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REPORT



# BETTER PAY, FAIRER PENSIONS III

## THE IMPACT OF CASH-BALANCE PENSIONS ON TEACHER RETENTION AND QUALITY: RESULTS OF A SIMULATION

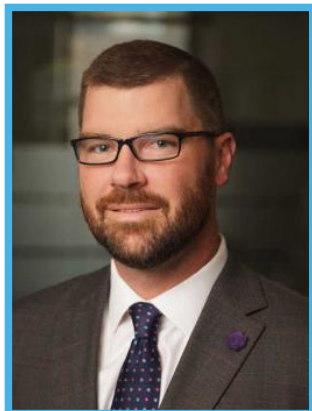
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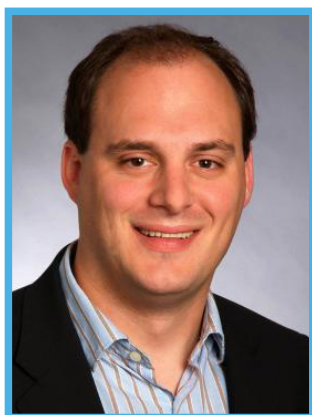
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## About the Authors



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## Executive Summary

Most U.S. public school teachers participate in traditional “final-average-salary-defined-benefit” (FAS-DB) pension plans. In these plans, teachers earn relatively meager retirement benefits during their first several years in the classroom and then rapidly accrue far more valuable benefits late in their careers, as they near their plan’s retirement eligibility threshold.

A previously released report by the authors found that rational entering teachers would strongly prefer a “cash-balance” (CB) pension plan (which would provide the same investment and longevity protection as an FAS-DB plan but would allow teachers to earn retirement benefits more evenly across their careers) to currently offered FAS-DB plans. However, empirical research offers little guidance on the effect of moving to a CB plan on teacher quality.

Given the findings from previous research for the relationships between teacher attrition, teacher quality, and longevity, our simulations suggest that switching to a CB pension plan would be expected to slightly increase a school system’s total level of teacher experience—and thus, slightly increase the school system’s total level of teacher quality. CB plans also would greatly benefit new teachers and would be cost-neutral for taxpayers,<sup>1</sup> strengthening the case for cash-balance pensions.

# BETTER PAY, FAIRER PENSIONS III

## THE IMPACT OF CASH-BALANCE PENSIONS ON TEACHER RETENTION AND QUALITY: RESULTS OF A SIMULATION

### I. Introduction

In recent years, teachers' pensions have faced considerable scrutiny, as concerns have grown about state and local governments' large, unfunded pension liabilities.<sup>2</sup> Some analysts<sup>3</sup> have argued that the benefit structure of teachers' pensions is ill-suited to the modern teaching workforce. This report, the third in the Manhattan Institute's "Better Pay, Fairer Pensions" series,<sup>4</sup> evaluates the effect on teacher quality of replacing final-average-salary-defined-benefit (FAS-DB) pension plans with cash-balance (CB) pension plans.

Good teachers are a school's most important asset. What policy reforms would allow schools to better recruit and retain high-quality teachers? FAS-DB plans heavily backload retirement benefits late into public school teachers' careers, favoring older teachers at the expense of young and mid-career teachers. The vast majority<sup>5</sup> of new public school teachers would benefit from CB plans, which would provide the same investment and longevity protection as FAS-DB plans but would allow teachers to earn retirement benefits more evenly across their careers.

The value of pensions in FAS-DB plans swells at the end of a career, incentivizing teachers to remain in the same school system until retirement. The value of pensions in CB plans grows proportionally throughout a career, and teachers who switched school systems would not be penalized with disproportionately lower pensions.<sup>6</sup> For this reason, under a CB plan, some suspect that more mid-career teachers would likely switch school systems or leave teaching, draining their former school systems of teaching experience and quality (mid- and late-career teachers are more effective, on average, than early-career teachers).<sup>7</sup> However, because there would no longer be stiff penalties for working beyond the official retirement age (see Section II below), more late-career teachers would be expected to postpone retirement, boosting the level of teaching experience in their school system.

