



Evaluating Retirement Income Security for Illinois Public School Teachers

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PUBLIC PENSION PROJECT REPORT
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Executive Summary

The Teachers' Retirement System of the State of Illinois is one of the worst funded public pensions in the nation. In 2013, it held enough assets to cover only 41 percent of its future obligations. This shortfall has led to several reforms, mostly involving benefit cuts. The focus on cost reductions, however, ignores larger questions about how well Illinois's retirement plan serves teachers or local school districts. To inform the growing pension reform debate, this report evaluates the pension benefits provided to Illinois public school teachers, showing how the benefits differ for short- and long-term employees, how they vary across the workforce, and how recent reforms will affect teachers' future benefits.

The retirement system includes two tiers, one covering Illinois teachers hired before January 1, 2011, and the second covering those hired later. Tier-1 teachers receive lifetime pensions equal to 2.2 percent of their final average salaries multiplied by completed years of service, capped at 75 percent of their final average salaries. Final average salary is calculated over teachers' 4 consecutive highest-compensated years of service during their final 10 service years. Teachers may begin collecting full benefits at age 62 if they have completed at least 5 years of service, at age 60 if they have completed at least 10 years of service, or at age 55 if they have completed at least 35 years of service. Reduced early pensions are available at age 55 for teachers who do not qualify for full benefits but have at least 20 years of service. Once retirees begin collecting, their pensions automatically rise 3 percent each year, regardless of the inflation rate. These escalators, however, do not begin until age 61.

The second tier cuts teacher pensions for new hires by restricting benefit eligibility, lengthening the final average salary calculation, and limiting cost-of-living adjustments (COLAs) for retirees. Tier-2 teachers do not qualify for full benefits until they have completed 10 years of service and reached age 67. Reduced early benefits are available at age 62, after 10 years of service. Final average salary is calculated over teachers' 8 consecutive highest-compensated years of service during their final 10 service years. Annual COLAs are set equal to one-half the percentage change in the consumer price index, but they may not exceed 3 percent and do not begin until age 67.

Teachers in both tiers must contribute 8.4 percent of their salaries each year. Upon separation, they may elect refunds of their contributions instead of receiving future pension benefits, but they do not receive any interest on those past contributions.

Long-tenured public school teachers in Illinois earn substantial retirement benefits in the tier-1 plan. For example, teachers hired at age 25 who complete 35 years of service and earn average salaries over their careers will receive lifetime pensions that pay \$96,500 at age 67, in 2014 constant dollars, and are worth \$1.3 million over their lifetimes. Although teachers must contribute 8.4 percent of their salaries each year to the plan to help offset the cost of these benefits, a 35-year career would generate \$740,000 in lifetime employer-financed benefits for age-25 hires. Teachers hired relatively late in life also receive generous pensions in the original state pension plan.

However, teachers who join the state payroll at relatively young ages and stay for less than 25 years get little, if anything, from the plan. For example, age-25 hires must teach for 22 years before they accumulate rights to future pension benefits worth more than their required plan contributions. Those who choose to have their contributions refunded lose money because the plan does not credit them with any interest. Only 18 percent of newly hired teachers remain in state employment for 25 years, including only 30 percent of those who stay for at least 5 years. Overall, 66 percent of all newly hired teachers and 47 percent of those who complete at least five years of service would lose money by participating in the tier-1 plan.

Recent reforms make Illinois's state pension plan even less appealing to most public school teachers. For age-25 hires who retire after 35 years of service, the tier-2 plan provides pensions worth \$609,000 over their lifetimes, less than half as much as they would receive in the tier-1 plan and only \$6,000 more than the value of their required plan contributions. Required tier-2 plan contributions are worth more than future pensions for all age-25 hires who separate with less than 35 years of service or more than 43 years of service. Overall, 84 percent of all newly hired teachers lose money by participating in the tier-2 plan, including 74 percent of those who complete at least five years of service.

Which teachers benefit most from the plan depends on when they are hired and how long they work. For example, age-25 hires receive about \$234,000 from the tier-1 plan, net of their own required contributions, if they separate with 29 years of completed service, but \$389,000 if they complete 30 years. Relative to their career earnings, age-55 hires in tier 1 who separate after 7 years of service receive 17 times as many state-financed benefits as age-25 hires who separate after 23 years. But age-25 hires in tier 1 who retire after 42 years of service receive only about one-third as many state-financed benefits, relative to their career earnings, as those who retire after 35 years.

Alternative plan designs, such as cash balance plans, could distribute benefits more equitably across the workforce and allow teachers to accumulate pension benefits more steadily over their careers. Cash balance plans express benefits as an account balance that builds over time with employee and employer contributions as well as accumulated investment returns. Our simulations show that 72 percent of newly hired public school teachers, including 56 percent of those who complete at least five years of service, would earn larger pensions, net of their contributions, in a cash balance plan similar to one recently proposed in the Illinois senate than in the tier-1 plan, even though the two plans would impose similar costs on taxpayers. Whether achieved through revisions to the benefit formula or more structural changes to the plan design, carefully developed reforms could put more Illinois public school teachers on a path to a financially secure retirement.

Introduction

Illinois's state pensions are among the worst funded public retirement plans in the nation. In 2013, the state employees' retirement system held enough assets to cover only 34 percent of its future obligations, and the state teachers' retirement system assets covered only 41 percent of future liabilities (Buck Consultants 2014; Gabriel Roeder Smith and Company 2014). Among major state and local pension plans, only Kentucky's plan for state employees was more poorly funded in 2013 (Munnell, Aubry, and Cafarelli 2014). Combined, Illinois's state pension plans for public school teachers, general state employees, municipal employees, and employees in higher education face a funding shortfall of \$104 billion.¹ Chicago's pension plans for the city's public school teachers, police officers, firefighters, and other employees are underfunded by another \$29 billion.² These estimates are based on the assumptions adopted by plan trustees, which many economists believe are overly optimistic (see, for example, Novy-Marx and Rauh 2011). The true funding shortfall may be much higher.

The financial problems besetting Illinois's pension plans have led to several rounds of reforms. In 2010, the governor signed a law creating a new tier of pension benefits for teachers and state employees hired on or after January 1, 2011. These reforms increased the retirement age, reduced retiree cost-of-living adjustments (COLAs), and trimmed the salary base used to compute pension benefits for new hires. Another bill, signed in December 2013, would cut benefits for employees hired before 2011 by reducing COLAs, raising the retirement age for younger employees, and limiting pensions for the highest-paid employees. These changes have not yet been implemented, however, pending the outcome of lawsuits challenging the statute's constitutionality. In June 2014, the governor signed a bill cutting pensions paid to many employees of the City of Chicago (but not to the city's public school teachers, police officers, or firefighters), reducing COLAs, and raising required employee contributions to their retirement plans.

This focus on cost cutting ignores larger questions about how well Illinois's retirement plans serve state employees and meet the needs of its public employers. Do these plans put most state employees on a path to a secure retirement, or are many left behind? Do they treat state employees fairly, providing similar pensions to employees with similar work histories? Do they provide the right incentives to attract and retain productive employees? How have recent reforms affected the suitability of state pensions and their attractiveness to state employees?

To inform the growing pension reform debate in Illinois, this report evaluates the pension benefits provided to Illinois public school teachers. We project annual and lifetime pension benefits for teachers in both tiers of the state's retirement plan, assuming teachers earn average salaries over their careers and separate from state employment at the rates estimated by the plan actuaries. Our results show that long-tenured teachers earn substantial pensions. Most teachers, however, do not work long enough to benefit much from the plan, because at least 25 years of service is required for most teachers to receive large pensions. Sixty-six percent of teachers in the more generous, prereform pension plan lose financially by participating in the plan because the pensions they earn are worth less than their required plan

contributions. In the plan available to teachers hired in 2011 and later, 84 percent suffer financial losses by participating. Which teachers benefit most from the Illinois pension plan depends on when they are hired and how long they work. Nonetheless, the plan reduces lifetime benefits for most teachers who remain employed after the benefit eligibility age, encouraging them to retire, even if they are still willing and able to teach. Alternative plan designs that allow teachers to accumulate retirement benefits more gradually over their careers would distribute benefits more fairly and improve retirement incomes for many Illinois public school teachers.

How Are Pension Benefits Calculated?

The Teachers' Retirement System of the State of Illinois provides pensions to Illinois public school teachers, who are not covered by Social Security. The system includes two tiers. Tier 1 covers teachers hired before January 1, 2011. They receive lifetime pensions equal to 2.2 percent of their final average salaries multiplied by completed years of service, capped at 75 percent of their final average salaries. Final average salary is calculated over teachers' 4 consecutive highest-compensated years of service during their final 10 service years. Teachers may begin collecting full benefits at age 62 if they have completed at least 5 years of service, at age 60 if they have completed at least 10 years of service, or at age 55 if they have completed at least 35 years of service. Reduced early pensions are available at age 55 for teachers with at least 20 years of service who do not qualify for full benefits. (Only those teachers still employed at age 54 and six months may take early retirement, however.) Early retirement benefits are reduced 6 percent for each year that they are collected before age 60. Once retirees begin collecting, their pensions automatically rise 3 percent each year, regardless of the inflation rate. These escalators, however, do not begin until age 61.

A teacher who separates before completing five years of service receives a lump sum that is actuarially equivalent to a lifetime pension beginning at age 65 and providing annual payments equal to 1.67 percent of final average salary multiplied by completed years of service. Final average salary is calculated as average career salary if a teacher separates before completing four service years.

In exchange for these benefits, the plan requires teachers to contribute 8.4 percent of their salaries each year. (They must also contribute an additional 1 percent of their salaries to defray the cost of survivor benefits, but our analysis ignores that extra contribution because we do not consider survivor benefits.) When teachers separate, they may elect refunds of their contributions instead of receiving future pension benefits, but they do not receive any interest on those past contributions.

