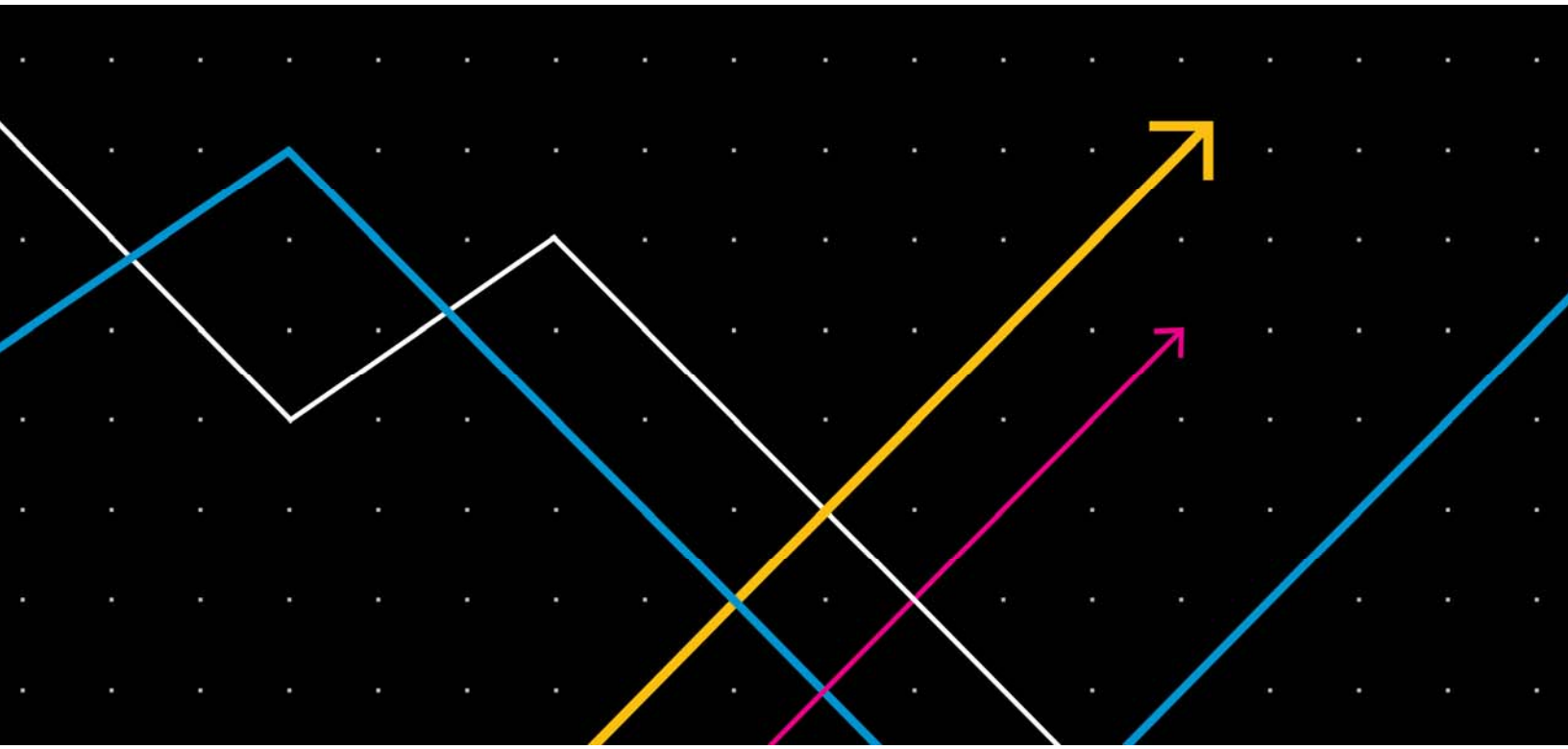

RESEARCH REPORT

# The Cost and Adequacy of Teacher Pensions in Texas

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# The Cost and Adequacy of Teacher Pensions in Texas

The Teacher Retirement System of Texas (TRS) operates one of the largest pension plans in the country, serving almost 1.5 million workers and retirees. Like pension plans in most other states, TRS faces an increasingly difficult funding environment that is complicated by uncertain investment returns and rapidly rising payouts, and its financial outlook has recently deteriorated. To bolster the plan's finances, Texas Governor Greg Abbott signed legislation in spring 2019 that gradually raises total contributions by the state, school districts, and plan members by 2.5 percentage points of salary over the next five years. However, this action may be insufficient to eliminate the plan's funding gap.

In this report, we analyze pension costs and benefits for public school teachers covered by TRS. Using an actuarial model, we run a series of simulations to better understand the system's current financial status and its prospects. Our results indicate that TRS can achieve a healthy funded status in the long run, but reaching this goal may require substantially more taxpayer contributions than those recently enacted, especially if optimistic actuarial and investment assumptions about the future fail to materialize. If annual nominal investment returns average 5.3 percent instead of 7.25 percent, the plan would have to raise the total contribution rate an additional 10 percentage points.

We also analyze typical pension benefits for Texas teachers, showing how they grow over a career and how they are distributed among teachers with different career lengths. Our results show that TRS offers adequate benefits to long-term teachers but relatively meager benefits to shorter-term teachers. A teacher hired at age 25 who completes 40 years of service typically collects lifetime pension benefits that are nearly seven times as much as the benefits collected by a teacher who spends only 20 years in the plan. Revising this one-sided benefit structure could significantly improve retirement security for teachers who spend less than a full career in the pension system, especially because most teachers in Texas are not covered by Social Security.

## Teacher Retirement System of Texas

TRS was founded in 1937 after voters passed a constitutional amendment creating a statewide pension system for employees in public education. The system gradually expanded and assumed more responsibilities over time, covering workers employed in schools, colleges, and universities funded by

the state. By the 1990s, TRS also operated health insurance programs for both current employees and public school retirees. In 2018, TRS covered 873,000 active contributing members and paid out benefits to about 400,000 retirees (TRS 2018a).

TRS provides participants with a final-average-salary defined-benefit (DB) pension.[1] Employees and employers contribute to a retirement account that grows over time with investment returns. Upon retirement, employees with at least five years of completed service receive a guaranteed benefit in the form of an annuity payment. When teachers separate, they may opt out of the plan and forgo their pension; in return, the plan refunds their contributions with interest, currently set at 2 percent per year.

Like most final-average-salary DB plans, TRS uses the following formula to calculate annual retirement benefits:

$$\text{Benefit} = \text{Multiplier} \times \text{Years of Service} \times \text{Final Average Salary}$$

The multiplier is a constant percentage set by the state, years of service is the number of creditable service years that the employee has earned, and final average salary is the average salary earned by an employee over the last several years of his or her career. Additional years of service raise pension benefits both directly (through the benefit formula) and indirectly (because salaries usually increase with years of service). Moreover, inflation erodes the real value of benefits for teachers who separate before they can begin collecting their pension. As a result, pension benefits grow slowly early in a career and rapidly later in a career.

As with many teacher plans, the benefit formula provisions have changed over time, but the provisions in effect when teachers were hired determine the pension benefits they receive. For Texas teachers hired on or after September 1, 2014, the multiplier is 2.3 percent, and their final average salary is based on their five highest-earning years (GRS 2018b).[2] For example, a newly hired teacher who eventually retires after completing 20 years of service with a final average salary of $75,000 would receive a $34,500 annual pension benefit (or $2,875 a month). Unlike nearly all private-sector workers and most public-sector workers, most public school teachers in Texas are not covered by Social Security.

Teachers hired in 2018 can retire with full pension benefits if they meet one of the following age and service year conditions:

- Age 65 with five years of service

- Ages 62–64 if age and years of service sum to 80 (the so-called Rule of 80). For example, a teacher with 18 years of service could retire with full benefits at age 62, whereas a teacher with 17 years of service would have to wait until age 63 to begin collecting full benefits.

Early reduced retirement benefits are available to teachers who do not meet either of these conditions but who have at least 30 years of completed service, meet the Rule of 80, or are at least age 55 with at least five years of service. The benefit reduction for early retirement depends on the teacher's age at retirement and his or her number of service years (GRS 2018b). For teachers younger than age 62 who do not qualify for full benefits but who meet the Rule of 80 or have completed 30 years of service, the early retirement penalty is 5 percent for each year they retire before age 62. Teachers with less than 30 years of service who do not meet the Rule of 80 may retire as early as age 55 (if they have at least five years of completed service), but their benefits are reduced between 4 and 7 percent for each year they retire before age 65. For example, teachers with five years of service who retire at age 55 would receive only 47 percent of their full benefit.

