29	2.4542 ***
	(0.438)
Hiring age 30-34	5.0787 ***
	(0.693)
Hiring age 35-39	7.8640 ***
	(0.965)
Hiring age 40-44	10.1072 ***
	(1.213)
Hiring age 45-49	11.1162 ***
	(1.374)
Hiring age 50-55	10.0817 ***
	(1.444)
Constant	41.54995 ***
	(8.748)
R-Squared	0.2746
Number of observations	3,570

Notes: Robust standard errors are in parentheses. Coeffi-
cients 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 A2. SUMMARY STATISTICS FOR REGRESSION ON PROBABILITY OF VESTING, EXCLUDING POLICE AND FIRE PLANS, 2010

Variable	Mean	Standard deviation	Minimum	Maximum
Probability of vesting	47.19	17.94	3.629	96.04
Social Security coverage	0.725	0.446	0	1
Public to private wage ratio	1.012	0.216	0.508	1.706
Vesting period	6.054	2.283	0	10
Has DC plan	0.137	0.344	0	1
Hiring age 25-29	0.143	0.350	0	1
Hiring age 30-34	0.143	0.350	0	1
Hiring age 35-39	0.143	0.350	0	1
Hiring age 40-44	0.143	0.350	0	1
Hiring age 45-49	0.143	0.350	0	1
Hiring age 50-55	0.143	0.350	0	1

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

About the Center

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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