Would adopting a CB plan incentivize more experienced teachers to, on net, leave or remain in their school system? This report simulates the effect of switching to a CB plan on teacher quality and experience levels, given recent empirical estimates on the relationships between teacher quality, attrition, experience, and response to changes in pension wealth accrual. The simulation finds that the overall level of teacher experience under a CB plan would be expected to rise slightly, in both the short and the long run. Overall, teacher quality would be expected to remain relatively unchanged—and perhaps would increase slightly—after adopting a CB plan. The culmination of our research on this topic shows that moving to a CB plan would be highly preferred by teachers, cost-neutral to taxpayers, and have no meaningful impact on teacher quality.

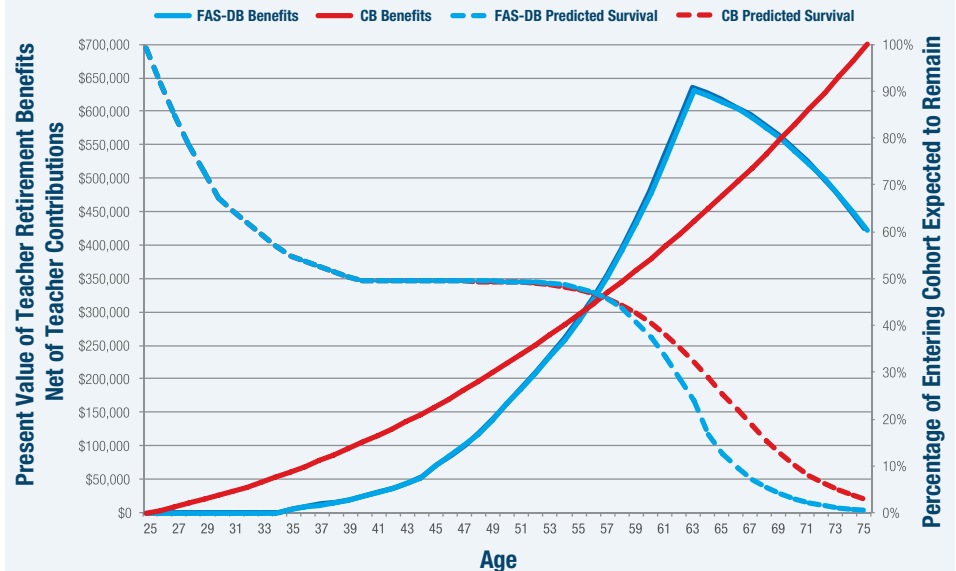
## II. FAS-DB Plans v. CB Plans

Most U.S. public school teachers earn retirement benefits under FAS-DB plans, whereby teachers earn a lifetime annuity once they reach their plan's retirement threshold (generally determined by age and years of service in a given school system).<sup>8</sup> As noted, FAS-DB plans backload retirement benefits late into teachers' careers, though the degree of the backloading varies.<sup>9</sup>

In **Figure 1** and **Figure 2**—and as discussed in the authors' two previous reports in this series<sup>10</sup>—the solid blue line shows the present value of retirement benefits (net

FIGURE 1.

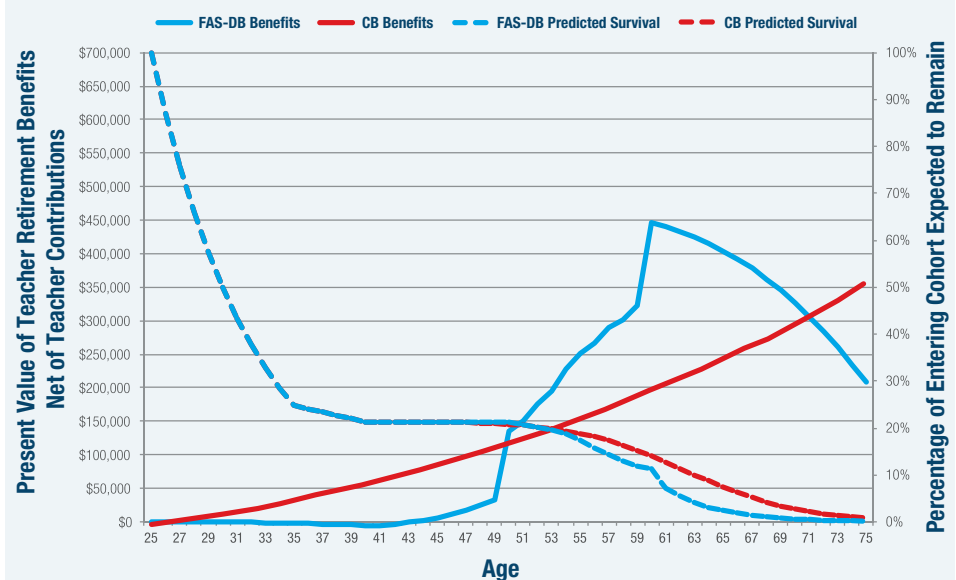
### Teacher Retirement Benefits and Teacher Attrition, New York City



Source: Authors' calculations based on data from the New York City Department of Education and the Teachers' Retirement System of the City of New York

FIGURE 2.

