Article from

In The Public Interest

July 2018
Issue 17

Are Most Teachers Better Off With a DB Pension, 401(k), or Cash Balance Plan? The Case of CalSTRS

By Nari Rhee and William B. Fornia

Most public school teachers in the U.S. are covered by traditional defined benefit (DB) pensions designed to reward long service. Several studies have been released in recent years that argue that "most teachers" do not receive meaningful pension benefits—e.g., McGee and Winters (2013 and 2015), Aldeman and Rotherham (2014), Johnson and Southgate (2015), Aldeman and Johnson (2015), Costrell and Mcgee (2016), and Luecken (2017).[1] These studies cite high turnover among new-hire cohorts as the basis for claiming, as Aldeman and Johnston (2015) do, that "most teachers get nothing from their pensions" under a Final Average Salary (FAS) DB pension given its back-loaded benefit structure.[2]

A major failing of these studies is that they conflate new hire cohorts with the teaching profession as a whole. When policymakers, parents and the public think about teachers, they generally think about those working in classrooms today—that is, they think about the teaching workforce. Understanding how retirement plan design affects the teaching profession requires looking at a representative cross-section of the teaching workforce, weighted by teaching position, not just by new entrant.[3] Only then can we understand whether most teaching jobs are held by foot-loose itinerants who are better off with Defined Contribution (DC) plans, or those committed for the long haul who stand to benefit from a traditional DB pension.

In this study, we ask whether most teachers currently working in California public schools can expect to stay long enough to accrue higher benefits under their pension than alternative retirement plans with the same expected cost and the same capital market assumptions.[4]

We first project the distribution of currently active teachers by age and years of service at withdrawal or retirement. We then model retirement benefit outcomes for teachers at different entry ages under the California State Teachers' Retirement System (CalSTRS) DB pension, an idealized 401(k) plan, and an exceptionally generous cash balance (CB) plan that offers a guaranteed interest rate equal to the CalSTRS DB pension expected return. The alternative plans are assumed to receive contributions equal to the normal cost for retirement benefits provided by the CalSTRS DB pension. Finally, we estimate the share of teachers who, based on age and years of service at exit, would receive higher retirement income from the CalSTRS pension than the idealized 401(k) and CB plan.

Importantly, while we do not fully account for the value of the DB pension guarantee during the accumulation phase, we calculate retirement income outcomes on apples-to-apples terms by converting DC and CB account balances to a life annuity, priced with CalSTRS-specific mortality assumptions and (for DC) a reasonable rate for private insurance group annuities.

We find that most California teachers can expect a long career: 73 percent of teachers can expect to work at least 20 years, and 46 percent can expect to work at least 30 years. Furthermore, 83 percent of the California teacher population will stay until age 55, early retirement age. Even on an entering cohort basis, controlled for age, half of current new hire teachers in California (50 percent) are better off with the DB pension than the idealized DC plan. Ultimately, 85 percent of California's teaching population will accrue higher benefits under the CalSTRS DB pension than through an idealized 401(k), and 76 percent will accrue higher benefits than through a generous CB plan.

The remainder of this article is organized as follows. The following section analyzes teacher turnover and tenure based on the current demographics of the California teaching workforce. The next section describes our alternative benefit modeling methodology and results. Finally, we apply the benefit modeling results to our tenure analysis to estimate the share of currently active teachers that are better off in the DB plan, versus an idealized DC plan and generously structured CB plan.