# Funding Status of TRS

The financial status of TRS has deteriorated substantially over the past two decades. In 2001, the system's funding ratio, defined as the value of plan assets divided by the present value of future benefit liabilities, reached 102.5 percent (TRS 2006). Since then, it has declined fairly steadily, falling to 76.9 percent in 2018 (TRS 2018a). Nonetheless, TRS remains better funded than many other state and local pension plans. In 2017, the 100 largest public pension systems that year had an average funding ratio of 71.6 percent.[3] By this standard, TRS is generally performing better than many of its peers, although the funding ratio is not the only metric for assessing the financial health of a public pension plan.

Much of the decline in the system's financial position resulted from investment returns that did not meet actuarial expectations. The S&P 500 index fell 46 percent between August 2000 and September 2002 as the Internet bubble burst. After recouping those loses, the stock market crashed again in the second half of the decade, with the S&P 500 index falling 53 percent between October 2007 and February 2009 during the financial crisis and Great Recession. The $2 billion surplus that the pension fund held in 2001—assets in excess of liabilities—disappeared. Unfunded liabilities grew to $14 billion in 2006, $22 billion in 2009, and $46.2 billion in 2018 (TRS 2018a).

Throughout the 1990s and early 2000s, when TRS had sound finances, the Texas legislature significantly enhanced retirement benefits for both active and retired teachers. The plan provided ad-

hoc cost-of-living adjustments to retirees, increased the plan multiplier used to determine benefits, raised minimum annuity payments and survivor benefits, and implemented other enhancements. As the plan's financial position worsened, however, the state began to curtail the cost of pension benefits. In the mid-2000s, legislators increased employer contribution rates and reduced benefits by including more service years in the final average salary calculation.

In 2013, the Texas legislature passed Senate Bill (SB) 1458, which gradually increased the member contribution rate from 6.4 percent of pay in 2014 to 7.7 percent in 2017 (TRS 2017). The state contribution rate increased as well, reaching 6.8 percent of employee salary by 2017. (The Texas constitution caps the state contribution rate at 10 percent.) School districts also contribute 1.5 percent of teacher salaries to TRS to help finance teacher retirements. These actions reduced the projected amortization period—the time needed to pay off all unfunded liabilities under the system's actuarial, economic, and contribution assumptions—to 28 years. Because state law forbids retirement pension enhancements if the projected amortization period exceeds 31 years, this reduction in the amortization period allowed the legislature to authorize an ad-hoc benefit enhancement for retirees.

As part of its regular efforts to provide more accurate assessments of its funded status and projected amortization, TRS recently conducted an experience study exploring the need for adjustments to its investment return assumptions.[4] The study recommended lowering the rate of return from 8 to 7.25 percent based on market assumptions from Aon, the primary investment consultant for TRS (GRS 2018a). The recommendation was consistent with the reductions taken by many other state pension plans that were making more conservative assumptions about future market performance. In a 5 to 4 vote, the TRS board acted on the actuaries' recommendation and dropped the investment return assumption to a new annual rate of 7.25 percent in July 2018.[5] The board also reduced the annual inflation assumption from 2.5 to 2.3 percent (as recommended by the same study).

As expected, adopting these more realistic assumptions worsened the system's financial outlook. The plan actuaries estimate that the system would now need 86 years to pay off its unfunded liabilities, up from 32 years under the previous assumptions, and the funding ratio fell to 76 percent. The unfunded liabilities soared to roughly $46 billion, $11 billion higher than in the previous valuation. In an appropriations request submitted to the governor, TRS argued that the total contribution rate would have to increase between 1.5 and 2 percentage points to reduce the amortization period to about 31 years (TRS 2018b).

To address these growing financial problems, the Texas legislature passed SB 12 in May 2019, which increases contribution rates for employees, the state, and local school districts.[6] The principal

intent of this legislation is to substantially reduce the amortization period and put TRS on a fiscally sustainable path. Beginning September 1, 2019, the legislation gradually increases the employee contribution rate from 7.7 percent of pay in 2019 to 8.25 percent in 2023 and the state contribution rate from 6.8 percent in early 2019 to 8.25 percent in 2023 (table 1). Local school districts would also have to contribute more in the future, paying 2 percent of salaries by 2025.

TABLE 1

**Mandated TRS Contribution Rates by Employees, the State, and School Districts (%)**

*(Percentage-point increase in contributions rates relative to January 1, 2019)*

| | Employee | State | School district |
|---|---|---|---|
| 2019 | 7.7 (0) | 7.5 (0.7) | 1.5 (0) |
| 2020 | 7.7 (0) | 7.5 (0.7) | 1.6 (0.1) |
| 2021 | 8.0 (0.3) | 7.75 (0.95) | 1.7 (0.2) |
| 2022 | 8.0 (0.3) | 8.0 (1.2) | 1.8 (0.3) |
| 2023 | 8.25 (0.55) | 8.25 (1.45) | 1.9 (0.4) |
| 2024 | 8.25 (0.55) | 8.25 (1.45) | 2.0 (0.5) |
| 2025 and later | 8.25 (0.55) | 8.25 (1.45) | 2.0 (0.5) |

**Source:** "Texas SB 12," LegiScan, accessed September 3, 2019, https://legiscan.com/TX/text/SB12/id/2027948.

Although SB 12 aims to put TRS on a fiscally sustainable path, reaching that goal will be complicated by other issues that SB 12 did not address. TRS also administers TRS-Care, a health benefits program for retirees. Almost 270,000 members participated in the program in 2017. The most recent actuarial valuation concluded that TRS-Care has major financial problems and that the current funding formula is "insufficient" to sustain the program in the long run. It has accumulated $43.5 billion in net benefit liabilities, largely because of exploding medical costs (TRS 2017). Funding these liabilities will impose a persistent drag on the state budget for the next few decades. Texas has already restricted future benefits for TRS members to provide more funding for TRS-Care.

TRS also administers TRS-ActiveCare, a health benefits program for active teachers. This program requires the state to pay $75 per employee and local school districts to pay a minimum of $150 to subsidize teachers' monthly premiums.[7] Since 2002, when the program went into effect, employees have seen their out-of-pocket premiums more than double. The health insurance programs covering Texas teachers and retirees are becoming increasingly costly, and the state has been criticized for not making sufficient contributions to fund excessive premiums.[8] The following section examines the impact of this legislation on the fiscal solvency of TRS.

# Funding and Contribution Simulations

To measure the financial risks that TRS faces, we simulated the system's funded status under various actuarial and investment assumptions. We also examined the total contributions required for TRS to become fully funded under different investment and amortization scenarios. Our actuarial projections in this analysis assume that the system's return on assets (ROA) equals the discount rate.[9] We also assume that each year the state will make all contributions mandated by statute and that retirees will not receive any benefit enhancements. If these and other conditions are not met, the state could encounter problems ensuring the future stability of TRS. Appendix A provides more details on our methods.

Using the old 2017 actuarial assumptions, including the high ROA of 8 percent, we calculate that the plan would fully amortize all unfunded liabilities in 28 years. In 2018, however, TRS agreed to use the new ROA assumption of 7.25 percent, along with other updated actuarial assumptions recommended by the 2017 experience study. Our model indicates that decreasing the ROA to 7.25 percent would extend the amortization period to 85 years, assuming no change in contributions from employers or employees. With the increased contribution provisions of the 2019 legislation, however, we calculate that the amortization period would drop to 31 years.

In inflation-adjusted 2019 dollars, we calculate that the increase in contributions from SB 12 will save TRS about $69 billion in net required contributions, compared with the system's current trajectory. Put another way, under the higher contribution rates mandated by SB 12, TRS is expected to spend $69 billion less to pay off its unfunded liabilities over the next 31 years. Amortization costs balloon substantially under the status quo contributions, and they do so over many years. For perspective on the size of these savings, they equal about 57 percent of total state government revenues collected by Texas in 2018.