### Teacher Retirement Benefits and Teacher Attrition, Philadelphia



Source: Authors' calculations based on data from the School District of Philadelphia and the Pennsylvania Public School Employees' Retirement System



of teacher contributions) earned each year for a newly hired 25-year-old teacher under New York City's and Philadelphia's FAS-DB plans; the solid red line represents retirement benefits earned under a hypothetical CB plan.<sup>11</sup> The dashed blue line indicates the percentage of teachers (see y-axis on the right) who are projected to remain in the school system over time under the FAS-DB plan; and the dashed red line indicates the percentage of teachers who are projected to remain in the school system over time under the CB plan. As described in more detail below, the projected attrition of teachers under the CB plan was calculated using the results from a recently published paper evaluating teacher responses to changes in pension wealth accrual.<sup>12</sup>

Teachers in NYC and Philadelphia do not vest in their retirement plan until they are employed for ten years, which means that they are not entitled to retirement benefits during their first decade in the classroom. After ten years, their retirement benefits slowly rise until their 25th year of service, after which their retirement benefits soar. A NYC teacher earns about \$1,031 per year in retirement compensation during each of his first 15 years of service (but only vests after ten years of service); in each of his next 15 years, he earns about \$16,908 per year.

After 35–40 years of service, a teacher's retirement benefits decline for two reasons. First, the teacher reaches the maximum percentage of his salary that the retirement system will replace in retirement. As a result, additional years of service no longer increase the value of the pension. Second, because the retirement benefit is paid as an annuity, after a teacher is eligible to retire, each additional year spent teaching equals one year fewer receiving a pension.

In contrast, under a CB plan, a teacher would earn retirement benefits evenly over his career. The CB plan, however, is *not* a defined-contribution plan, such as a 401(k): it would, as noted, provide the same investment and longevity protections offered by FAS-DB plans. In other words, the CB plan does not shift risk to teachers, is not an aggregate benefit cut for public school teachers, and *would* be cost-neutral for taxpayers.

### III. CB Plans and Teacher Attrition

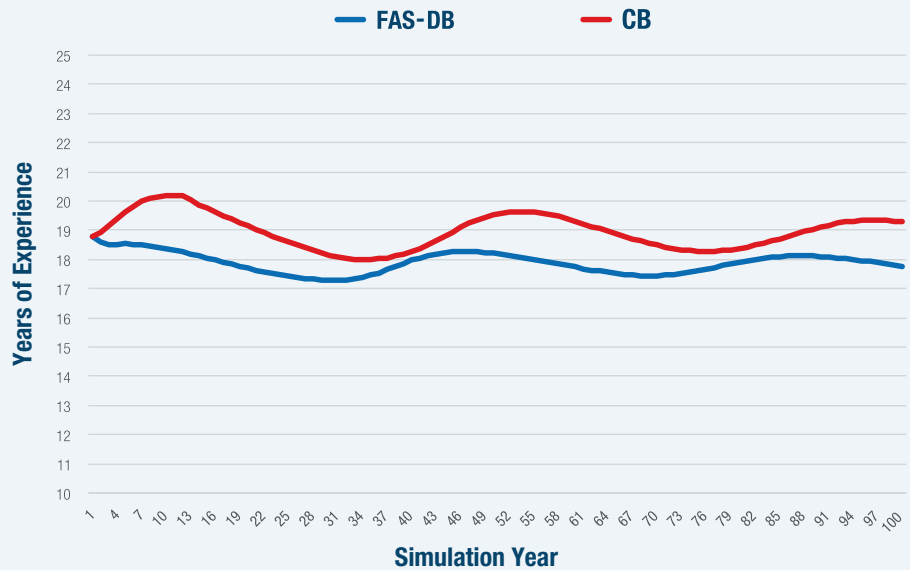
As discussed, FAS-DB plans create strong incentives for mid- and late-career teachers to work to the official retirement age in their current school systems and then promptly retire.<sup>13</sup> Indeed, FAS-DB plans largely succeed in this aim.<sup>14</sup> By eliminating the pension penalty for switching school systems or leaving teaching, CB plans would likely alter teacher-attrition rates.