In 2010, as the pension plan's financial problems intensified, the Illinois state legislature substantially cut benefits for teachers hired on or after January 1, 2011. This tier-2 plan is similar to tier 1, except for changes in benefit eligibility, the final average salary calculation, and COLAs. Teachers covered by tier 2 are not eligible for full benefits until they have completed 10 years of service and reached age 67. Reduced early benefits are available at age 62 after 10 years of service, reduced 6 percent for each year that they are

collected before age 67. Tier-2 teachers with less than 10 years of completed service still qualify for lump-sum payments, again equivalent to lifetime pensions beginning at age 65 and providing annual payments equal to 1.67 percent of their final average salaries multiplied by completed years of service. Final average salary is calculated over teachers' 8 consecutive highest-compensated years of service during their final 10 service years. Annual COLAs are set equal to one-half the percentage change in the consumer price index, but they may not exceed 3 percent and do not begin until age 67.

How Can We Project Future Pension Benefits?

Our analysis simulates the pension benefits that public school teachers would receive under tiers 1 and 2 of the state plan at age 67 and over their lifetimes. Teachers are assumed to earn the average salaries for their ages and years of service among those hired in the fall of 2013, as projected by the plan actuaries (Buck Consultants 2014). Our simulations project final service years by applying separation probabilities that vary by age and years of service as estimated by the plan actuaries. We assume plan participants discount future benefits by 8 percent a year and that prices increase 3.25 percent a year, the interest and inflation rates adopted by the plan trustees. All financial amounts are expressed in constant 2014 dollars.

We compute annual pension benefits by applying the benefit formula to our assumed salary histories. The calculations assume that all plan participants receive their payments as single-life annuities—forgoing survivor benefits for any spouse. We compute the value of lifetime benefits by summing all future annual payments, discounting them by 8 percent a year and by the probability that teachers will die before they can collect. The value is measured at the year that plan participants leave state employment. Mortality probabilities are derived from unisex life tables compiled by the Social Security Administration. We also estimate lifetime benefits net of the value of lifetime employee contributions, to show how much the public sector is paying for teachers' pensions. The simulated value of lifetime contributions assumes that those contributions would earn 8 percent annual returns if invested outside the pension plan. When we estimate the value of lifetime benefits, we further assume that plan participants will elect to have their contributions refunded instead of receiving pensions, if the refunds are worth more.

How Much Annual Income Will Retirees Receive?

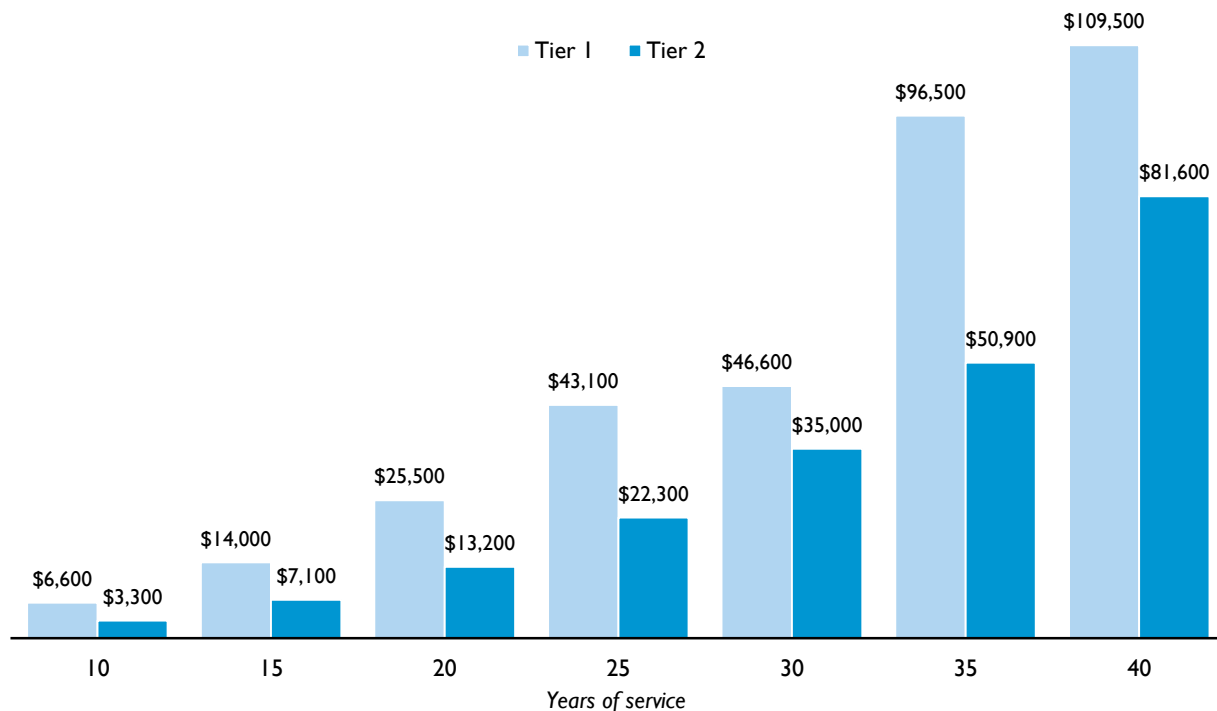
Annual pension benefits for Illinois public school teachers increase sharply with years of service. Under tier 1, teachers hired at age 25 would receive \$6,600 in annual pension benefits at age 67, measured in 2014 dollars, if they leave state employment after 10 years of service (figure 1).³ Their annual benefits at age 67 would nearly quadruple—to \$25,500—if they, instead, remain employed for 20 years. Another five years of service boosts their annual retirement payments by \$17,600. After 30 years of service, age-25 hires qualify for early retirement, allowing them to take up benefits at age 55 instead of waiting until age 60, but their annual benefits would be reduced by 30 percent—6 percent for each of the five years that

they collect before age 60. We assume that teachers will choose this option, because it maximizes the payments they receive over their lifetimes. As a result, extending tenure from 25 to 30 years of service increases annual benefits received at age 67 by only \$3,500. Performing 35 years of service, however, raises annual benefits by nearly \$50,000: teachers hired at age 25 who remain employed for 35 years would collect \$96,500 at age 67.

The state pension rewards long-serving teachers much more than those with shorter careers because the benefit formula directly ties payments to years of service. Final average salary also generally increases with tenure, so the earnings base partially replaced by the plan grows as teachers work longer. Future retirement benefits erode over time when teachers separate before they may begin receiving payments because the benefit is not adjusted for inflation in the interim. However, annual benefits do not increase much with additional service for teachers with at least 34 years of tenure because they have reached the 75 percent replacement rate cap. Benefits for these long-serving teachers rise with additional service only to the extent that their final average salary increases.

FIGURE I

Annual Pension Benefits at Age 67
For 25-year-old hires



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary amounts are in constant 2014 dollars. Estimates assume benefits are collected at the age that maximizes the value of lifetime payments.

Tier-2 benefits also increase rapidly with years of service, but they are much smaller than tier-1 benefits. We assume that tier-2 teachers will generally begin collecting early benefits at age 62 instead of waiting until age 67, when full pensions may begin, because collecting early maximizes benefits collected over the lifetime. Collecting at age 62, however, reduces tier-2 annual benefits by 30 percent. Tier-2 benefits are also lower than tier-1 benefits, because COLAs do not begin until age 67—six years later than in tier 1—and the new formula reduces final average salary. After 20 years of service, teachers in tier 2 hired at age 25 receive \$13,200 in annual pension benefits at age 67, barely half as much as they would collect under tier 1.

How Much Will Tier-1 Retirees Receive over Their Lifetimes?

How well teachers are served by the state retirement plan depends on how much they receive over their lifetimes, not in a single year. Teachers who begin collecting their pensions at relatively young ages will benefit more from the plan than their counterparts who begin collecting the same annual payments at older ages. Figure 2 shows how the value of lifetime pension benefits increases with years of service for tier-1 members hired at age 25. Teachers who separate before completing about 15 years of service receive few pension benefits over their lifetimes. After 10 years of service, for example, teachers hired at age 25 receive lifetime benefits worth only \$28,000 in 2014 dollars. This value is low because they must wait 25 years to begin collecting and, as mentioned, their benefits are based on the relatively low salaries they earned in their mid-30s. Additional years of service, however, raise benefits substantially. They rise to \$174,000 after 20 years of service, \$557,000 after 28 years of service, and peak at \$1.3 million after 35 years of service. The value of lifetime benefits falls if teachers hired at age 25 work more than 35 years. Because such long-tenured teachers have already reached the 75 percent replacement rate cap specified in the benefit formula, annual pensions do not increase much with additional years of service. Moreover, teachers forgo a benefit check each additional year they remain in state employment past the benefit eligibility age. As a result, age-25 hires with 35 years of service forgo \$49,000 in lifetime pension benefits by working an additional 5 years, while contributing an additional \$222,000 to the plan.

Teachers must work many years before their future retirement benefits are worth more than what teachers could have earned on their required plan contributions if they instead invested those contributions outside the plan. Assuming teachers could receive the same returns outside the plan as the plan trustees assume the plan receives, we estimate that teachers' contributions would be worth three times as much as their future pension benefits after 9 years of service, twice as much after 12 years of service, and 1.5 times as much after 16 years of service. Age-25 hires must remain in the plan for 22 years before their future benefits are worth more than their contributions. After just a few more years on the job, however, future benefits are worth much more than what teachers contributed.