In figures 1 through 6, we show the evolution of the funding ratio under different investment and contribution scenarios. Extra contributions can come from any source, including employees, school districts, and the state. These scenarios show what could happen to the finances of TRS in high- and low-risk market environments. The baseline, high-risk scenario uses the new ROA of 7.25 percent recommended by the 2017 experience study, along with the contribution schedule in SB 12. This high-ROA assumption raises the odds that TRS will be unable to achieve the desired return, increasing the risk that the system becomes underfunded. Another scenario features a lower, constant ROA of 5.3 percent, which is the intermediate interest rate assumed by the Social Security Administration's trustees for 2018 (Board of Trustees 2018). We refer to this case as the "low-risk" scenario because

TRS stands a greater chance of achieving a lower investment target and thus has a lower risk of underfunding in the future. Finally, we consider results from a "medium-risk" scenario that uses a constant ROA of 6 percent annually, roughly midway between the returns assumed in the high- and low-risk scenarios. In appendix B, we also show results for an additional scenario that assumes a time-varying ROA that averages 6 percent across all years.

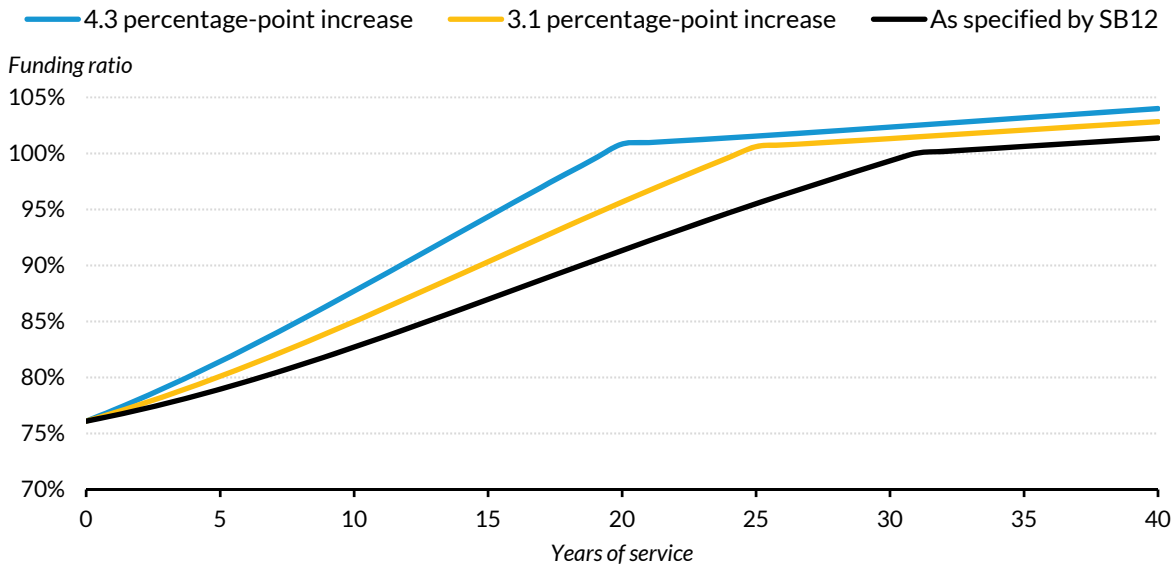
For each of these investment scenarios, we estimate the changes in contribution levels that would be required to amortize the unfunded liabilities in 31, 25, and 20 years. The 31-year mark is significant because it represents the longest amortization period under which TRS could issue benefit enhancements to retirees. However, the Pension Benefit Design Study notes that industry best practices encourage amortization periods of about 20 years (TRS 2018c).

With the ROA set at 7.25 percent, the new contribution schedule authorized by SB 12 that goes into effect September 2019, could amortize the unfunded liabilities in 31 years (figure 1). Immediately increasing the total contribution rate by 3.1 percentage points over current contribution rates would reduce the amortization period to 25 years, while an immediate 4.3 percentage-point increase would reduce the amortization period to 20 years.

FIGURE 1

**Evolution of TRS Financial Position under Alternative Contribution Increases**

*Constant ROA of 7.25 percent*




**Source:** Authors' calculations.

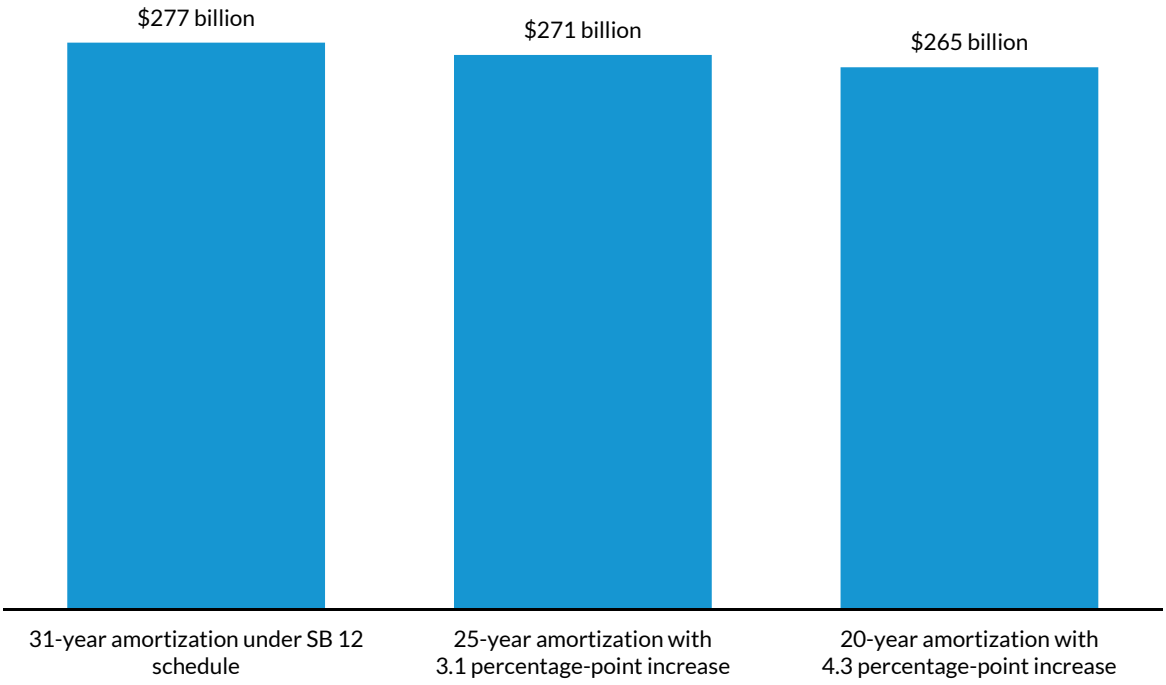
**Notes:** Projections assume a payroll growth rate of 3 percent, an average salary growth rate of 3.3 percent, and no benefit enhancements for retirees. The SB 12 contribution schedule gradually raises contribution rates by 2.5 percentage points. See appendix A for more details on our methods and assumptions.

Figure 2 shows the inflation-adjusted total required contributions that TRS would make over 31 years under these three amortization scenarios. Shorter amortization periods would require larger contributions from employers and employees, but they would reduce overall amortization costs. TRS would record net savings of $11 billion over 31 years if it amortized its unfunded liabilities in 20 years rather than waiting to amortize over the full 31 years under the provisions of SB 12.

FIGURE 2

**Total Contributions over 31 Years Needed to Reach Various Amortization Targets**

*Constant ROA of 7.25 percent, under alternative contribution increases*




**Source:** Authors' calculations.

**Notes**: ROA = return on assets. SB 12 gradually raises contribution rates by 2.5 percentage points. Calculations assume an inflation rate of 2.3 percent, as recommended by the 2017 Teacher Retirement System of Texas experience study (GRS 2018a).