We use recent research—from a forthcoming paper by Podgursky and Ni<sup>15</sup> on Missouri public school teachers—to assess the impact of a change in retirement-benefit accrual on the probability that a given teacher exits a school system in a given year. Podgursky and Ni estimated the relationship between future salary and pension benefits at various points in a teacher's career and the likelihood that the teacher would retire.

How do teachers decide when to retire? Typically, a teacher compares the utility gained from another year on the job, thanks to a higher salary and more retirement income, with the utility gained from immediately retiring, given the pension's current value. Other factors do influence retirement decisions, but for the average teacher, as Podgursky and Ni show for Missouri, the above trade-off is, by far, the most important. This means that salary and pension status allow for reliable predictions on when most teachers will choose to retire.<sup>16</sup> (Figures 1 and 2 use the Podgursky and Ni model to predict teacher-attrition patterns under a CB plan.)<sup>17</sup>

FIGURE 3.

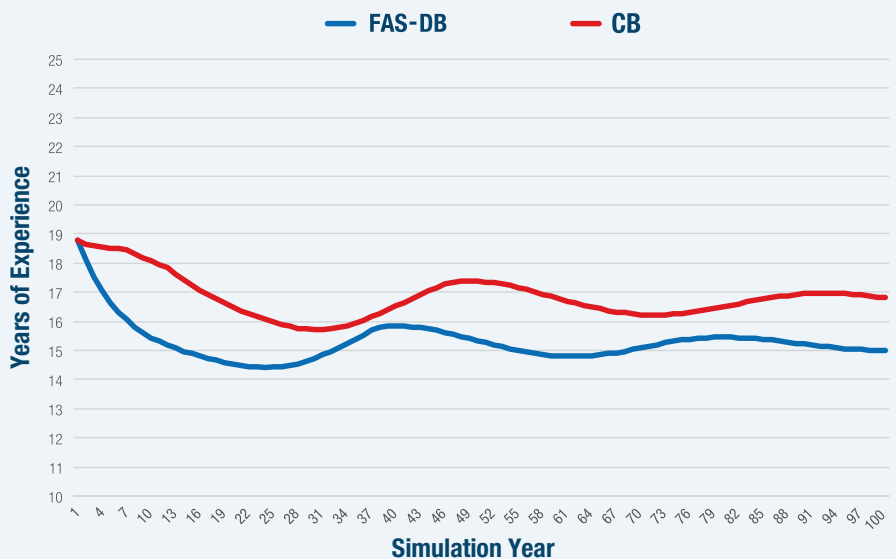
#### Average Teacher Experience, FAS-DB v. CB, New York City



Source: Authors' calculations

FIGURE 4.

#### Average Teacher Experience, FAS-DB v. CB, Philadelphia



Source: Authors' calculations

Critics of CB plans<sup>18</sup> worry that such plans would increase mid-career attrition and, thus, reduce teacher quality, as more experienced teachers were replaced with younger, less experienced teachers. Such fears appear misplaced: the Podgursky and Ni model suggests that the main effect of transitioning to a CB plan would be to encourage late-career teachers to delay retirement by removing the huge penalty for teaching beyond the official retirement age.

**Figure 3** and **Figure 4** compare the average years of experience for teachers under NYC's and Philadelphia's (current) FAS-DB plans, as well as under (hypothetical and cost-equivalent) CB plans: under the latter, the average experience level of teachers would be slightly *higher*. Why? Because CB plans would have only a modest effect on early- and mid-career teacher attrition (a few more teachers would leave) but would have a significant impact on late-career attrition (many more would stay).

## IV. Simulating Teacher Quality Under a CB Plan

### Methodology

We build upon the Winters and Cowen (2013) model<sup>19</sup> to simulate the effect on the distribution of teacher quality, in the short and the long run, of switching from an FAS-DB plan to a CB plan. We use a set of simulated data containing the number of observations representative of teachers with experience levels that mimic a particular school system (in this analysis, a school system with 100,000 teachers with experience levels similar to those of NYC and Philadelphia). At the end of each year, a group of teachers exits the system in a way that relates to their experience and quality, as suggested by previous empirical research. At the start of each period, teachers who left are replaced by novice teachers of random quality. After each year of service, a teacher's quality improves in a manner consistent with previous empirical estimates.