TURNOVER AND TENURE AMONG CALIFORNIA TEACHERS

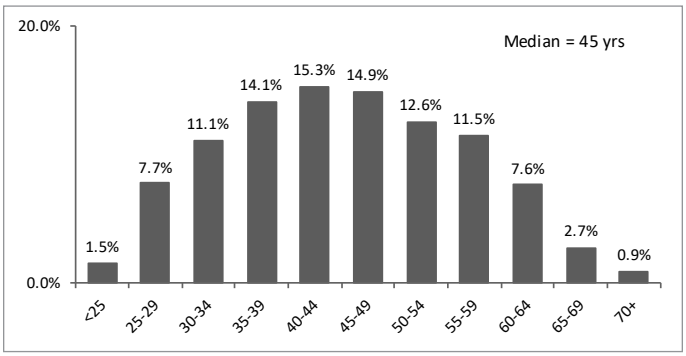
We obtained the following data from CalSTRS: detailed age-service tables for the active membership as of FY 2016; detailed actuarial assumptions adopted in 2016, including annual death, disability, withdrawal, and retirement rates, contingent on age and accrued service years, based on recent CalSTRS experience. We also obtained anonymized microdata for FY 2014 that includes each CalSTRS active member's accrued service credits, hire date, and birth year and month. For our tenure analysis, we conducted a survival analysis by applying the actuarial assumptions to the teacher counts in the age-service table in order to calculate the final age-service distribution, at exit, of currently active teachers.

Current Age And Service Profile

There are currently over 438,000 teachers working in California public schools, community colleges, and state and county job-training programs, based on the CalSTRS active membership count for the fiscal year ending June 30, 2016. Half of active teachers have 11 full years of service or less in California schools (**Figure 1**). Nearly 28 percent of the teacher population in our analysis is a relatively recent hire, with less than five years of service credits as of the end of the 2015–2016 school year.

Although the service distribution is skewed towards recently hired teachers, the age distribution of the California teaching workforce mirrors the college-educated labor force, with a median age of 45 years (**Figure 2**). Looking at the age distribution of teachers hired in FY 2014, the mode is clearly age 25, but there is a long right-hand tail; thus the median is 29.2 years, and the mean is 32.7 (**Figure 3**).

Figure 1
Accrued Service Years Among California Teachers



Note: Authors' analysis of CalSTRS active membership data as of June 30, 2016.

Figure 2
Age Distribution of California Teachers

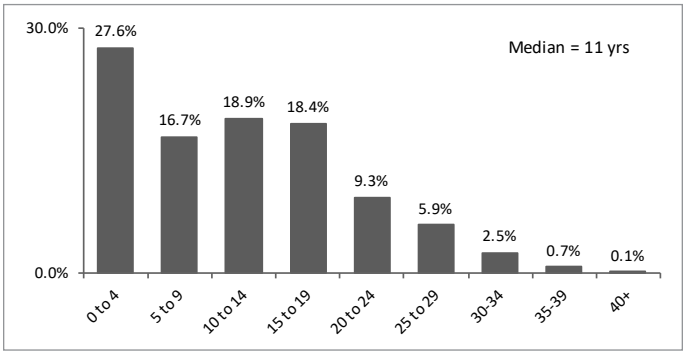


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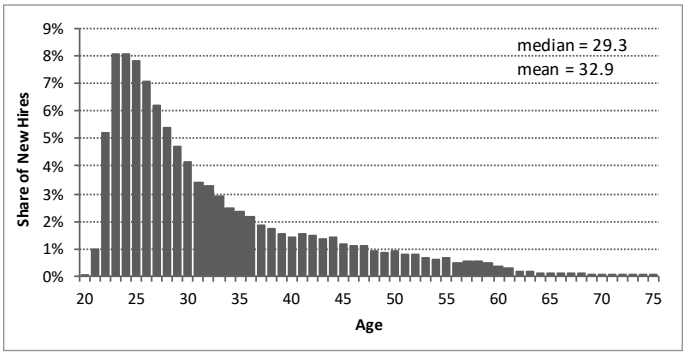
Figure 3
Age Distribution of California New Hire Teachers



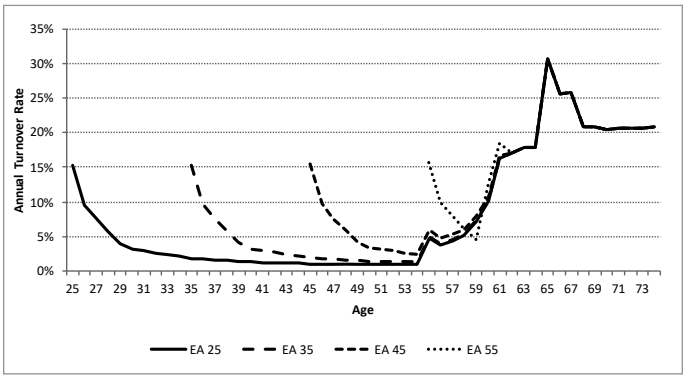
Note: Authors' analysis of CalSTRS active membership microdata for FY 2014.