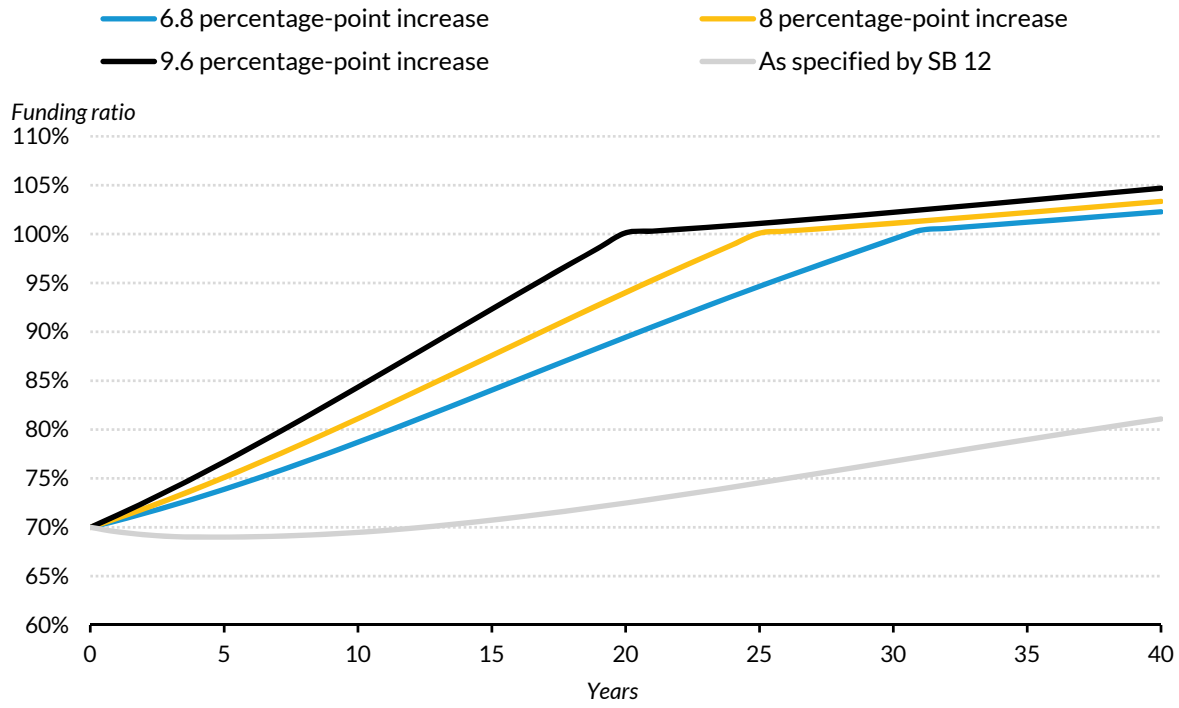
Understanding what happens to the system's finances if actual investment returns are lower than those assumed by the state actuaries in their annual valuation reports can help TRS better map out the financial risk it might encounter. Figure 3 shows the evolution of the funding ratio for the medium-risk scenario, with the ROA set at a constant 6 percent. The lower ROA significantly increases required contributions. Because we assume that the discount rate equals the ROA (just as the plan actuaries assume) a lower ROA means a lower discount rate, which raises the present value of future benefit liabilities. Under this scenario, the system must make much larger contributions to become fully funded.

The medium-risk scenario requires a contribution rate increase of 6.8 percentage points over the current rate to amortize the unfunded liabilities in 31 years, an increase of 8 percentage points to amortize liabilities in 25 years, and an increase of 9.6 percentage points to amortize liabilities in 20 years. Under the SB 12 contribution rate schedule, TRS would reach a funded status of only 80 percent after 40 years, under the assumption of a constant 6 percent ROA. Over the 110 years of our simulation, the SB 12 rate schedule and 6 percent ROA would never achieve a fully funded system.

FIGURE 3

**Evolution of TRS Financial Position under Alternative Contribution Increases**

*Constant ROA of 6 percent*




**Source:** Authors' calculations.

**Notes**: Projections assume a payroll growth rate of 3 percent, an average salary growth rate of 3.3 percent, and no benefit enhancements for retirees. See appendix A for more details on our methods and assumptions.

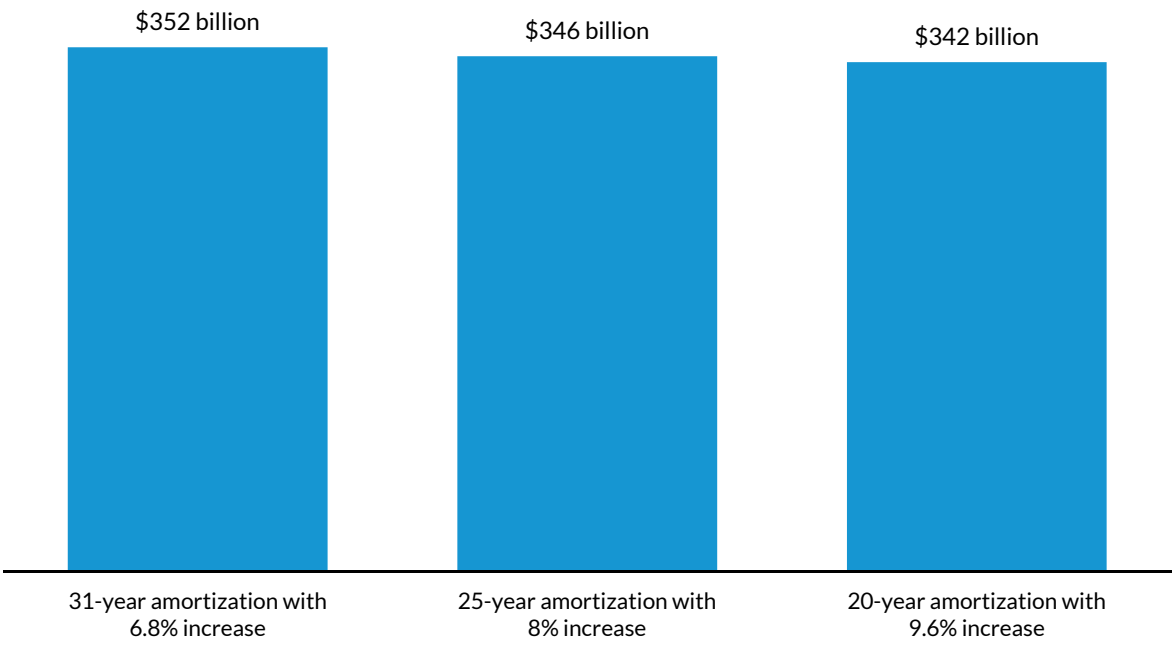
Reducing the ROA and discount rate significantly increases the total contributions that must be made to amortize unfunded liabilities (figure 4). Under a 6 percent ROA assumption, TRS needs $352 billion to amortize its unfunded liabilities over 31 years, compared with $276 billion under a 7.25 percent ROA assumption, a difference of $76 billion. This difference underscores the importance of high investment returns for the fiscal position of TRS. If actual future returns fall this far short of expectations, TRS would require substantial external funding to meet its actuarial obligations. In the 6 percent scenario, TRS could stand to save roughly $10 billion by amortizing the unfunded liabilities over

20 years relative to amortizing over the full 31 years. However, even the 20-year amortization period would require roughly $70 billion more in total contributions than under the current 7.25 percent ROA assumption

FIGURE 4

**Total Required Contributions over 31 Years Needed to Reach Various Amortization Targets**

*Constant ROA of 6 percent, under alternative contribution increases*




**Source:** Authors' calculations.

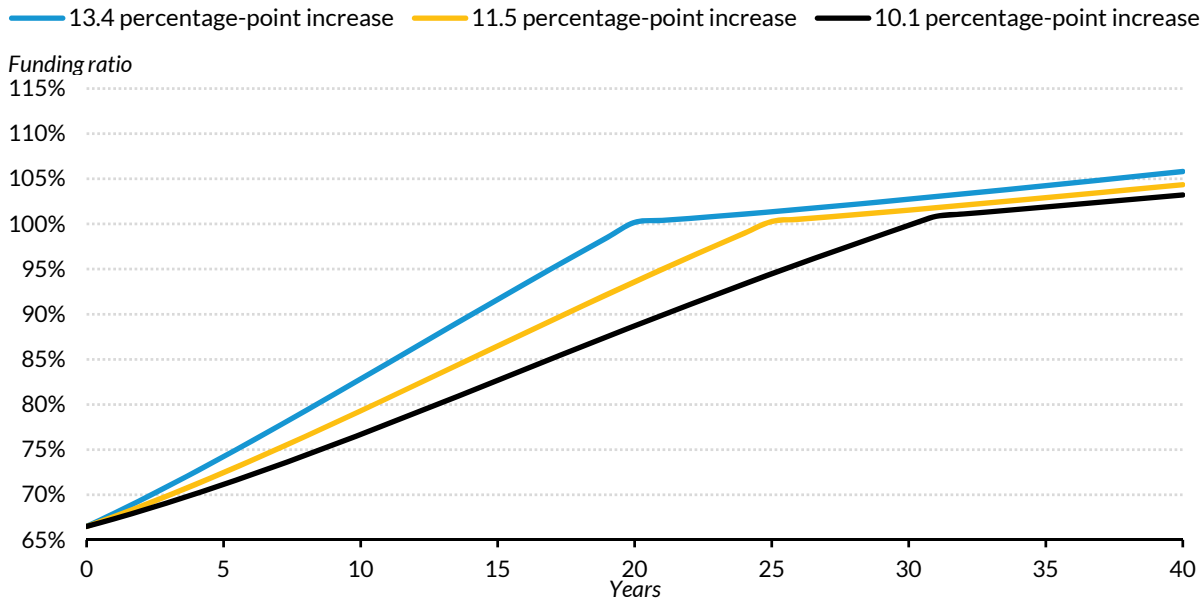
**Notes**: Calculations assume an inflation rate of 2.3 percent, as recommended by the 2017 Teacher Retirement System of Texas experience study (GRS 2018a).