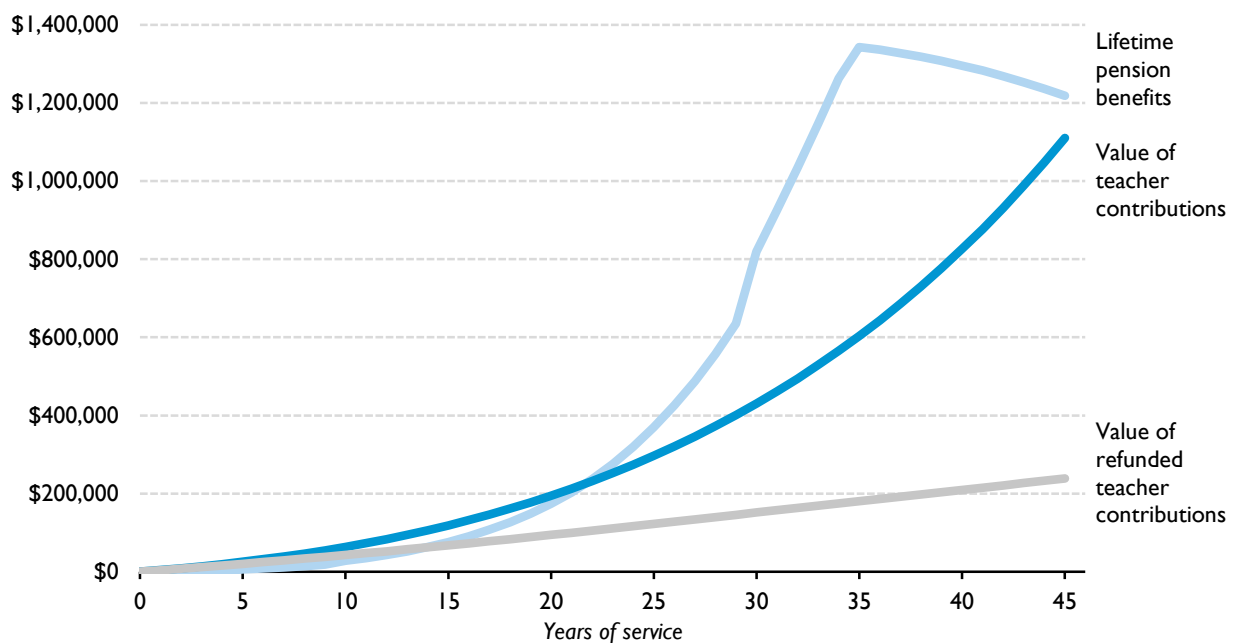
Teachers who separate before they have earned sizeable pensions may have their contributions refunded, without interest. The gray line in figure 2 shows how much teachers would receive if they opted

for refunds. Age-25 hires separating with less than 14 years of service would benefit more from refunds than future pensions. Even when their contributions are refunded, though, they lose money by participating in the mandatory teacher pension plan because they could have earned more by investing their contributions outside the plan. Using the plan trustees' investment-return assumptions, we estimate that teachers hired at age 25 who separate with 13 years of completed service forfeit \$37,000 by participating in the plan. Tier-1 teachers who complete 14 or more years of service are better off collecting their pensions than taking refunds. Nonetheless, those who separate with less than 22 years of service lose money in the plan because their future pensions are worth less than their contributions combined with the investment returns they could have earned on those contributions outside the plan, even though their pensions are worth more than those contributions when refunded without any interest. These teachers, even those who serve for many years, are essentially subsidizing the large pensions received by long-tenured teachers.

FIGURE 2

Value of Teacher Contributions and Future Benefits

For 25-year-old hires, tier 1



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

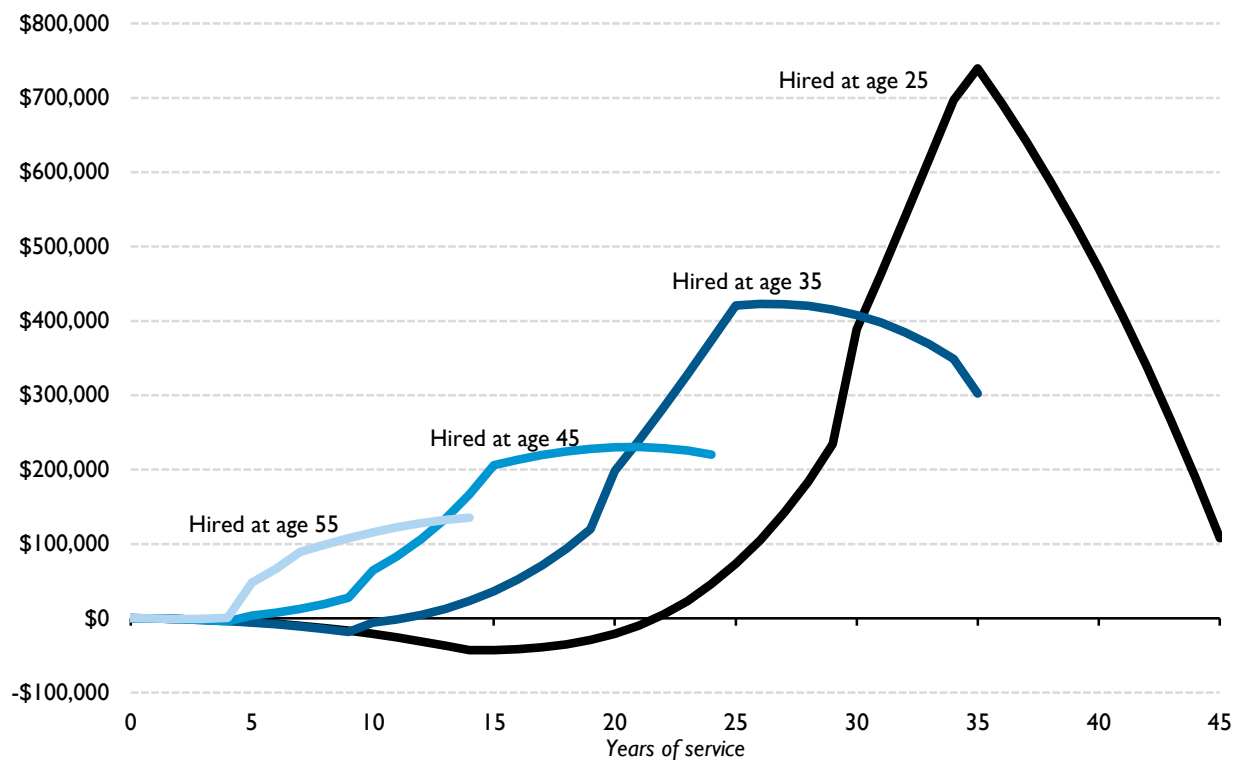
To this point, our analysis has focused on age-25 hires, but only 32 percent of Illinois public school teachers are hired at age 25, according to data from the plan actuaries (Buck Consultants 2014). Thirty-five percent join the plan at age 30 or later, and 14 percent join at age 40 or later. Teachers who start their careers later accumulate future pension benefits faster than those who begin teaching earlier.

Figure 3 shows how the expected value of lifetime pension benefits net of teacher contributions changes with years of service for tier-1 teachers hired at ages 25, 35, 45, and 55. For age-25 hires, the figure highlights the plan-related financial losses teachers experience when separating with less than 22 years of service, the surge in the net value of future pension benefits for teachers with between 30 and 35 years of service, and the sharp decline for those who teach more than 35 years. Lifetime pension benefits net of teacher contributions are worth \$234,000 for those who separate with 29 years of completed service, but \$389,000 for those who separate with 30 years of completed service, a gain of \$155,000 from just one additional year of teaching. Lifetime pension benefits for age-25 hires soar at the 30th service year because it enables them to begin collecting immediate early benefits, instead of having to wait until age 60 to collect their pensions. Lifetime benefits peak at \$740,000 after 35 years of service but then fall 36 percent, to \$470,000, after 40 years of teaching and 85 percent, to \$108,000, after 45 years of teaching. The value of net lifetime benefits decreases after 35 years of service because additional service years do not raise annual payments much for long-tenured teachers who have reached the plan's replacement-rate cap, and retirement-eligible teachers forgo a year of benefits for each year they remain employed, yet these teachers must continue to make substantial contributions to the pension plan.

FIGURE 3

Expected Value of Tier-I Lifetime Benefits

Net of teacher contributions, by starting age



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

Lifetime pension benefits net of employee contributions grow differently for teachers hired at older ages. Older hires who receive refunds of their contributions lose more by participating in the plan than younger hires who separate with the same tenure because those hired later tend to earn and contribute more. With additional time on the job, however, employees hired at older ages accumulate school-financed lifetime pension benefits faster than those hired at younger ages. For example, teachers hired at age 35 must remain for only 12 years before the value of their lifetime pension benefits exceeds the value of their plan contributions, and those hired at age 45 must remain employed for only 5 years, compared with 22 years for age-25 hires. After 25 years of service, teachers hired at age 35 have accumulated \$421,000 in future lifetime benefits, while those hired at age 25 have accumulated only \$73,000. Similarly, after 15 years of service, employees hired at age 45 will have accumulated \$206,000 in future lifetime benefits compared with \$37,000 for those hired at age 35. Age-55 hires will have accumulated \$48,000 after 5 years and \$116,000 after 10 years.