Turnover And Tenure Analysis

We combined CalSTRS' separation, retirement, disability and pre-retirement mortality rates to construct survival curves for each age-service cohort in the active membership table, and projected the active membership counts in each cohort forward until age 75, when CalSTRS actuaries assume all surviving teachers will retire. We assumed that teachers who are currently age 75 or older will retire immediately.

Turnover rates indicate that retention of California teachers within the state as a whole is remarkably high after the initial churn of the pre-vesting years. **Figure 4** illustrates turnover by entry age. Turnover is highest in the first three years after hire, and then decreases dramatically until early retirement age. Indeed, for teachers hired at age 25, the cohort turnover rate for most years between vesting and age 55 is roughly 1 percent.

Figure 4
Age-Specific Turnover Rates, by Entry Age



Note: Authors' analysis of CalSTRS actuarial assumptions adopted FY 2016. Data reflect weighted average of male and female turnover rates.

When the careers of the current teaching workforce are projected forward, it turns out that the vast majority of California teachers can expect a long teaching career in the state, and that the typical California teacher will stay until retirement age. Nearly half (47 percent) of the teaching workforce will have earned at least 30 years of service by the time they leave the California schools (**Figure 5**). One-quarter (25 percent) will leave with 20 to 29 years of service. These add up to 72 percent of teachers staying at least 20 years. Only 6 percent will leave without vesting, and 22 percent will leave with five to 19 years of service.[5]

Figure 5
Projected Tenure of Current California Teachers

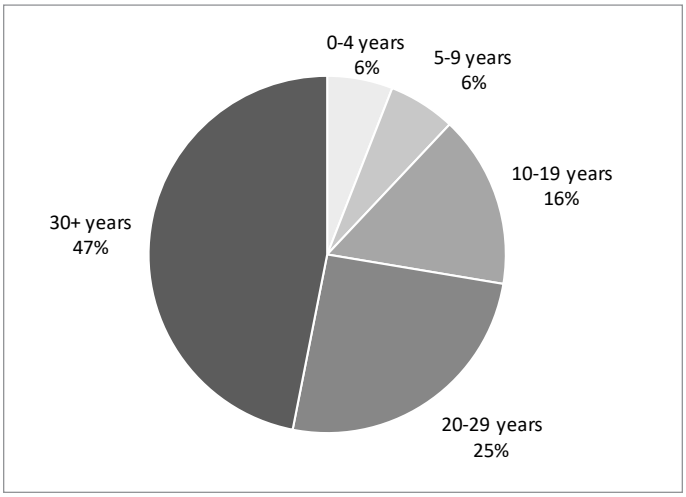


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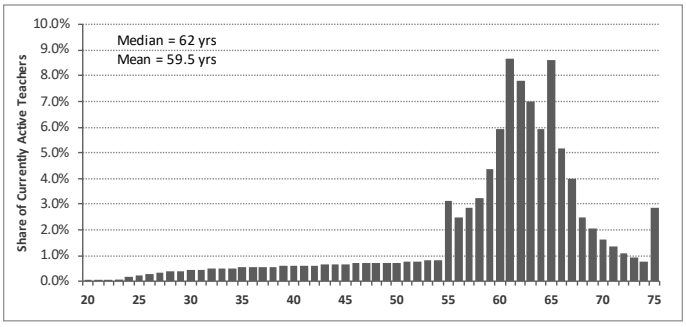
Figure 6 illustrates the distribution of projected exit ages among currently active teachers. The median projected exit age is 62 years, and the mean is 59.5. Before age 55, the share of the total current teaching workforce that will leave each year is miniscule, under 1 percent annually until age 54. A large majority of California teachers (83 percent) will leave when they are at least 55 years old, and virtually all of this group (82 percent of active teachers) will have vested by then.