Figures 5 and 6 show results for the low-risk scenario, which sets the ROA at 5.3 percent. At this ROA, TRS would have to raise the total contribution rate 10.1 percentage points to amortize the unfunded liabilities in 31 years, 11.5 percentage points to amortize in 25 years, and 13.4 percentage points to amortize in 20 years. As expected, the total required contributions shown in figure 6 are substantially larger than in the other two scenarios. To reach a funding ratio of 100 percent in 31 years, TRS would need $129 billion more in total contributions in the low-risk scenario (with a 5.3 percent ROA) than in the high-risk scenario (with a 7.25 percent ROA). Although the required contribution levels are much higher with the low-risk scenario, they also better reflect the market returns TRS can anticipate in the future.

FIGURE 5

**Evolution of TRS Financial Position under Alternative Contribution Increases**

*Constant ROA of 5.3 percent*



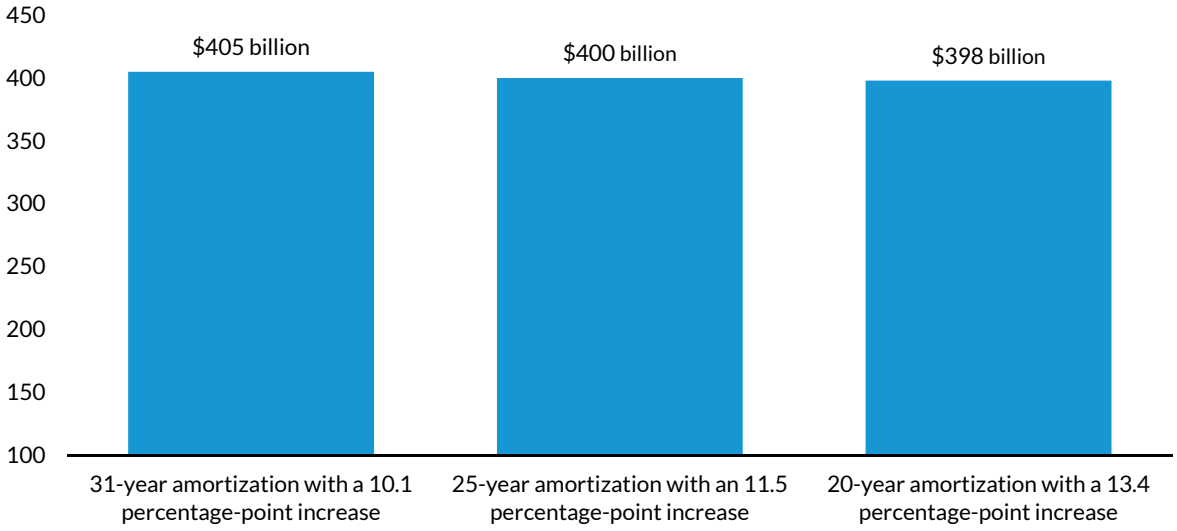

**Source:** Authors' calculations.

**Notes**: Projections assume a payroll growth rate of 3 percent, an average salary growth rate of 3.3 percent, and no benefit enhancements for retirees. See appendix A for more details on our methods and assumptions.

FIGURE 6

**Total Required Contributions over 31 Years Needed to Reach Various Amortization Targets**

*Constant ROA of 5.3 percent, under alternative contribution increases*




**Source:** Authors' calculations.

**Notes**: Calculations assume an inflation rate of 2.3 percent, as recommended by the 2017 Teacher Retirement System of Texas experience study (GRS 2018a).

# Benefit Simulations

To gauge how much retirement security TRS provides for teachers with different career lengths, we performed a series of actuarial calculations that track lifetime pension benefits for typical employees. The goal of this analysis is to show how TRS distributes pension benefits among different members, to measure how rapidly pension benefits rise toward the end of a career, and to compare lifetime benefits with salaries. We simulated expected lifetime pension benefits for teachers hired at age 25 at a salary of $40,000 and whose salary increases over their career at the average rate estimated by the plan actuaries. The analysis in this section uses the new employee contribution rates established by the May 2019 pension plan legislation.

The TRS benefit formula bases pension payments on years of service. However, expected future retirement benefits must be discounted to determine how much they are worth at retirement or the hire date because payments received in the future are worth less than payments received earlier, because earlier payments can be invested and earn interest. This calculation typically assumes some constant discount rate, which is generally set equal to the plan's ROA. For TRS, the discount rate is now 7.25 percent, reflecting the 2018 reduction in the assumed ROA. Many major state pension plans have adopted discount rates of 7 to 8 percent. Varying the discount rate changes the present value of projected lifetime pensions benefits.

To assess potential risks and benefit liabilities to TRS going forward, we ran our actuarial models with the new discount rate of 7.25 percent, a medium rate of 6 percent, and a lower rate of 5.3 percent. Determining an ideal discount rate is still a controversial topic in the field of pension finances, but many analysts and economists have concluded that the typical discount rates used in actuarial modeling of state pensions are too high (Chen and Matkin 2017). Analyzing benefit levels using a variety of rates provides a more complete picture of what TRS members could face in retirement.

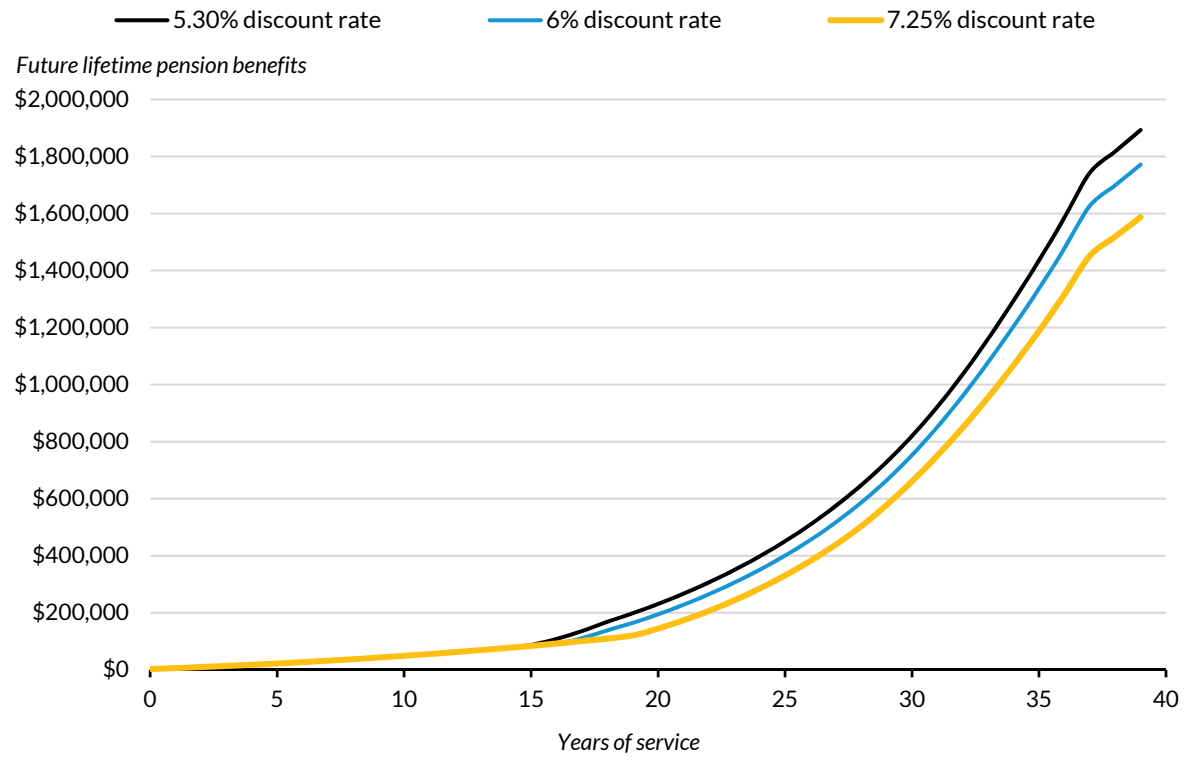
Three broad conclusions emerge from our analysis of expected lifetime pension benefits and how they grow over a typical career. First, higher discount rates let employers set aside a smaller pool of money today for benefits that must be paid in the future. Second, current plan rules distribute pension benefits disproportionately toward long-term teachers and away from teachers who spend less than a full career in the plan. And third, most newly hired teachers in Texas do not work long enough to benefit financially from the retirement plan. When we value pension benefits using the discount rate adopted by the TRS trustees, we find that teachers must work 19 years to earn pension benefits worth more than the value of their mandatory contributions to the pension plan. Teachers with shorter careers would benefit financially if they could opt of the pension plan and invest their contributions elsewhere.