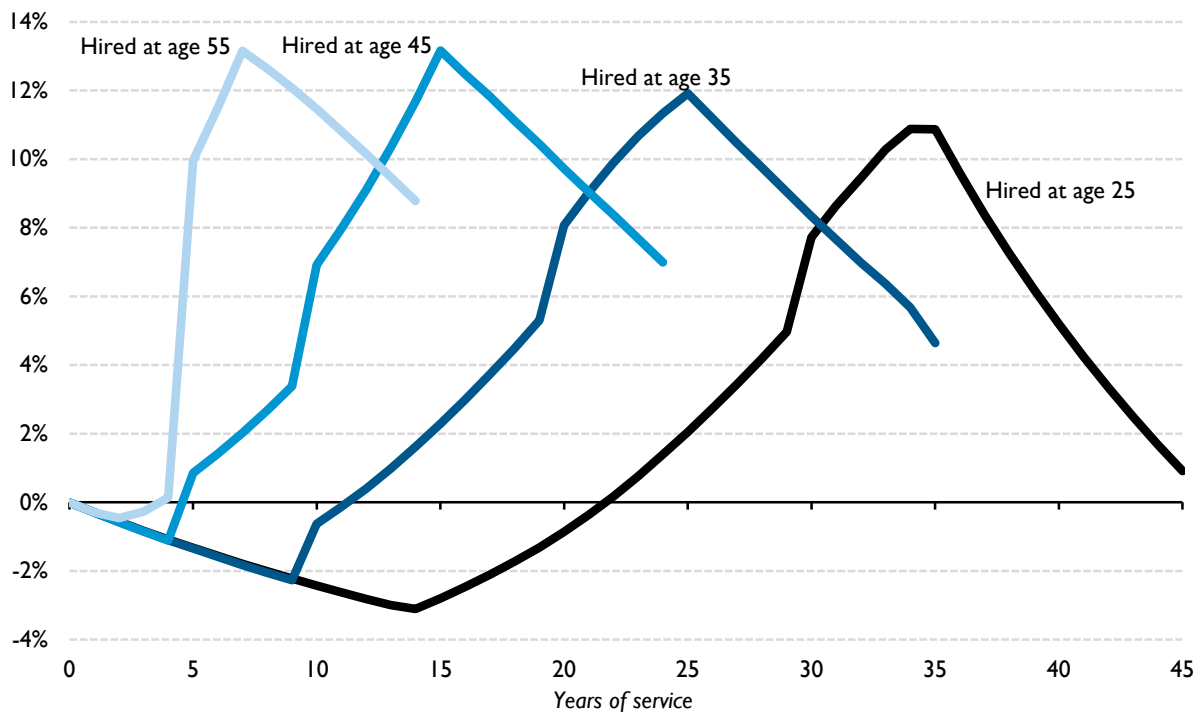
Older hires benefit from the pension plan sooner than those hired at younger ages because they do not wait as long to begin collecting their pensions. However, the value of lifetime benefits also begins declining sooner when employees are hired at older ages. For example, net lifetime benefits begin falling after 26 years of service for age-35 hires and after 21 years of service for age-45 hires because the growth in annual benefits from working another year is not large enough to offset the benefit checks lost by those who delay retirement or the additional contributions they must make.

Another way of expressing the expected value of lifetime benefits net of teacher contributions is as the portion of salary that schools would have to set aside each year (combined with employee contributions) to finance the stream of future benefits that teachers will receive once they retire. These calculations show how much retirement benefits supplement employee salaries, averaged over their careers, assuming that employer contributions earn 8 percent nominal returns, the rate assumed by the plan trustees.

The existing retirement plan significantly reduces salaries for teachers hired at age 25 who separate before completing 22 years of service because, as we saw earlier, future pension benefits for teachers with less seniority are worth less than their required contributions. For age-25 hires who leave after completing 14 years of service, for example, the retirement plan reduces their salaries by 3 percent each year they worked (figure 4). The plan supplements salary for those who remain on the job for at least 22 years, but how much they benefit depends on how long they stay. For instance, the plan supplements salaries 2.1 percent each year for those who separate after 25 years of service and 10.9 percent each year for those who separate after 35 years of service. The annual supplement then falls each year that age-25 hires remain on the job beyond 35 years, declining to 5.2 percent after 40 years of service and 0.9 percent after 45 years of service.

FIGURE 4

Career-Average Employer Cost as Percentage of Salary for Tier-1 Teachers



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. The figure reports the fixed percentage of teachers' salaries that the state would have to contribute each year to finance promised benefits. The analysis assumes an annual interest rate of 8 percent and inflation rate of 3.25 percent, the rates adopted by the teacher retirement system.

Teachers hired at older ages get much more out of the plan for each year of service than those hired at younger ages. For example, the plan supplements salaries 13.2 percent each year for age-45 hires who separate after 15 years of service and for age-55 hires who separate after only 7 years of service.

How Much Will Tier-2 Retirees Receive over Their Lifetimes?

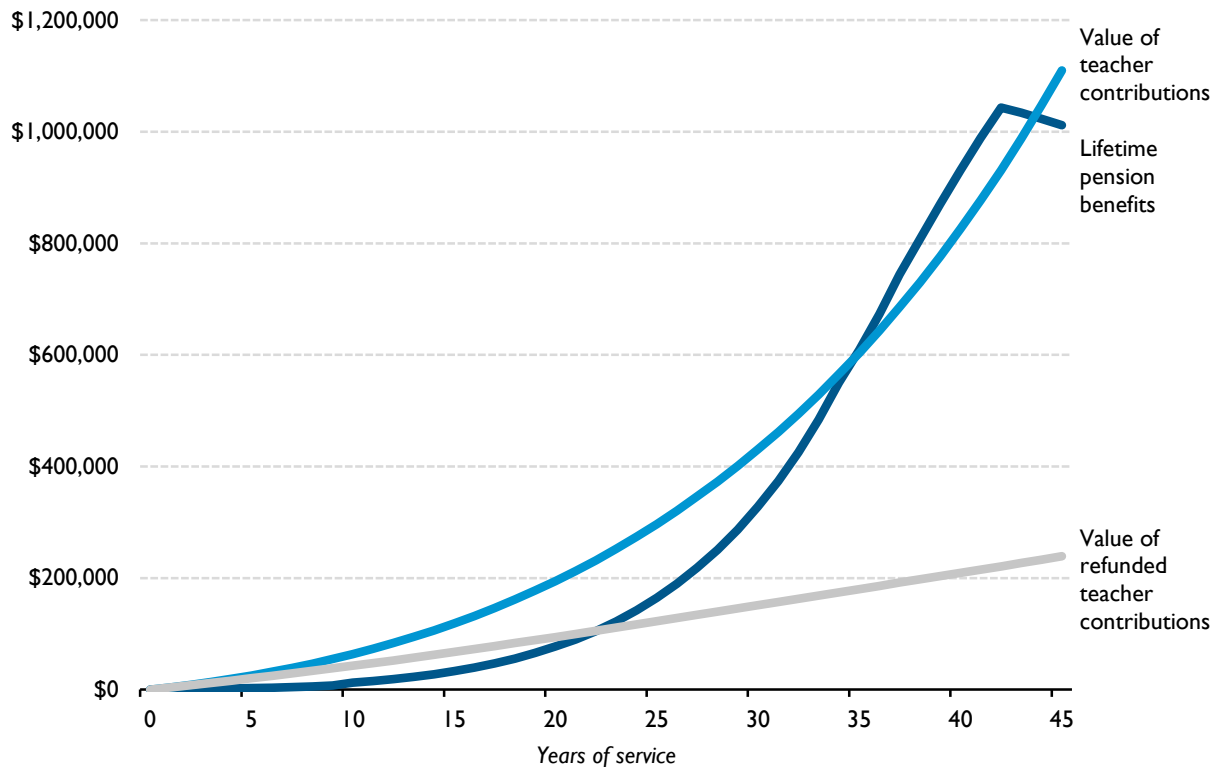
Tier-2 teachers receive far fewer pension benefits over their lifetimes than their tier-1 counterparts because tier-2 pensions start later, receive lower COLAs, and are based on smaller measures of final average salary. Teachers in tier 2 hired at age 25 accumulate future pension benefits worth \$77,000 after 20 years of service and \$609,000 after 35 years of service, less than half as much as tier-1 teachers with such experience accumulate (figure 5). However, tier-2 teachers contribute as much to the plan as those in tier 1. Consequently, age-25 hires in tier 2 must work 35 years before their future benefits are worth more than their contributions. Those with less than 23 years of service are better off having their contributions refunded than waiting to collect future pensions. However, because they receive no interest on past contributions, they suffer significant financial losses by participating in the plan. If they could earn as

much on their contributions if invested outside the plan as the plan trustees assume the plan will earn on those contributions, teachers hired at age 25 who separate with 22 years of completed service forfeit \$126,600 by participating in the plan.

FIGURE 5

Value of Teacher Contributions and Future Benefits

For 25-year-old hires in tier 2



Source: Authors' calculations based on plan documents and actuarial reports.

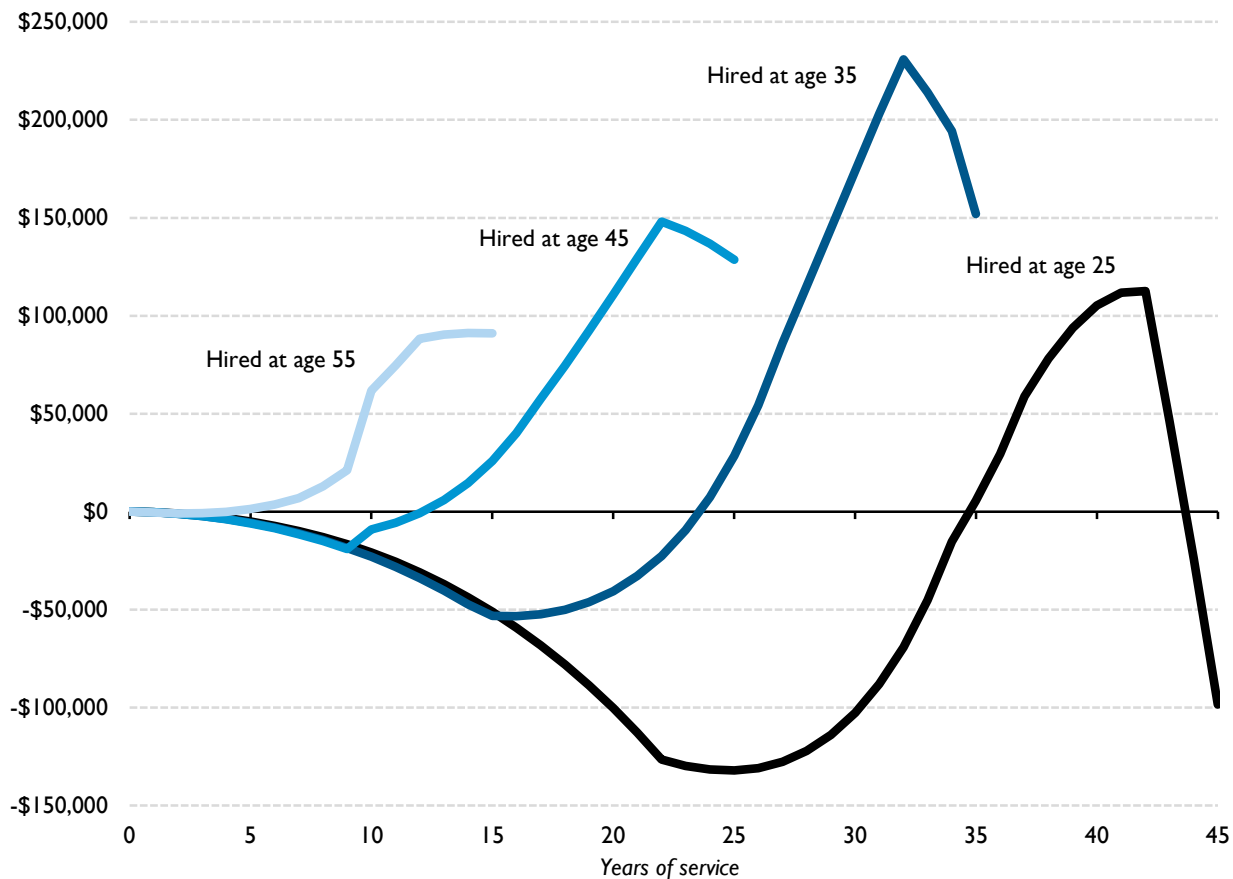
Notes: All monetary figures are in constant 2014 dollars. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