Figure 6
Projected Age at Exit Among Current California Teachers



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We find that most California teachers can expect a long career: 73 percent of teachers can expect to work at least 20 years, and 46 percent can expect to work at least 30 years. Furthermore, 83 percent of the California teacher population will stay until age 55, early retirement age. Even on an entering cohort basis, controlled for age, half of current new hire teachers in California (50 percent) are better off with the DB pension than the idealized DC plan. Ultimately, 85 percent of California's teaching population will accrue higher benefits under the CalSTRS DB pension than through an idealized 401(k), and 76 percent will accrue higher benefits than through a generous CB plan.

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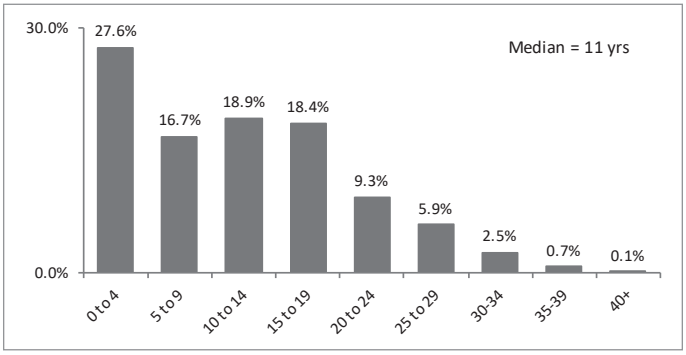

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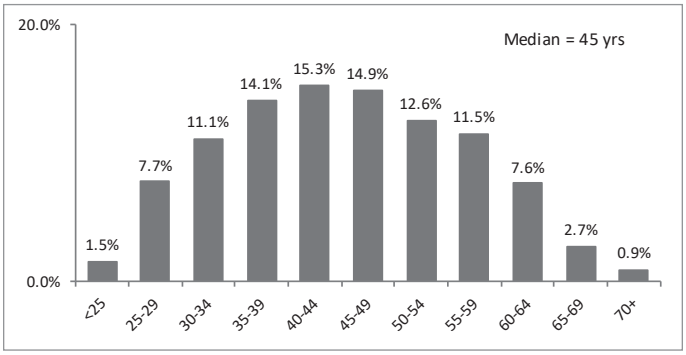

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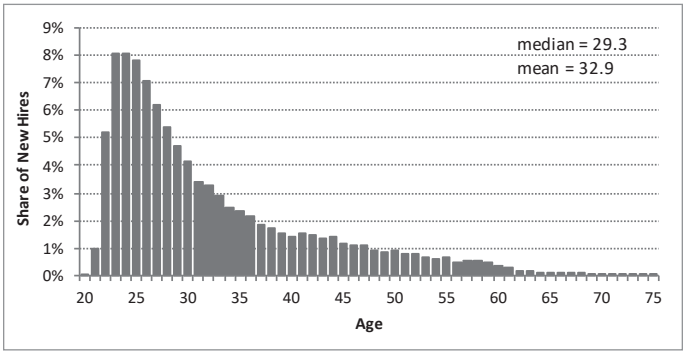
Age Distribution of California New Hire Teachers



Note: Authors' analysis of CalSTRS active membership microdata for FY 2014.

Annuitization. In order to facilitate an apples-to-apples comparison with the DB plan, we assumed that the entire account balance at retirement is used to purchase a private insurance immediate annuity equivalent to the lifetime income stream provided by CalSTRS. In this way, we incorporate the value of the longevity insurance that is one of the key benefits of a DB pension.[9] We assumed a generous interest rate of 5 percent, which aligns with historical and projected long-term averages, but which significantly exceeds market interest rates in the low-interest environment that has persisted since 2008. We assume a cost (load) of 0.5 percent of the annuitized amount, in line with pricing for group annuities.

For the CB plan, we assumed a generous guaranteed interest rate of 7 percent. The employer is assumed to bear all the investment and longevity risk—highly unusual in public or private CB plans. However, the benefit accrual pattern is similar to a 401(k). That is, a compound annual interest rate of 7 percent was applied to contributions equal to 16.5 percent of salary. We assumed that the plan offered in-plan annuitization at 7 percent interest, on terms identical to the CalSTRS pension annuity. This is highly unusual among real world CB plans, which are almost always used as a means to facilitate risk-sharing between participants and employers.