The treatment of short-term teachers is especially important because public schools in Texas, as in other states, are having problems with low teacher retention rates. We calculate, based on data from the plan's 2018 actuarial valuation report (GRS 2018a), that 59 percent of new hires will leave the classroom within their first five years of employment.

FIGURE 7

**The Impact of Service Years on Lifetime Pension Benefits, Under Various Discount Rates**

*Discounted to the Separation Age*




**Source:** Authors' calculations.

**Notes**: Calculations assume a starting age of 25, a starting salary of $40,000, and employee contribution rates that begin at 7.7 percent and gradually increase to 8.25 percent four years later, per recent legislation (SB 12).

We begin by calculating total lifetime pension benefits for an employee and showing how they vary with service years, discounted to the age at which an employee is assumed to stop working. Total pension benefits rise rapidly after 20 years of service, and especially after 28 years of service, when teachers hired at age 25 satisfy the Rule of 80 and qualify for early retirement benefits (figure 7). This pattern is common in final-average-salary DB plans. Assuming a 7.25 percent discount rate, we see that future lifetime pension benefits reach about $84,000 at 15 years of service and $145,000 at 20 years of service. But they then soar to $331,000 at 25 years of service and $661,000 at 30 years of service. A

teacher hired at age 25 who works for 30 years will receive pension benefits worth nearly twice as much as an otherwise identical teacher who works for only 25 years, nearly five times as much as one who works for only 20 years, and nearly eight times as much as one who works for only 15 years. The same patterns are evident in the other two scenarios. With a 5.3 percent discount rate, for example, future lifetime benefits reach about $230,000 after 20 years of service and then almost quadruple to $820,000 after 30 years of service.

Teachers who remain in the classroom for 40 years earn lifetime benefits worth $1.6 million when those benefits are evaluated using a 7.25 percent discount rate, $1.77 million when evaluated using a 6 percent discount rate, and $1.9 million when evaluated using a 5.3 percent discount rate. Future pension benefits are worth more when we assume a low discount rate because that scenario values future benefits more than scenarios with higher discount rates.

These pensions can guarantee substantial retirement security for long-term teachers. We estimate, for example, that teachers hired at age 25 who participate in TRS for 40 years and retire at age 65 can replace 87 percent of their final salary in retirement, greater than the 70 to 75 percent replacement rate many experts say is needed to maintain preretirement living standards in old age (Cosic, Johnson, and Smith 2018).

However, teachers who spend less than a full career with TRS or who retire early might see their living standards decline when they retire. Unlike teachers in most other states, most Texas public school teachers are not covered by Social Security, forcing many to rely solely on their TRS pension in retirement, and those who spend less than a full career in the plan will be unable to replace at least 70 percent of their earnings when they retire. We estimate that teachers hired at age 25 who stop work at age 55 after 30 years of service and begin collecting benefits at age 60 could replace only 59 percent of their final salary. The replacement rate for 25-year-old hires who begin collecting benefits at age 60 falls to 29 percent for those who separate after 20 years and 22 percent for those who separate after 15 years.

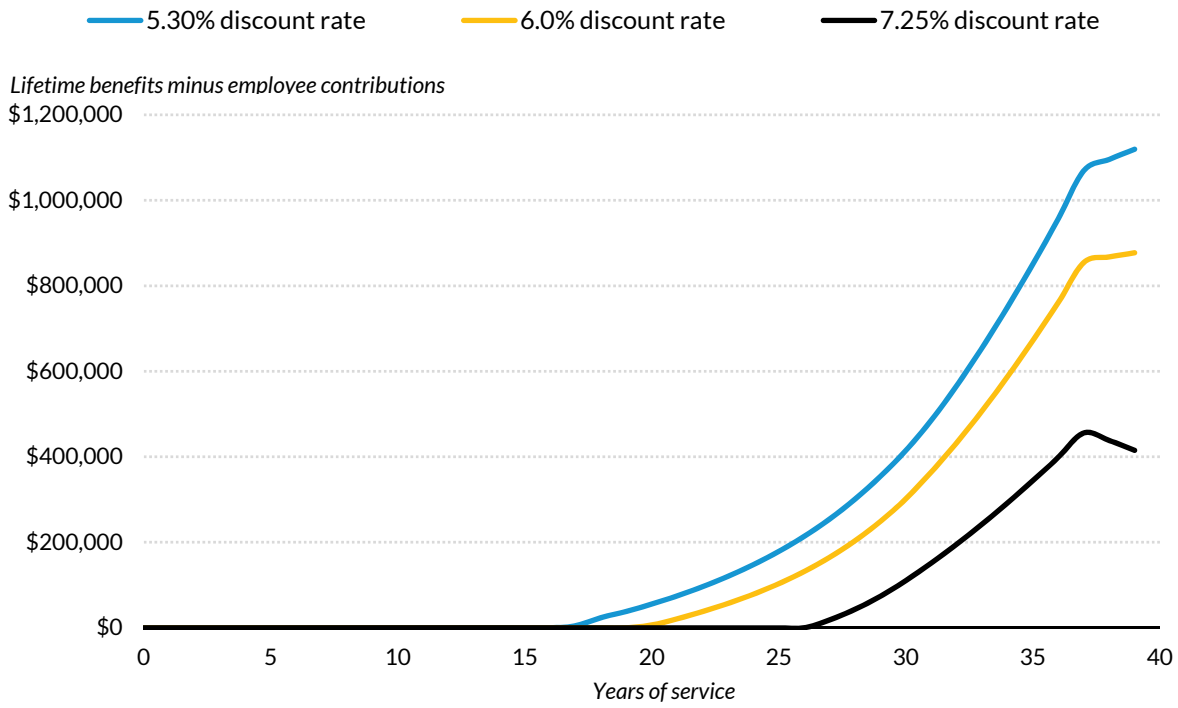
Texas teachers must make significant contributions to the retirement plan, and much of their benefits are financed by these contributions, not by the state or their employers. To determine how much the retirement plan adds to members' compensation, we subtract total employee contributions from expected lifetime pension benefits and show how lifetime benefits net of employee contributions grow over a career. Netting out employee contributions, we see that lifetime benefits financed by the state and school district total $415,000 for a 25-year-old hire who completes 40 years of service, based on a 7.25 percent discount rate (figure 8), only about one-quarter of total lifetime benefits. Under these

high discount rate and rate of return assumptions, we find that about three-quarters of total lifetime benefits received by a teacher who completes a 40-year career are financed by his or her mandatory contributions, not by the state or school district. When we use a 5.3 percent discount rate, estimated lifetime benefits net of employee contributions after 40 years of service increase to $1.1 million, and account for nearly 60 percent of total lifetime benefits.