For age-25 hires, the expected value of lifetime benefits net of teacher contributions peaks at 42 years of completed service, when teachers are age 67 (figure 6). Their net lifetime benefits are then worth \$112,500, but the value declines rapidly with additional service, turning negative after only two more years of service. Their lifetime pension benefits are worth less than the value of their required plan contributions after 44 years of service because working longer reduces the number of benefit checks teachers receive without increasing their annual payments by much, and they must continue to contribute to the plan as long they remain employed.

FIGURE 6

Expected Value of Lifetime Benefits Net of Teacher Contributions

By starting age for teachers in tier 2



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

Older hires fare better in the tier-2 plan, although they receive much smaller pensions than their tier-1 counterparts. For age-35 hires, the value of lifetime net benefits peaks at 32 years of completed service, again when teachers are age 67. Lifetime pension benefits net of teacher contributions are worth about twice as much at 32 years of completed services for age-35 hires as at 42 years of completed service for age-25 hires. Older hires get more from the plan because they made fewer required plan contributions, yet receive similar monthly payments. The pensions age-35 hires receive replace 70.4 percent of their final average salaries, while the pensions age-25 hires receive (who are employed for an additional 10 years) replace 75 percent of their final average salaries, the statutory replacement rate cap. The value of lifetime net benefits falls quickly if age-35 hires teach for more than 32 years.

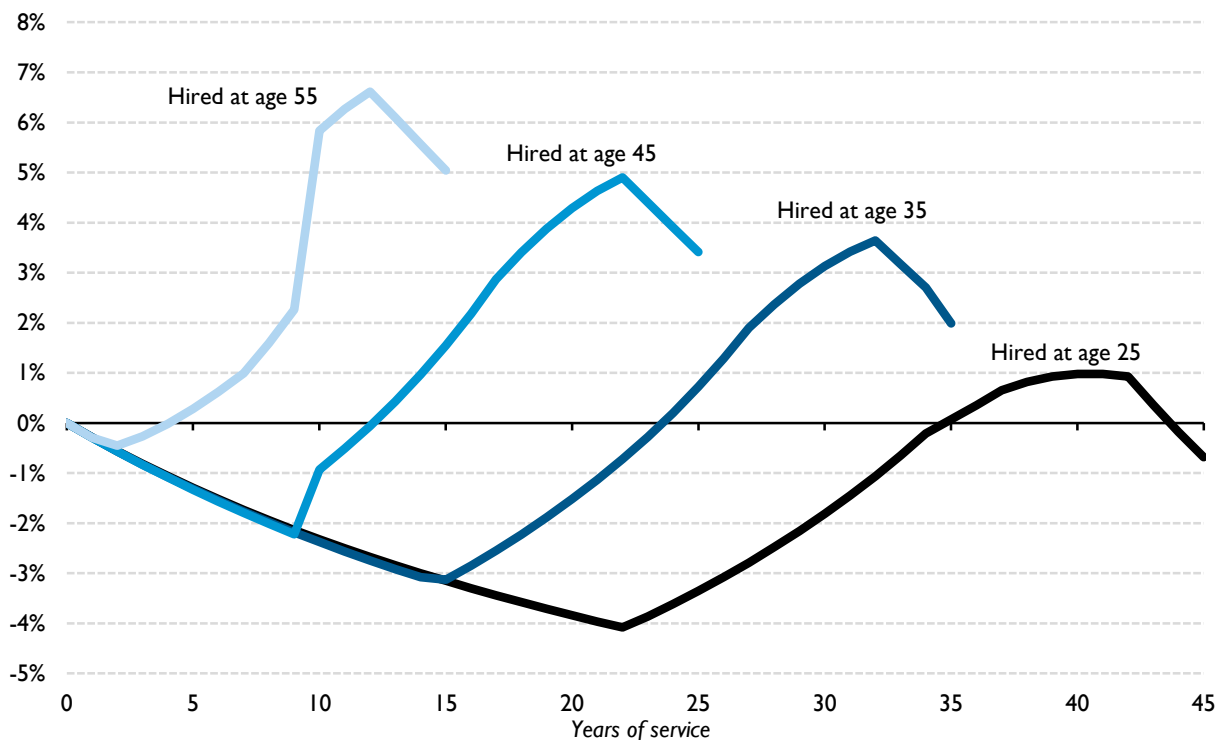
Most teachers in the tier-2 plan must remain employed much longer than those in the tier-1 plan for their future pensions to be worth more than their required plan contributions. Pension benefits in the

tier-2 plan are worth less than teachers' required contributions for age-25 hires who complete less than 35 years of service, assuming those contributions would earn 8 percent annual returns if invested outside the plan, as the plan trustees assume they will earn inside the plan. Age-35 hires must teach for 24 years and age-45 hires must teach for 13 years to collect pensions worth more than their contributions. Tier-2 teachers hired at age 55, however, must remain employed only five years to earn pensions worth more than their contributions.

The tier-2 plan does not provide Illinois public school teachers with many pension benefits per year of service, especially those hired at age 25. Local school districts and the state would never have to contribute more than 1 percent of teachers' salaries every year of their careers to finance the future pension benefits that age-25 hires earn, and employers would have to pay that much only for those who separated with 42 years of completed service (figure 7). For age-25 hires who separate with less than 35 years of service or more than 43 years of service, the tier-2 plan generates revenue for local school districts and the state. For example, the plan reduces take-home pay every year by 4.1 percent of salary for age-25 hires who separate with 22 years of completed service.

FIGURE 7

Career-Average Employer Cost as Percentage of Salary for Tier-2 Teachers



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. The figure reports the fixed percentage of teachers' salaries that the state would have to contribute each year to finance promised benefits. The analysis assumes an annual interest rate of 8 percent and inflation rate of 3.25 percent, the rates adopted by the teacher retirement system.

Teachers who join the tier-2 plan after age 25 fare better, but they earn less than their tier-1 counterparts. At their peak, future benefits supplement salaries by 3.6 percent for age-35 hires, 4.9 percent for age-45 hires, and 6.6 percent for age-55 hires.

How Are Pension Benefits Distributed across the Workforce?

Table 1 reports the distribution of projected pension benefits for newly hired teachers in Illinois, assuming they participate in tier 1 or tier 2. For teachers in tier 1, annual age-67 pension benefits will average \$17,200 in constant 2014 dollars, and total lifetime pension will average \$215,800. Three-fifths of those pension benefits will be financed by teachers' contributions. Lifetime benefits net of teacher contributions will average only \$89,000. Average benefit levels will be significantly higher among those who teach in state public schools for at least five years, whose retirement incomes arguably matter more when evaluating the pension plan than those for teachers with shorter tenures. For tier-1 teachers who complete at least five years of service, annual benefits will average \$27,800, total lifetime benefits will average \$342,500, and lifetime benefits net of teacher contributions will average \$144,300. For their counterparts who complete at least 10 years of service, annual benefits will average \$37,700, total lifetime benefits will average \$472,200, and lifetime benefits net of teacher contributions will average \$206,500.

Pension benefits vary widely across the workforce.⁴ Focusing on teachers who complete at least five years of service, we estimate that one-quarter of newly hired teachers would receive more than \$47,600 in annual pension benefits at age 67 (the 75th percentile, as reported in table 1) if they participating in tier 1, and one-tenth would receive more than \$64,700 per year (the 90th percentile). However, half of tier-1 teachers with at least five years of completed service would receive less than \$19,200 per year (the 50th percentile, or median value), and one-quarter would receive less than \$5,800 (the 25th percentile). In terms of lifetime benefits net of teacher contributions, one-quarter of tier-1 teachers with at least five years of completed service will accumulate more than \$274,700, and one-tenth will accumulate more than \$468,300. However, one-quarter of newly hired teachers who complete at least five years of service would lose more than \$13,100 by participating in the tier-1 state pension plan because the pensions or refunds that they collect will be worth less than the contributions they are required to make.