Because DB plans express benefits in terms of income replacement (lifetime monthly income as a percentage of final pay), while DC plans and CB plans express benefits as lump sum account balances, we needed to create an apples-to-apples measure of retirement benefit value across these three plans. Given that the DC plan is the only plan in which there is an immediate cash value for individual participants, we converted the DB and CB plan benefits to 401(k)-equivalent values. For each year of separation, we identified the projected annuity benefit for the DB plan, and calculated the balance that would be required to fund the same benefit through the DC plan. We repeated the same procedure for the CB plan based on the assumed interest rate of 7 percent. In the cases where an employee contribution refund or lump sum cash-out in the DB plan had the greatest value, we simply used those cash values without adjustment. The same account balance will generate different income streams in a DC plan compared to the CB plan that we modeled, because the latter offers a higher interest rate on annuities.

Benefit Model Results

In order to simplify findings across entry ages and plan types, **Exhibit 7** provides a schematic illustration of benefit accumulation under the DC plan and the CalSTRS DB pension, and the share of current teachers that fall on each side of the crossover point between the two plans. (The CB plan in our model follows a similar accrual pattern to the DC plan, albeit with higher benefits due to the 7 percent in-plan annuity.) When benefit accrual patterns are considered in conjunction with projected tenure, we find that 85 percent of California teachers will receive higher retirement benefits from the CalSTRS DB pension than they would from an idealized DC plan, taking into account both retirement wealth and retirement income.

Under the CalSTRS pension, like most plans of its kind, teachers accumulate benefits more slowly than in a DC or CB plan in the beginning of their career. Pension accrual begins to accelerate mid-career so that the slope of the DB benefit curve becomes steeper than the slope of the DC benefit curve. Finally, after age 65—the age at which the CalSTRS pension benefit multiplier peaks—the growth of pension benefits as a multiple of current pay flattens out and in some cases becomes negative. Benefits continue to grow in absolute terms in tandem with salary growth and accumulated service years, but this is counterbalanced by the decrease in the number of years of benefit payments from delayed retirement.

Figure 7
Benefit Accumulation Under CalSTRS DB vs Idealized DC Plan

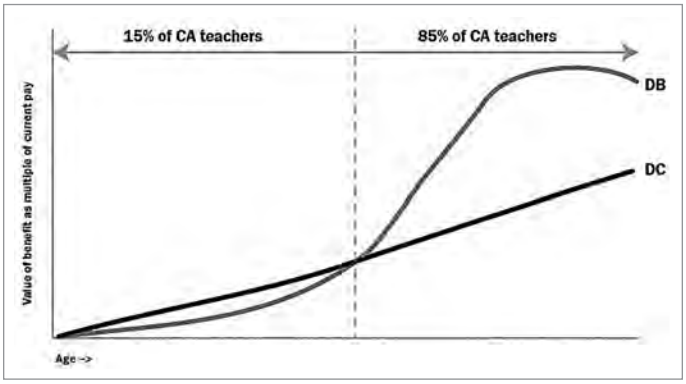


Figure 8 shows the age at which DB plan value exceeds the value of DC and CB plans for entry ages 25 to 45, in five-year increments. The comparison to the DC model has two sets of parameters: full normal cost versus just employee contributions, and idealized 401(k) returns versus a more realistic scenario in which typical individual behavior leads to 1 percent reduction of annual investment returns due to adverse investment behavior.

As expected for a back-loaded pension, it does take longer for younger workers to reach the break-even point compared to older workers. The CalSTRS DB pension becomes more valuable than the idealized DC plan at age 50 for teachers hired at age 25. This transition occurs at age 51 for those hired at age 30 and at age 50 for those hired at age 45. The CalSTRS DB pension becomes more valuable than the CB plan somewhat later—at age 57 for those hired at age 25, and at progressively younger ages for older hires.[10]

Figure 8 also shows that the addition of realistic individual investor behavior shortens the break-even horizon for the DB plan in relation to the DC plan, to age 47 for teachers hired at age 30. Realistic investor behavior also reduces the number of years to recover the full value of employee contributions vis-à-vis the DC plan to 11. Again, this assumes that teachers place no value on the guaranteed nature of DB pension benefits.