The relationship between a teacher's experience and his teaching ability is among the most widely studied topics in educational research. For example, Hanushek (2003) surveyed 206 empirical estimates: new teachers, he found, see large returns to quality

(i.e., they improve fast) as they gain experience; but after five to seven years of teaching, the returns to quality plateau permanently.<sup>20</sup> More recent academic research reports similar findings.<sup>21</sup> Accurately modeling returns to quality is particularly important to this report's findings, which depend largely on the difference in quality between experienced teachers and the less experienced teachers who replace them. We calibrate our simulation with the estimates presented by Clotfelter et al. (2007),<sup>22</sup> which are generally consistent with previous research.

Our findings compare alternative simulations: (1) average teacher quality for each period, when the separation probabilities, by year of service, match the current system; and (2) average teacher quality when the separation probabilities match those predicted for a CB plan. To assess teacher quality in the short and the long run, the simulation is run for 100 years. To reduce the likelihood that an extreme run influences the overall results, the estimated teacher quality in each year equals the average teacher quality over 1,000 iterations of the simulation.

We define a teacher's quality,  $q$ , as the teacher's unchanging, independent contribution to student learning. At entry, a simulated teacher is endowed with a level of  $q$ —drawn from a normal distribution with a mean of 0 and a standard deviation of 0.15—that is consistent with previous empirical estimates, as well as with the parameters used in other recent simulations<sup>23</sup> of the impact of policy changes on the teacher-quality distribution.

Each year, some teachers retire. Other teachers switch school systems. Still others pursue entirely new careers. Because extensive empirical research<sup>24</sup> shows that teacher attrition is correlated with teacher quality, we allow teacher-exit probabilities to depend on a random process, as well as on teacher quality. We calibrate the relationship between the relative likelihood of teacher attrition and teacher effectiveness using Feng and Sass's (2011) analysis<sup>25</sup> of teacher attrition in Florida. The relative probability that a teacher exits a school system depends on the teacher's quartile of  $q$ , relative to teachers with the same level of experience. Teachers in the bottom quartile are the most likely to exit, and teachers in the top quartile are the next most likely to exit.

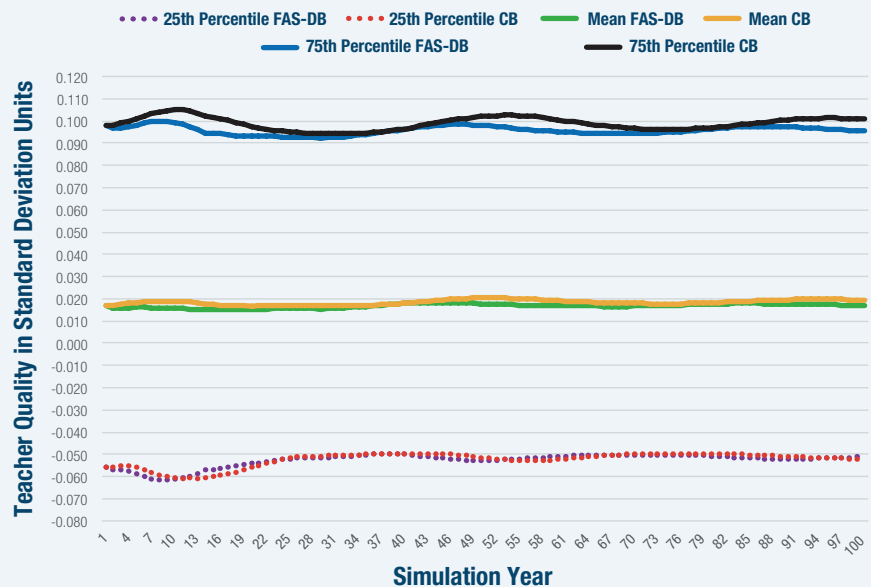
For simplicity, our simulation assumes that a school system replaces departing teachers with the same number of new hires (keeping the total number of teachers constant); and that each new teaching hire is a novice 25-year-old with persistent quality that is randomly generated by the aforementioned process. This assumption puts the policy change—the switch to a CB plan—to a more exacting test than reality would likely impose: in practice, at least some new hires would be experienced teachers from a different school system.<sup>26</sup>

### Results

**Figure 5** and **Figure 6** compare predicted average and the 25<sup>th</sup> and 75<sup>th</sup> percentiles of teacher quality each period under an FAS-DB plan, in NYC and Philadelphia, with the same values under a CB plan. The teacher-quality lines do not perfectly overlap (i.e., there are differences in teacher quality between the two plans in different periods); but the magnitude of that difference is very small, in the short and long term. The overall result: a CB plan would produce little change in the average teacher quality of a school system.