TABLE I

Distribution of Projected Pension Benefits (\$)

	Annual Benefits at Age 67		Total Lifetime Benefits		Lifetime Benefits Net of Teacher Contributions	
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
Average						
All teachers	17,200	10,200	215,800	117,500	89,000	-4,000
At least 5 years of service	27,800	17,500	342,500	195,200	144,300	-6,000
At least 10 years of service	37,700	26,400	472,200	279,600	206,500	-4,800
10th percentile						
All teachers	0	0	4,500	4,400	-20,700	-52,500
At least 5 years of service	3,000	0	24,700	24,200	-29,100	-85,900
At least 10 years of service	8,800	4,100	52,300	47,600	-34,100	-102,800
25th percentile						
All teachers	0	0	11,600	10,300	-5,400	-16,600
At least 5 years of service	5,800	0	38,100	33,600	-13,100	-36,800
At least 10 years of service	16,100	6,700	118,500	63,100	-20,600	-55,800
50th percentile						
All teachers	4,500	0	33,500	26,200	-900	-2,300
At least 5 years of service	19,200	6,700	168,100	65,100	34,200	-12,800
At least 10 years of service	34,400	17,900	426,800	167,800	197,100	-25,400
75th percentile						
All teachers	29,800	10,100	333,800	87,400	147,200	-300
At least 5 years of service	47,600	26,900	628,500	280,000	274,700	7,000
At least 10 years of service	55,800	38,900	749,200	442,800	373,900	58,800
90th percentile						
All teachers	58,000	38,200	795,700	429,000	399,800	58,000
At least 5 years of service	64,700	48,400	922,500	575,700	468,300	95,700
At least 10 years of service	69,400	56,900	962,400	655,700	501,500	123,400

Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Annual benefits are reported at take-up age for teachers who begin collecting after age 67. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

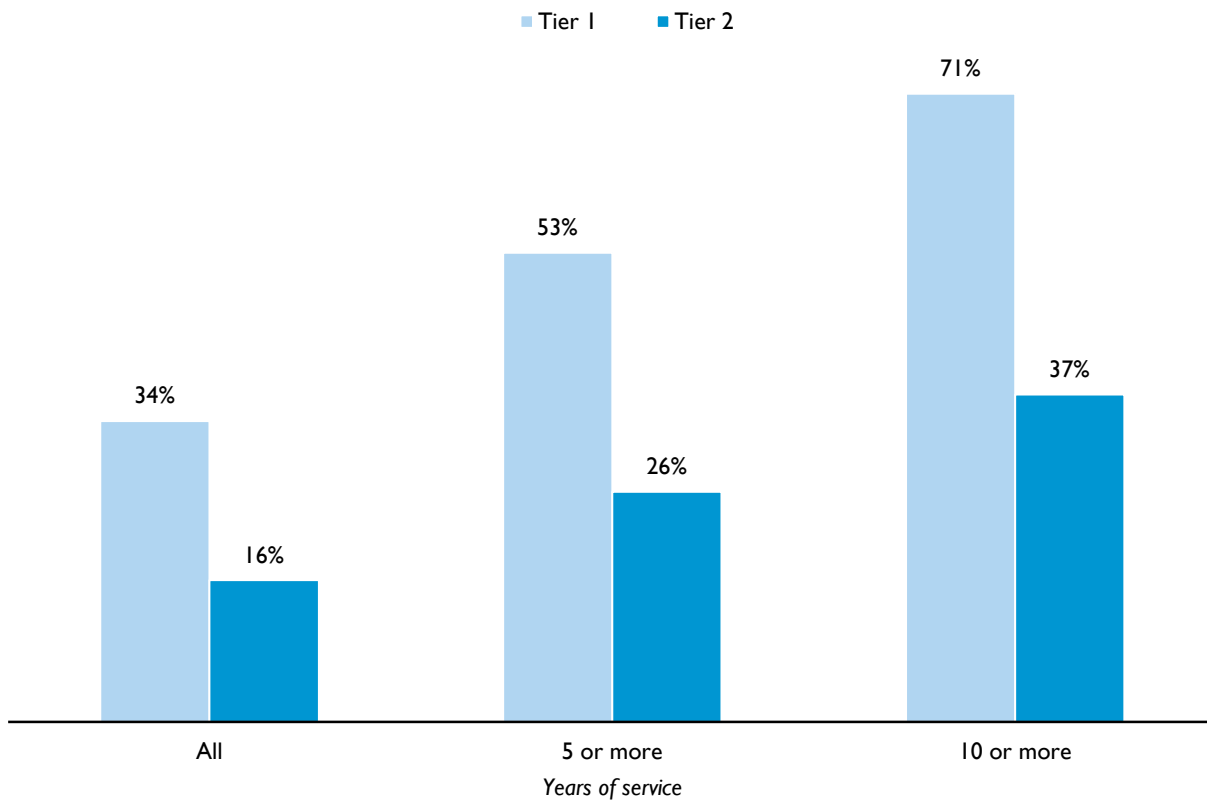
Tier-2 benefits are substantially lower than those provided to tier-1 members. Annual age-67 benefits will average \$10,200 for all new tier-2 hires and \$17,500 for those who complete at least five years of service. Average lifetime pension benefits for tier-2 teachers with at least five years of service will be \$195,200, all of which would be financed by teachers' contributions. Among tier-2 members with at least five years of completed service, more than one-quarter will not work long enough to receive pension benefits and half will receive no more than \$6,700 at age 67.⁵ Nonetheless, 10 percent will receive more than \$48,400 per year. More than half of newly hired tier-2 teachers who teach for at least five years will receive pension benefits over their lifetimes that fall short of the value of their required contributions by

at least \$12,800, so they lose financially by participating in the plan. Only one-quarter of tier-2 teachers with at least five years of completed service will earn lifetime benefits worth at least \$7,000, net of their own contributions, and only 10 percent will earn net lifetime benefits worth at least \$95,700.

Only 16 percent of newly hired tier-2 teachers will earn pensions worth more than their required plan contributions, whereas 34 percent would earn pensions worth more than their contributions if enrolled in tier 1 (figure 8). Among teachers completing five or more service years, future pensions would be worth more than required teacher contributions for 53 percent of new hires in tier 1 and 26 percent of new hires in tier 2. Among teachers with at least 10 service years, the value of future pensions would exceed required teacher contributions for 71 percent of new hires enrolled in tier 1 and 37 percent of new hires enrolled in tier 2.

FIGURE 8

Share of Teachers with Lifetime Pension Benefits Worth More than Their Required Plan Contributions



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary amounts are in constant 2014 dollars. The analysis assumes an annual interest rate of 8 percent and inflation rate of 3.25 percent, the rates adopted by the teacher retirement system.

How Would Teachers Fare in a Cash Balance Plan?

Relatively few teachers gain much from Illinois's existing pension plan because benefits are accrued late into the career. Among teachers hired at relatively young ages, tier-1 members must work at least 30 years to receive pensions worth substantially more than their own required contributions, and tier-2 teachers must work at least 40 years. Alternative plan designs, such as cash balance plans, that allow participants to earn future benefits gradually throughout their careers could generate larger pensions for many Illinois teachers.

Cash balance plans express benefits as an account balance that builds over time with employee and employer contributions as well as accumulated investment returns. They are similar to 401(k)-type defined-contribution plans except that participants do not own their accounts. Instead, the accounts are pooled and professionally managed, and plans often guarantee some minimum investment return. The account balance may continue to increase with investment returns after employees separate, so those who separate early may accumulate substantial savings by the time they reach retirement age. In the existing teacher pension plan, by contrast, retirement benefits are frozen when teachers separate, so inflation and lost interest erode their values while teachers wait to collect. Additionally, cash balance plans allow participants to collect their benefits as lifetime annuities (instead of having to purchase them from private insurance companies that usually offer unfavorable rates).

Illinois State Senator Daniel Biss (D-Evanston) introduced a bill in 2012 to create a cash balance plan for state employees, including public school teachers.⁶ Under his proposal, teachers and school districts would each contribute the same share of teachers' salaries to the plan. Account balances would receive interest credits equal to the actual state return on investments, but no less than 5 percent and no more than 10 percent in any year. Both employee and employer contributions would vest immediately. Upon separation, teachers could immediately withdraw their balances, or they could keep their funds in the plan and receive an actuarially fair, lifetime annuity beginning at age 67. The annuity would be computed using a 5 percent interest rate and provide the same COLA as the tier-2 plan.⁷ Those who leave state employment before age 67 and choose to keep their balances in the plan would earn 5 percent interest each year until they begin collecting their annuities.

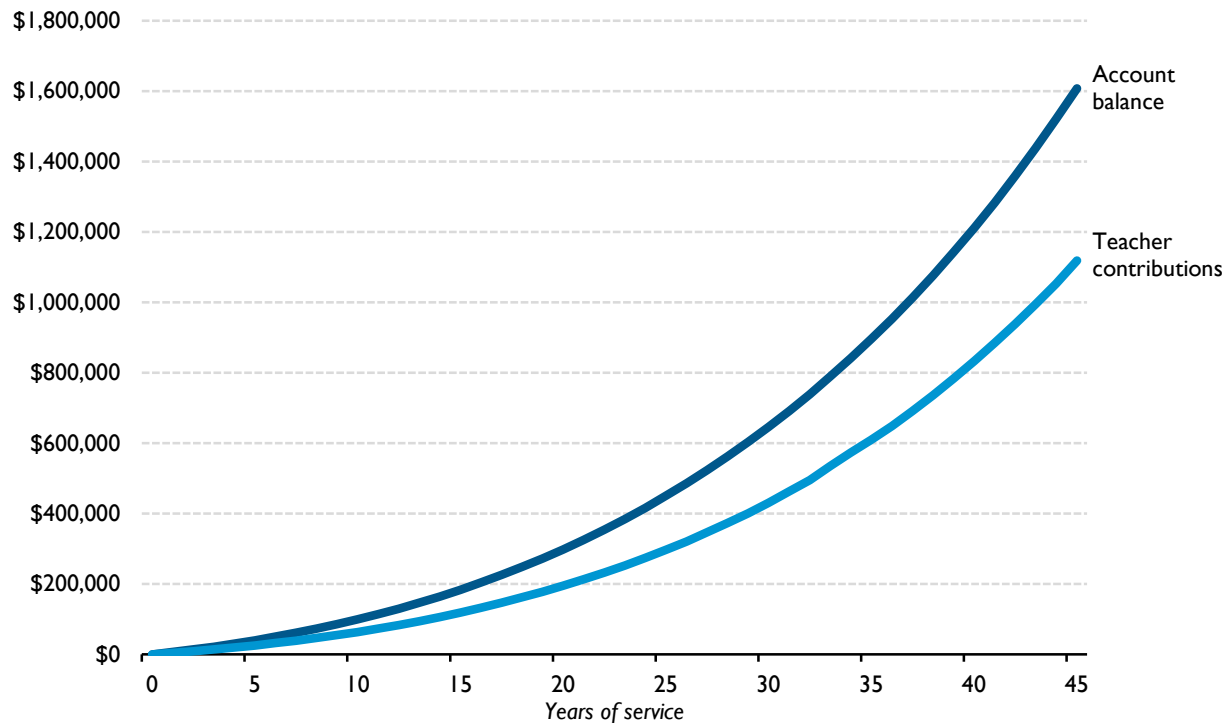
We simulate future pension benefits for newly hired Illinois public school teachers in a cash balance plan similar to Senator Biss's proposal. We modify the contribution rates he proposed so that the expected employer cost of the plan for new hires equals the expected cost of the tier-1 plan. Employee contribution rates are set at 8.4 percent, the existing rate in tiers 1 and 2, which implies an employer contribution rate of 5.0 percent to equilibrate expected costs.⁸ All other elements of the simulated cash balance plan are as described in Senator Biss's proposal. Outcomes under the cash balance plan are uncertain, depending on variable investment returns. We account for this uncertainty by simulating benefits under 1,000 different investment return scenarios and reporting the average outcome. The random investment return for each scenario is drawn from a normal distribution with a mean of 8.0 percent and standard deviation of 11.0