Figure 8
Age When Value of DB Plan Equals or Exceeds Value of Alternative Plans, by Entry Age

	Entry Age				
Comparison Plans	**25**	**30**	**35**	**40**	**45**
Idealzed DC Plan					
Full DC benefit	50	51	49	48	50
Value of employee contributions	41	42	41	45	50
DC Plan with Typical Investor Returns					
Full DC benefit	45	47	46	46	50
Value of employee contributions	36	38	40	45	50
CB Plan with Guranteed Equal to DB Expected Return	57	55	55	53	54

Note: Idealized DC plan assumes no investor mistakes. Realistic DC plan assumes 1% drag on returns from typical investor behavior. However, all plans assume consistent funding and no leakage. Difference between DB and CB value at age 56 was trivial, .06%.

While it does take a significant period of time for new hire teachers to accrue benefits under the CalSTRS DB pension that exceed the benefits they might have accumulated under an idealized DC plan, CalSTRS comes out ahead for a significant share of new hire teachers. **Figure 9** shows the share of new hires that will earn greater benefits under the DB pension than alternative plans, by sample entry ages and for all new hires combined. It includes an estimated share of all new hires who will accumulate greater benefits under the CalSTRS pension than the alternative plans, calculated by weighting the percentage of each entry group projected to stay until the benefit crossover points by its share of the new hire population in FY 2014. Notably, half of new hires (50 percent) are better off with the DB pension than a 401(k)-type plan—again, without fully accounting for the value of the pension guarantee. This contradicts the assertion that new teachers are unequivocally better off with a DC plan.

85 percent of teachers will earn greater retirement benefits from the CalSTRS DB pension than they could expect from DC.

We found that 45 percent of new hires are better off with the CalSTRS pension than a CB plan that guarantees 7 percent. However, it is unlikely that states would offer this level of guarantee for a new CB plan for public employees. Such a plan would impose the same liability on public employers as a traditional DB plan, while sacrificing retention incentives and potentially increasing turnover costs.

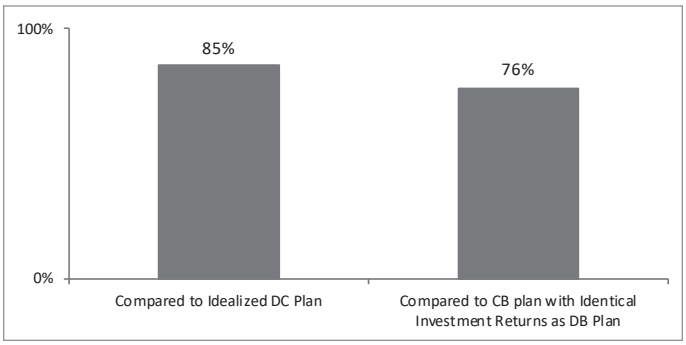
Figure 9
Share of New Hire Cohort for Whom Value of DB Pension Will Equal or Exceed Alternative Plans

	Entry Age					Weighted Average for All New Hires
	25	**30**	**35**	**40**	**45**	
Idealzed DC Plan	47%	51%	52%	58%	64%	**50%**
CB Plan	40%	46%	48%	52%	56%	**45%**

Note: Authors' analysis of FY 2014 membership microdata based on current actuarial assumptions.

Finally, in order to estimate the share of the California teaching workforce that is better off with a DB pension, we applied the highest age thresholds when the DB value exceeds the value of alternate plans (age 50 for DC and age 57 for CB) to the projected age-service distribution. Ultimately, 85 percent of active teachers will vest and stay long enough to earn greater retirement benefits from the CalSTRS DB pension than they could expect from an ideal DC plan (**Figure 10**). Similarly, 76 percent of active teachers are better off with the CalSTRS pension than with a generous CB plan that offers a guaranteed interest rate equal to the CalSTRS pension expected return.