FIGURE 5.

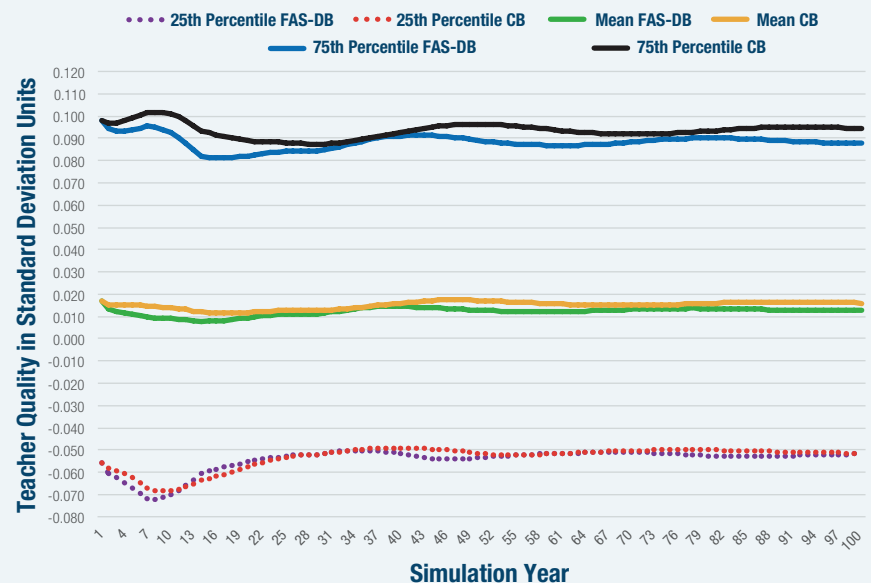
### Predicted Teacher Quality, New York City



Source: Authors' calculations

FIGURE 6.

### Predicted Teacher Quality, Philadelphia



Source: Authors' calculations



## V. Conclusion

Our simulation indicates that, compared with current trends under an FAS-DB plan, a school system that adopted a CB plan: (1) would see only a relatively modest number of (experienced) mid-career teachers leave; and (2) would see a significant number of (experienced) late-career teachers postpone retirement. The net effect would be to slightly increase the school system's total level of teacher experience—and, thus, slightly increase the school system's total level of teacher quality. When combined with the fact that CB plans would greatly benefit new teachers and would be cost-neutral for taxpayers, this report's finding further strengthens the case in favor of cash-balance pension plans.