FIGURE 8

**The Impact of Service Years on Lifetime Pension Benefits Net of Employee Contributions**

*Discounted to the separation age*




**Source:** Authors' calculations.

**Notes**: Calculations assume a starting age of 25, a starting salary of $40,000, and employee contribution rates that begin at 7.7 percent and gradually increase to 8.25 percent four years later, per recent legislation (SB 12).

Teachers must work many years before their pension benefits are worth more than the value of their required contributions (i.e., so that lifetime benefits net of employee contributions are positive). Under a 7.25 percent discount rate assumption—the rate now used by TRS—teachers in Texas must complete 27 years of service before their benefits exceed the value of their contributions. Those who work fewer years could accumulate more retirement savings if they opt out of TRS, invest their contributions outside the plan, and earn an annual rate of return of 7.25 percent. The required plan contributions of these short-term teachers are partially subsidizing benefits received by longer-serving

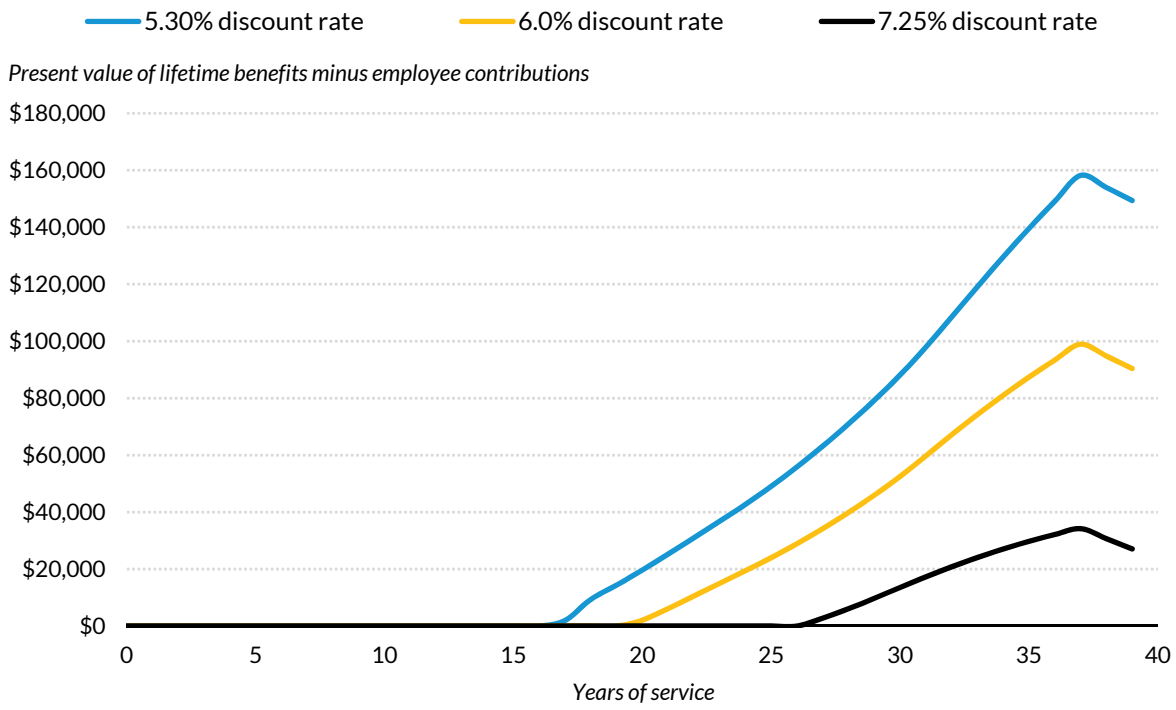
teachers. The turnover rates computed by the plan actuaries (GRS 2018b) indicate that only about one-third of newly hired teachers complete 27 or more years of service.

The breakeven point occurs sooner when we use a lower assumed discount rate, because future benefits are worth more today when the discount rate is lower. Even under those more favorable assumptions, however, most newly hired teachers will not work long enough to gain financially from the plan. Using a 5.3 percent discount rate, for example, we estimate that a teacher would have to complete 17 years of service to earn lifetime pension benefits worth more than the value of his or her own contributions, a threshold only 36 percent of newly hired teachers reach.

FIGURE 9

**The Impact of Service Years on Lifetime Pension Benefits Net of Employee Contributions**

*Discounted to the hire date*




**Source:** Authors' calculations.

**Notes**: Calculations assume a starting age of 25, a starting salary of $40,000, and employee contribution rates that begin at 7.7 percent and gradually increase to 8.25 percent four years later, as specified by SB 12.

An alternative way to measure lifetime pension benefits net of employee contributions is to discount future payments back to the entry age, which indicates how much school districts and the state would have to set aside when a teacher is hired to cover all expected future pension benefits. Using the 7.25 percent discount rate adopted by the plan actuaries, we estimate that expected lifetime benefits

minus mandatory employee contributions for a 25-year-old hire, discounted to the hire date, are worth $3,000 after 27 years of service (figure 9). They grow to $13,600 after 30 years of service and peak at 37 years of service, when they are worth $34,200. Once teachers have completed 37 years of service, the expected value of lifetime benefits falls with additional service years because the plan contributions they must make when they continue working exceed the increment to lifetime pension benefits from additional work years. Teachers with 37 years of completed service, who can immediately collect retirement benefits if they stop working, cannot boost their total lifetime pension benefits much by working longer, because they forfeit a year of benefits for each year they continue working.

The estimated value of lifetime pension benefits net of employee contributions is much higher when we use discount rates of 5.3 and 6.0 percent rather than a 7.25 percent discount rate. The lower discount rates value future benefits more. With a 6.0 percent discount rate, we estimate that the net value of lifetime pension benefits reaches $2,000 after 20 years of service, $52,500 after 30 years of service, and $98,900 after 37 years of service. Using a 5.3 percent discount rate instead, the net value of lifetime pension benefits reaches $19,700 after 20 years of service, $88,100 after 30 years of service, and $158,200 after 37 years of service. These lower discount rates require the state and school districts to set aside much more money to finance future pension benefits than the higher discount rate currently being used.

To explore the portion of total teacher compensation that is paid in pension benefits, we tracked the expected value of total lifetime pension benefits relative to cumulative salary paid over a career (figure 10). For about the first two decades of employment, the expected value of total lifetime benefits as a share of cumulative salary declines with additional years of service, because a teacher's salary grows faster than his or her pension benefits. When we use a 7.25 percent discount rate in our calculations, the estimated ratio of total lifetime benefits to cumulative salary falls to a low of 4.9 percent at 19 years of completed service but then grows rapidly, reaching 9.3 percent at 30 years of completed service and peaking at 11.0 percent at 37 years of completed service. The estimated ratio is much higher when we instead use a lower discount rate. With a 5.3 percent discount rate, the estimated ratio bottoms out at 5.8 percent at 15 years of service and then rises to 15.7 percent at 30 years of service and 19.5 percent at 37 years of service. The relative importance of pension benefits in a teacher's compensation package depends crucially on the discount rate used in the calculation.