percent. We measure the lifetime benefits in the cash balance plan as the account balance that has accumulated by the time teachers separate from state employment.

Average account balances in a cash balance plan structured under these terms would grow steadily over a career. Assuming that the accounts earn expected returns of 8 percent—the current rate of return assumed by the plan’s trustees—teachers hired in 2014 at age 25 can expect to accumulate \$99,000 (in constant 2014 dollars) after 10 years of service, \$298,000 after 20 years, \$646,000 after 30 years, and \$1.2 million after 40 years (figure 9). Teacher contributions account for about two-thirds of the accumulated balance.

FIGURE 9

Expected Value of Account Balances and Teacher Contributions in the Proposed Cash Balance Plan
For 25-year-old hires



Source: Authors’ calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Estimates assume that investments earn 8 percent per year and the annual inflation rate is 3.25 percent, the rates adopted by the teacher retirement system.

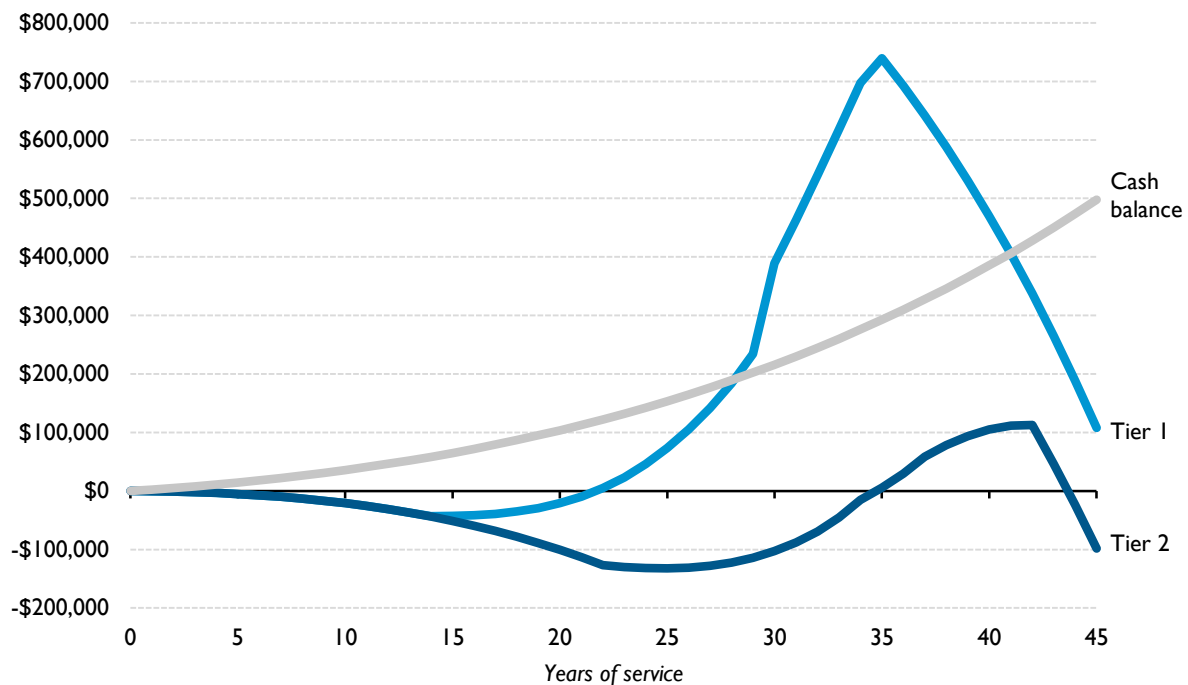
Most teachers hired at age 25 would receive more from the simulated cash balance plan than the existing state pension plans (figure 10). The proposed cash balance plan would generate higher lifetime benefits, net of teacher contributions, for all age-25 hires in tier 2 and for all age-25 hires in tier 1 except those retiring with between 29 and 40 years of completed service. For many teachers, the gains from transitioning to the cash balance plan would be substantial. Relative to tier 1, for example, teachers would gain \$57,000 in net lifetime benefits after 10 years of service by transitioning to the cash balance plan and

\$124,000 after 20 years of service. Tier-2 teachers with 25 years of service would gain \$286,000 in net lifetime benefits by moving into the simulated cash balance plan.

Overall, 72 percent of Illinois public school teachers in the tier-1 pension plan would fare better in the simulated cash balance plan, including 56 percent of those with five or more years of completed service, even though the cash balance plan would be no more costly to taxpayers than the tier-1 plan (table 2). Teachers with relatively short tenures and those who join the state payroll at relatively young ages are most likely to gain in the cash balance plan. For example, the cash balance plan would generate higher pensions for 91 percent of teachers separating with between 5 and 9 years of completed service, 81 percent of those separating with between 10 and 14 years of service, and 52 percent of those separating with between 15 and 19 years of service, as well as nearly all teachers who separate with less than 5 years of service. By contrast, only 9 percent of teachers with between 30 and 34 years of service would fare better under the cash balance plan. Additionally, 84 percent of teachers hired before age 25, 76 percent of those hired at ages 25 to 29, and 66 percent of those hired at ages 30 to 34 would gain in the cash balance plan, compared with only 45 percent of teachers hired at ages 40 to 49. Gains from transitioning to the cash balance plan would be substantial. Teachers with five or more years of service who would fare better in the cash balance plan would experience a median gain of \$45,000 in lifetime benefits net of their own contributions.

FIGURE 10

Expected Value of Lifetime Pension Benefits Net of Employee Contributions



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: All monetary figures are in constant 2014 dollars. Estimates assume that investments earn 8 percent per year and the annual inflation rate is 3.25 percent, the rates adopted by the teacher retirement system.

Teachers receiving few benefits in the existing state pension plan would fare better in the cash balance plan. In tier 1, 66 percent of teachers would not receive any state-financed benefits from the existing pension plan. All would gain in the simulated cash balance plan. However, only 11 percent of tier-1 teachers receiving \$50,000 or more in tier-1 pension benefits, net of their own contributions, would do better in the cash balance plan.

TABLE 2

Change in Lifetime Expected Pension Benefits when Switching from Tier-I Plan to the Simulated Cash Balance Plan

By final years of service, starting age, and expected benefits under tier I

	Median Change in Expected Lifetime Benefits, Net of Teacher Contributions				
	Percent of teachers	Percent who accumulate at least as many benefits in the cash balance plan	All teachers	Those who do at least as well in the cash balance plan	Those who do worse in the cash balance plan
All Teachers	100	72	\$7,200	\$14,600	-\$152,500
Years of service					
0 to 4	38	99	\$6,500	\$6,500	-\$1,700
5 or more	62	56	\$19,700	\$45,000	-\$155,300
5 to 9	18	91	\$27,500	\$29,300	-\$40,600
10 to 14	11	81	\$63,700	\$69,100	-\$85,200
15 to 19	7	52	\$19,700	\$108,700	-\$118,700
20 to 24	7	35	-\$86,900	\$107,300	-\$156,000
25 to 29	7	20	-\$157,700	\$47,400	-\$196,200
30 to 34	11	9	-\$231,100	\$32,600	-\$247,200
35 or more	1	35	-\$167,800	\$301,300	-\$320,800
Starting age					
Younger than 25	32	84	\$14,800	\$21,300	-\$167,000
25 to 29	32	76	\$9,900	\$16,300	-\$254,400
30 to 34	14	66	\$6,300	\$11,400	-\$209,800
35 to 39	7	54	\$3,100	\$10,200	-\$166,800
40 to 49	9	45	-\$33,100	\$7,500	-\$120,100
50 and older	5	47	-\$1,300	\$6,500	-\$47,100
Value of lifetime benefits net of employee contributions in the tier-I plan					
Negative or zero	66	100	\$13,900	\$13,900	--
\$1 to \$15,000	2	83	\$8,800	\$13,800	-\$1,600
\$15,001 to \$50,000	2	72	\$32,300	\$61,900	-\$12,500
More than \$50,000	30	11	-\$137,700	\$33,100	-\$158,000

Source: Authors' calculations from plan documents and actuarial reports.

Notes: All monetary amounts are in constant 2014 dollars. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

How Might Pensions Plans Affect Teacher Recruitment and Retention?