# Endnotes

- <sup>1</sup> See Josh B. McGee and Marcus A. Winters, "Better Pay, Fairer Pensions: Reforming Teacher Compensation," Manhattan Institute (2013), Civic Report 79; and Marcus A. Winters and Josh B. McGee, "Better Pay, Fairer Pensions II: Modeling Preferences Between Defined-Benefit Teacher Compensation Plans," Manhattan Institute (2014), Civic Report 90.
- <sup>2</sup> See, e.g., Robert Novy-Marx and Joshua Rauh, "The Revenue Demands of Public Employee Pension Promises," *American Economic Journal: Economic Policy* 6, no. 1 (Feb. 2014): 193–229; and Josh B. McGee, "Chicago Crowd-Out: How Rising Pension Costs Harm Current Teachers—and Students," Manhattan Institute (2016), Issue Brief 52.
- <sup>3</sup> See, e.g., [http://www.teacherpensions.org/sites/default/files/Bellwether\\_TP\\_Illinois\\_Final.pdf](http://www.teacherpensions.org/sites/default/files/Bellwether_TP_Illinois_Final.pdf).
- <sup>4</sup> See n. 1 above.
- <sup>5</sup> I.e., new teachers who possess normal to significant levels of risk aversion and who enter a school system uncertain about the number of years that they will remain employed in that system.
- <sup>6</sup> See, e.g., Robert M. Costrell and Michael Podgursky, "Peaks, Cliffs, and Valleys: The Peculiar Incentives in Teacher Retirement Systems and Their Consequences for School Staffing," *Education Finance and Policy* 4, no. 2 (2009): 175–211; and idem, "Distribution of Benefits in Teacher Retirement Systems and Their Implications for Mobility," *Education Finance and Policy* 5, no. 4 (2010): 519–57.
- <sup>7</sup> See, e.g., Charles T. Clotfelter et al., "How and Why Do Teacher Credentials Matter for Student Achievement?," NBER Working Paper (2007) no. 12828; Robert Gordon et al., "Identifying Effective Teachers Using Performance on the Job," Brookings Institution (2016); E. A. Hanushek, "Assessing the Effects of School Resources on Student Performance: An Update," *Educational Evaluation and Policy Analysis* 19, no. 2 (1997): 141–64; E. A. Hanushek, "The Failure of Input-Based Schooling Policies," *Economic Journal* 113, no. 485 (2003): F64–F98; E. A. Hanushek et al., "The Market for Teacher Quality," NBER Working Paper (2005), no. 11154; and S. G. Rivkin et al., "Teachers, Schools, and Academic Achievement," *Econometrica* 73, no. 2 (2005): 417–58.
- <sup>8</sup> For a detailed description of how to calculate the present value of an annuity under FAS-DB and CB plans, see McGee and Winters, "Better Pay, Fairer Pensions: Reforming Teacher Compensation," <https://www.manhattan-institute.org/html/better-pay-fairer-pensions-reforming-teacher-compensation-5861.html>.
- <sup>9</sup> See Winters and McGee, "Better Pay, Fairer Pensions II."
- <sup>10</sup> See n. 1 above.
- <sup>11</sup> In practice, the CB plan that we model is equivalent to a plan where cumulative retirement compensation is equal to the accumulated employer contributions and interest (5 percent, in this case). For each plan, we calculate the average expected benefit for an entering teacher under an FAS-DB plan and use that value to determine the accrual rate for the cost-equivalent CB plan. In pension parlance, the employer contribution percentage in our cost-equivalent CB plan equals the normal cost of benefits calculated using the entry-age-normal method.
- <sup>12</sup> Michael Podgursky and Shawn Ni, "How Teachers Respond to Pension System Incentives: New Estimates and Policy Applications," *Journal of Labor Economics* (forthcoming), <http://www.journals.uchicago.edu/doi/abs/10.1086/686263>.
- <sup>13</sup> See, e.g., Costrell and Podgursky, "Distribution of Benefits in Teacher Retirement Systems and Their Implications for Mobility."
- <sup>14</sup> See, e.g., Robert M. Costrell and Josh B. McGee, "Teacher Pension Incentives, Retirement Behavior, and Potential for Reform in Arkansas," *Education Finance and Policy* 5 (2010): 492–518; and Cory Koedel, Michael Podgursky and Shishan Shi, "Teacher Pension Systems, the Composition of the Teaching Workforce, and Teacher Quality," *Journal of Policy Analysis and Management* 32, no. 3 (Summer 2013): 574–596.
- <sup>15</sup> See n. 12 above.
- <sup>16</sup> Analyses not reported in this paper show that the Podgursky and Ni model reliably predicts the teacher-attrition patterns of NYC and Philadelphia public school teachers, as shown in Figs. 1–2 above.
- <sup>17</sup> Podgursky and Ni estimate their model using only teachers who are approaching retirement age. Their model does not appear to predict early-career teacher exits well (perhaps because early-career teachers do not value their retirement benefits in the same way that mid- and late-career teachers do). We make the assumption that moving to a CB plan would have no meaningful effect on the attrition of early-career teachers, and we apply this assumption by holding teacher attrition under a CB plan the same as under an FAS-DB plan for a teacher's first 15 years.
- <sup>18</sup> See, e.g., [http://www.nirsonline.org/index.php?option=com\\_content&task=view&id=730&Itemid=49](http://www.nirsonline.org/index.php?option=com_content&task=view&id=730&Itemid=49); <http://www.epi.org/publication/will-switching-government-workers-to-account-type-plans-save-taxpayers-money>; and <https://www.americanprogress.org/issues/education/report/2011/09/30/10293/buyer-beware>.
- <sup>19</sup> Marcus A. Winters and Joshua M. Cowen, "Would a Value-Added System of Retention Improve the Distribution of Teacher Quality? A Simulation of Alternative Policies," *Journal of Policy Analysis and Management* 32, no. 3 (summer 2013): 634–54.
- <sup>20</sup> See Hanushek, "The Failure of Input-Based Schooling Policies." See also idem, "Assessing the Effects of School Resources on Student Performance."
- <sup>21</sup> See, e.g., Clotfelter et al., "How and Why Do Teacher Credentials Matter for Student Achievement?"; Rivkin et al., "Teachers, Schools, and Academic Achievement"; Hanushek et al., "The Market for Teacher Quality"; and Robert Gordon, Thomas J. Kane, and Douglas O. Staiger, "Identifying Effective Teachers Using Performance on the Job," Brookings Institution (April 2016).
- <sup>22</sup> See Clotfelter et al., "How and Why Do Teacher Credentials Matter for Student Achievement?" These estimates were also used to calibrate the effect of experience on teacher quality in a simulation of the impact of a different policy on the teacher-quality distribution. See Jesse Rothstein, "Teacher Quality Policy When Supply Matters," *American Economic Review* 105, no. 1 (Jan. 2015): 100–130.
- <sup>23</sup> See Clotfelter et al., "How and Why Do Teacher Credentials Matter for Student Achievement?"; and Rothstein, "Teacher Quality Policy When Supply Matters."