Figure 10
Share of California Teachers Who Are Better Off With CalSTRS DB Pension Compared to Alternative Plans



Note: Authors' analysis based on CalSTRS active membership data and actuarial assumptions as of June 30, 2016.

CONCLUSION

Contrary to studies of retirement benefits based on new-hire cohorts that claim that most teachers do not benefit from a traditional pension, our analysis clearly shows that most teachers working in the profession can expect long careers, and are thus well-positioned to benefit from a traditional pension. Conversely, replacing DB pensions with DC or CB plans would reduce the retirement incomes of a large majority of teachers.

Nari Rhee, Ph.D., is a director of the Retirement Security Program at the UC Berkeley Center for Labor Research and Education. She can be contacted at *nari@berkeley.edu*.

William B. (Flick) Fornia, FSA, is president of Pension Trustee Advisors, consultant to public pensions and related parties. He can be contacted at *flick@pensiontrusteeadvisors.com*.

ENDNOTES

1 McGee, J. and M. Winters, "Better Pay, Fairer Pensions: Reforming Teacher Compensation." Manhattan Institute, 2013; McGee, J. and M. A. Winters. "Modernizing Teacher Pensions." *National Review*, No. 22 (2015); Aldeman, C. and A.J. Rotherham. "Friends without Benefits: How States Systematically Shortchange Teachers' Retirement and Threaten Their Retirement Security." Bellwether Education Partners, 2014; Johnson, R.W. and B. Southgate, "Are California Teacher Pensions Distributed Fairly?" Urban Institute, April 2015; Aldeman, C. and R. Johnson, "Negative Returns: How State Pensions Shortchange Teachers," Urban Institute, September 2015; Costrell, R. M. and J. McGee, "Cross-Subsidization of Teacher Pension Normal Cost: The Case of CalSTRS," University of Arkansas, EDRE Working Paper 2016-2017, October 2016; Luecken, M., "(No) Money in the Bank: Which Retirement Systems Penalize New Teachers?." University of Arkansas Thomas B. Fordham Institute, 2017.

2 Aldeman and Johnston (2015), op cit.

3 Morrissey, M., "Teachers and Schools are Well Served by Teacher Pensions," Economic Policy Institute, October 2017.

4 The results of this study were originally published in Nari Rhee and William B. Fornia, , "How do California Teachers Fare under CalSTRS? Applying workforce Tenure Analysis and Counterfactual Benefit Modeling to Retirement Benefit Evaluation," Journal of Retirement, Fall 2017. An earlier version of this study, based on 2014 data, was published as Nari Rhee and Flick Fornia, "Are California Teachers Better off with a Pension or 401(k)?," UC Berkeley Center for Labor Research and Education, February 2016.

5 Grouped totals may not add up due to rounding.

6 Normal cost for the CalSTRS DB pension, exclusive of death and disability benefits was provided by David Lamoreux, CalSTRS actuary, via email, April 17, 2017.

7 The only change in the capital market assumptions between FY 2014 and FY 2016 was a .25 percent reduction in the inflation assumption, and CalSTRS chose to reduce its discount rate by .50 percent as a measure of conservatism. For this study, we decreased the TDF portfolio annual returns by .25 percent to reflect the inflation decrease.

8 For an overview of research on individual investor behavior and underperformance, see Barber Odean (2011) and Tang, Mitchell, and Utkus (2011).

9 If an individual were to forgo the annuity, they would still have to pace their annual withdrawals to last well past average life expectancy, or else run a large risk of running out of money.

10 Comparing our current findings to our 2016 study of CalSTRS (Rhee and Fornia 2016), and looking across entry ages, the crossover points at which the CalSTRS pension benefit equals or exceeds alternative benefits have not significantly shifted as the result of the new actuarial and investment return assumptions. The reason is that, while our model shrank the gap in investment returns between the DB pension and alternative plans, and increased contributions to the alternative plans on par with the new normal cost for CalSTRS, this was offset by salary growth changes and increased life expectancy.