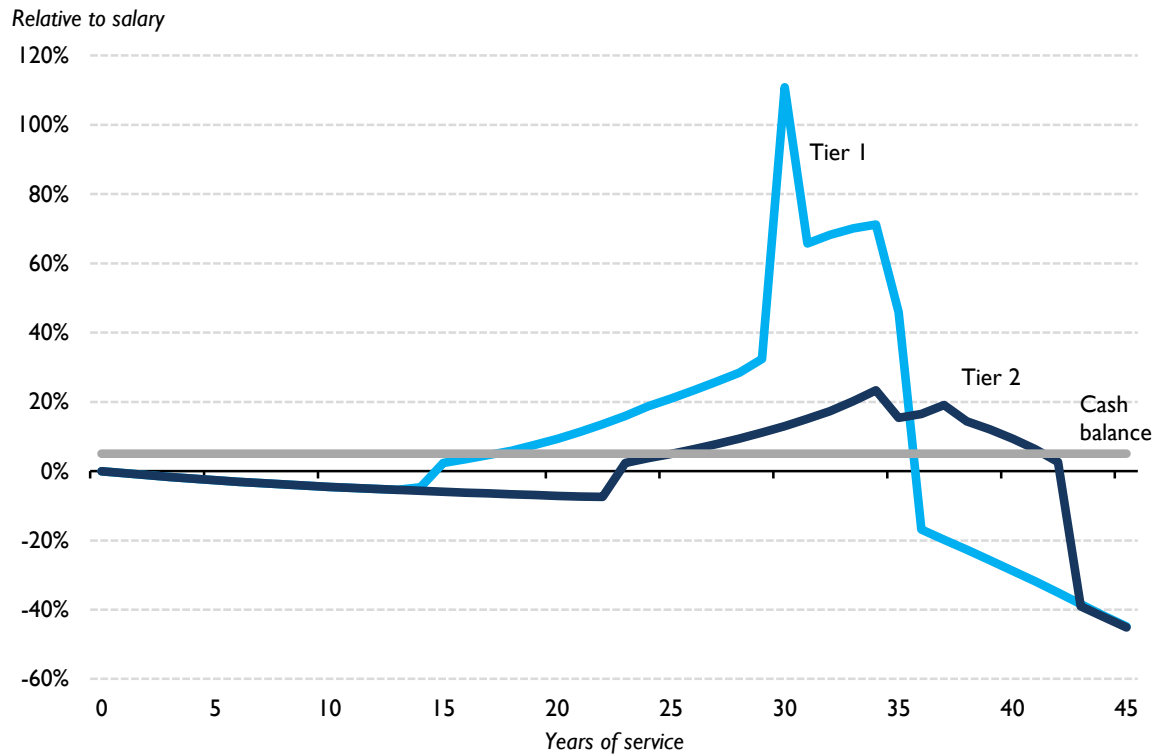
The change in lifetime retirement benefits from working an additional year can significantly affect teacher compensation. Another year of service sometimes substantially increases the value of lifetime pension benefits, boosting total compensation. Sharp spikes in the growth of lifetime benefits can create strong incentives for employees to remain on the job until they realize those rewards, even if the job is a poor match with their skills and they could be more productive elsewhere. However, working an additional year after the plan's retirement age can reduce lifetime pension benefits because workers forfeit a year of benefits for every year they remain on the job, cutting total compensation and creating strong incentives to retire.

Figure 11 shows how the annual increment to the expected value of lifetime pension benefits net of teacher contributions changes over teachers' careers in the tier 1, tier 2, and simulated cash balance plans, for age-25 hires earning average salaries. Tier 1 reduces total teacher compensation each year until teachers have completed 15 years of service. At year 14, the tier-1 pension reduces teacher compensation by 5 percent. In many subsequent years, however, the tier-1 plan substantially supplements compensation. At year 29, for example, the plan boosts compensation by one-third. Completing the 30th year of service, when 25-year-old hires reach age 55 and may begin collecting early pension benefits, nets teachers windfalls equal to 111 percent of their current salary. However, remaining employed for more than 35 years substantially lowers the value of lifetime benefits net of teacher contributions, reducing the total compensation paid to teachers. For example, the loss in future lifetime benefits from working an additional year equals 17 percent of salary at 35 years of service and 29 percent of salary at 40 years. By contrast, the value of lifetime retirement benefits grows steadily over time in the cash balance plan, equal, each year, to 5 percent of salary.

The simulated cash balance plan seems better positioned than the tier-1 and tier-2 plans to help school districts meet their teacher recruitment and retention goals. The traditional plan offers little to younger teachers who do not expect to stay in the plan for their entire careers and prefer the flexibility to accommodate family obligations and changing work opportunities. The cash balance plan should be more appealing to these employees. Additionally, the cash balance plan augments compensation for older teachers instead of cutting it, promoting work at older ages. This is an increasingly important goal as the nation's population ages and the availability of younger workers stagnates. Finally, the sharp spike in the lifetime value of traditional retirement benefits at the time teachers qualify for early benefits locks mid-career teachers into their jobs even if they are not good fits. The cash balance plan makes it easier for these employees to separate and work more productively elsewhere.

FIGURE 11

Annual Increment to Lifetime Pension Benefits



Source: Authors' calculations based on plan documents and actuarial reports.

Notes: Increments are net of teacher contributions. Future benefits are discounted at 8 percent and the annual inflation rate is assumed to be 3.25 percent, the rates adopted by the teacher retirement system.

Conclusions

Long-tenured public school teachers in Illinois earn substantial retirement benefits in the tier-1 plan that covers those hired before 2011. For example, teachers hired at age 25 who complete 35 years of service and earn average salaries over their careers will receive lifetime pensions that pay \$96,500 at age 67, in constant 2014 dollars, and are worth \$1.3 million over their lifetimes. Though teachers must contribute 8.4 percent of their salaries each year to the plan to help offset the cost of these benefits, a 35-year career would generate \$740,000 in lifetime employer-financed benefits for age-25 hires. Teachers hired relatively late in life also receive generous pensions in the original state pension plan.

However, teachers who join the state payroll at relatively young ages and stay for less than 25 years get little, if anything, from the plan. For example, age-25 hires must teach for 22 years before they accumulate rights to future pension benefits worth more than their required plan contributions. Those who choose to have their contributions refunded lose money because the plan does not credit them with any interest. Only 18 percent of newly hired teachers remain in state employment for 25 years, including

only 30 percent of those who stay for at least 5 years. Overall, 66 percent of all newly hired teachers and 47 percent of those who complete at least five years of service would lose money by participating in the tier-1 plan.

Recent reforms, which cut future pensions for teachers hired in 2011 and later, make Illinois's state pension plan even less appealing to most public school teachers. For age-25 hires who retire after 35 years of service, this tier-2 plan provides pensions worth \$609,000 over their lifetimes, less than half as much as they would receive in the tier-1 plan and only \$6,000 more than the value of their required plan contributions. Required tier-2 plan contributions are worth more than future pensions for all age-25 hires who separate with less than 35 years of service or more than 43 years of service. Overall, 84 percent of all newly hired teachers lose money by participating in the tier-2 plan, including 74 percent of those who complete at least five years of service.

Which teachers benefit most from the plan arbitrarily depends on when they are hired and how long they work. For example, age-25 hires receive about \$234,000 from the tier-1 plan, net of their own required contributions, if they separate with 29 years of completed service, but \$389,000 if they stay one more year. Relative to their career earnings, age-55 hires in tier 1 who separate after 7 years of service receive 17 times as many state-financed benefits as age-25 hires who separate after 23 years. But age-25 hires in tier 1 who retire after 42 years of service receive only about one-third as many state-financed benefits, relative to their career earnings, as those who retire after 35 years.

Alternative plan designs could distribute benefits more equitably across the workforce and allow teachers to accumulate pension benefits more steadily over their careers (Johnson and Southgate 2014; Johnson et al. 2014). Some states, including Rhode Island and Tennessee, have recently shifted to hybrid plans, which typically combine a relatively small traditional defined benefit plan with a 401(k)-type defined contribution plan. Other states, such as Kentucky, have shifted to cash balance plans, which express benefits as an account balance that builds over time with employee and employer contributions as well as accumulated investment returns. Our simulations show that 72 percent of newly hired public school teachers, including 56 percent of those who complete at least five years of service, would earn larger pensions, net of their contributions, in a cash balance plan similar to one recently proposed in the Illinois senate than in the tier 1-plan, even though the two plans would impose similar costs on taxpayers. Whether achieved through revisions to the benefit formula or more structural changes to the plan design, carefully developed reforms could put more Illinois public school teachers on a path to a financially secure retirement.

Notes

1. This estimate is based on the authors' calculations of actuarial data from the plans' most recent financial reports (Buck Consultants 2014; Gabriel Roeder Smith and Company 2014; Illinois Municipal Retirement Fund 2013; State Universities Retirement System of Illinois 2013).
2. This estimate is based on actuarial data from the plans' most recent financial reports (Chicago Teachers Pension Fund 2013; Gabriel Roeder Smith and Company 2013; Laborers' and Retirement Board Employees' Annuity and Benefit Fund of Chicago 2013; Municipal Employees' Annuity and Benefit Fund of Chicago 2013; Policemen's Annuity and Benefit Fund of Chicago 2013).
3. With 10 years of service, retirees hired at age 25 could begin collecting \$20,400 in annual pension benefits at age 60, assuming their final average salaries were \$92,800 when they separated. Cost-of-living escalators would raise their annual payments to \$25,100 at age 67, equivalent to \$6,600 in 2014 constant dollars.
4. Our estimated variation arises solely from differences in service years because we assume that all teachers earn the same average salary for their age and years of service. Actual pension benefits Illinois teachers receive vary more because salaries differ across teachers with the same hire date and years of completed service.
5. Our tabulation of data from the plan actuaries indicates that 29 percent of teachers employed for at least 5 years will separate before completing 10 years of service, the vesting requirement for the tier-2 plan.
6. For details, see H.R. 6149, 97th General Assembly, (IL 2011 and 2012), <http://www.ilga.gov/legislation/97/HB/09700HB6149.htm>.
7. The COLA would be paid out of the account balance.
8. Senator Biss's proposal sets both employee and employer contribution rates at 8 percent for state employees who are not covered by Social Security.

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