- <sup>24</sup> See, e.g., Donald Boyd et al., "The Narrowing Gap in New York City Teacher Qualifications and Its Implications for Student Achievement in High-Poverty Schools," NBER Working Paper (2008) no. 14021; Winters and Cowen, "Would a Value-Added System of Retention Improve the Distribution of Teacher Quality?"; Li Feng and Tim Sass, "Teacher Quality and Teacher Mobility," Urban Institute (Feb. 2011); Dan Goldhaber et al., "Teacher Career Paths, Teacher Quality, and Persistence in the Classroom: Are Public Schools Keeping Their Best?," *Journal of Policy Analysis and Management* 30, no. 1 (winter 2011): 57–87; John M. Krieg, "Teacher Quality and Attrition," *Economics of Education Review* 25, no. 1 (Feb. 2006): 13–27; and Matthew M. Chingos and Martin R. West, "Do More Effective Teachers Earn More Outside of the Classroom?," Program on Education Policy and Governance Working Papers Series (2009), Kennedy School, Harvard.
- <sup>25</sup> See Feng and Sass, "Teacher Quality and Teacher Mobility," table 4, specification 6. These estimates represent the probability that a teacher will exit the school system, not the probability that the teacher will simply move to another school within that system.
- <sup>26</sup> We assume a perfectly elastic supply of teachers from the teacher-quality distribution, thus allowing schools to fill vacancies by pulling teachers from the same teacher-quality distribution. Two reasons that this simplifying assumption could be considered a limitation of analysis: first, it seems reasonable to assume that, as school systems dig deeper into the labor pool, they will be required to hire lower-quality teachers. Second, though some schools are better than others at identifying effective teachers (see, e.g., Brian A. Jacob and Lars Lefgren, "Can Principals Identify Effective Teachers? Evidence on Subjective Performance Evaluation in Education," *Journal of Labor Economics* 26, no. 1 [Jan. 2008]: 101–36; and Susanna Loeb et al., "Effective Schools: Teacher Hiring, Assignment, Development, and Retention," Association for Education Finance and Policy [2012]), it does not appear that school systems as a whole have this ability; see, e.g., Justine S. Hastings et al., "Parental Preferences and School Competition: Evidence from a Public School Choice Program," NBER Working Paper (2005) no. 11805.

## Abstract

Most U.S. public school teachers participate in traditional “final-average-salary-defined-benefit” (FAS-DB) pension plans. In these plans, teachers earn relatively meager retirement benefits during their first several years in the classroom and then rapidly accrue far more valuable benefits late in their careers, as they near their plan’s retirement eligibility threshold.

## Key Findings

1. A previously released report by the authors found that rational entering teachers would strongly prefer a “cash-balance” (CB) pension plan (which would provide the same investment and longevity protection as an FAS-DB plan but would allow teachers to earn retirement benefits more evenly across their careers) to currently offered FAS-DB plans; however, research offers little guidance on the effect of moving to a CB plan on teacher quality.
2. Given the findings from previous research for the relationships between teacher attrition, teacher quality, and longevity, our simulations suggest that switching to a CB pension plan would be expected to slightly increase a school system’s total level of teacher experience—and thus, slightly increase the school system’s total level of teacher quality.
3. CB plans also would greatly benefit new teachers and would be cost-neutral for taxpayers, strengthening the case for cash-balance pensions.