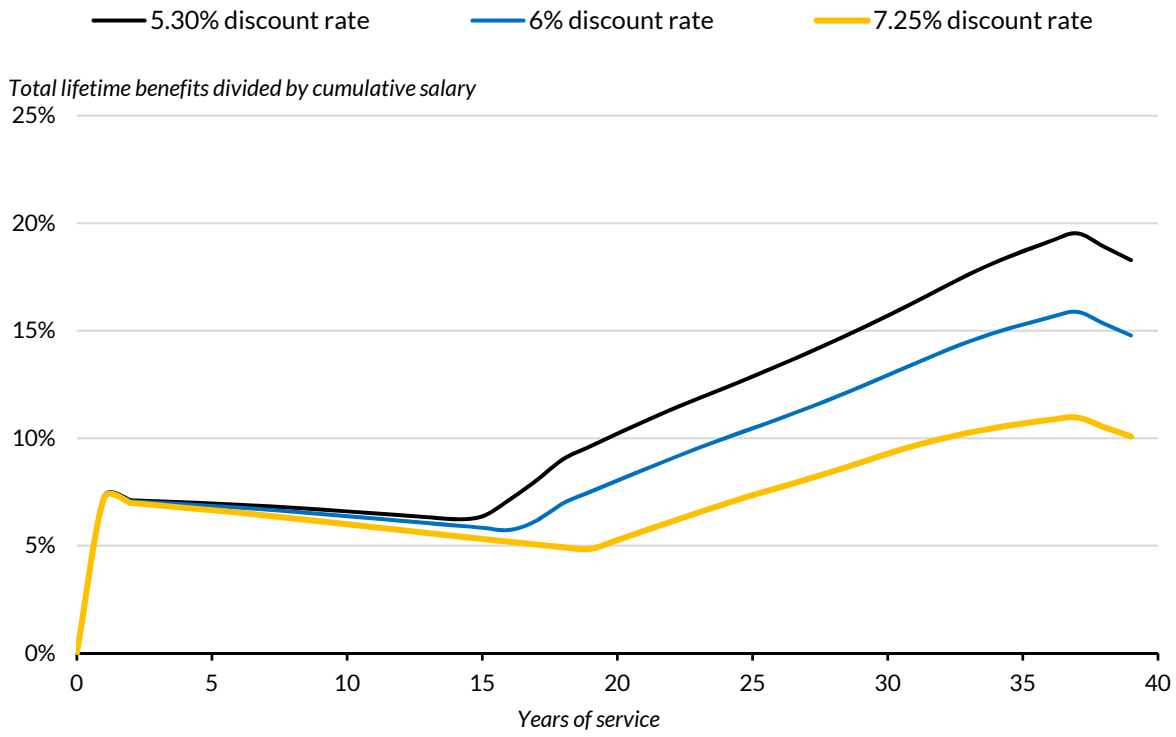
Because TRS provides disproportionately large pension benefits to long-tenured teachers, and because relatively few newly hired teachers remain in the plan for a full career, lifetime pension benefits are unequally distributed throughout the workforce, We simulated the distribution of total lifetime pension benefits and lifetime pension benefits minus employee contribution for teachers hired at age

25 whose annual salary begins at $40,000 and increases each year by the average rate estimated by the plan actuaries. Our calculations assumed that teachers separate from the plan at the average rate computed by the actuaries, and we discounted future benefits to the separation age using a 7.25 percent discount rate.

FIGURE 10

**The Impact of Service Years on Expected Total Lifetime Benefits as a Share of Cumulative Salary**

*Under various discount rates*



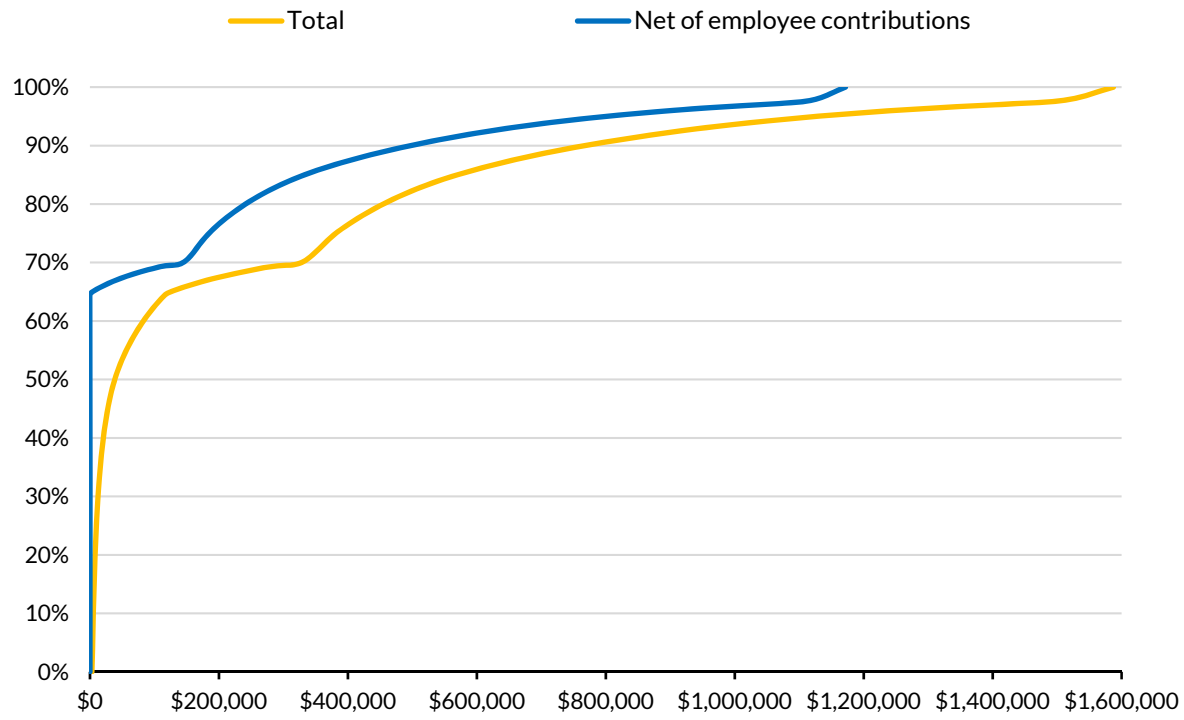

**Source:** Authors' calculations.
**Notes**: Calculations assume a starting age of 25.

Total lifetime pension benefits for teachers hired at age 25 average about $75,000, but one-half of teachers will receive no more than $37,500, and one-quarter will receive no more than $10,000 (figure 11). Another quarter, by contrast, will receive more than $381,700 in total lifetime benefits, while one-tenth will receive more than $750,000. Lifetime benefits net of employee contributions are distributed even more unequally across the workforce. Nearly two-thirds (64 percent) of teachers hired at age 25 will not remain in the plan long enough to accumulate pension benefits worth more than the value of their required contributions; they therefore do not benefit financially from the pension plan. However, net lifetime pension benefits will exceed $185,000 for 25 percent of teachers, $484,000 for 10 percent of teachers, and $750,000 for 5 percent of teachers.

FIGURE 11

**Cumulative Distribution of Lifetime Pension Benefits**

*Discounted to separation using 7.25 percent discount rate (constant 2018 dollars)*




**Source:** Authors' calculations.

**Notes**: Calculations assume a starting age of 25 and a starting salary of $40,000.

# Policy Implications

TRS is in better financial shape than many other state pension plans around the country. Its funding level is higher than average, while other major pension plans have experienced low investment returns and have accrued large unfunded liabilities. But TRS also faces serious risks and uncertainties. In 2019, the Texas legislature elected to ramp up the total contribution rate to the plan by 2.5 percentage points over several years. Although raising contribution rates will improve the system's finances, additional reforms may be necessary to ensure TRS's fiscal stability. The new contribution rates would allow TRS to pay off all unfunded liabilities in 31 years if the actuarial and investment assumptions that went into that calculation are realized, including a 7.25 percent annual return. If investment returns average only 6 percent a year, however, the plan would need to increase contributions about another 7 percentage points to still pay off all unfunded liabilities within 31 years; that increase would need to be another 10 percentage points if investment returns average only 5.3 percent a year. The rising cost of TRS retiree health programs could force policymakers to raise contribution rates further.

Like other final-average-salary DB plans, TRS provides backloaded pension benefits to long-tenured teachers. These teachers rapidly accumulate pension wealth near the end of their careers because plan rules favor members with many years of service. Short-tenured teachers in Texas, as in most other states, struggle to accumulate pension wealth. A five-year vesting requirement makes it impossible for teachers with very short tenures to accumulate any pension benefits.

Many teachers employed for much more than five years accumulate few benefits. Our simulations show that teachers hired at age 25 must work between 17 and 27 years, depending on how we value future benefits, to accrue a pension worth more than their contributions. Those who leave before reaching that milestone gain nothing financially by participating in the plan. Teachers who complete 20 years of service amass only 15 percent of the lifetime pension benefits those with a 40-year career would accumulate. They amass more than half of lifetime benefits in the final 10 years of service. This disparity in what teachers get out of the plan violates the principle of equal pay for equal work. A fairer plan would supplement salaries by about the same percentage regardless of completed years of service

Various plan changes could distribute benefits more fairly across the workforce. Changing the benefit formula of the current DB plan would be one method of redistributing benefits. For example, TRS could adjust multiplier rates so that short-term workers get a larger share of their final average salary than long-term workers. TRS could also index salaries for inflation past a certain number of service years, thereby slowing the rate of growth in the final average salary. These flexible options might appeal more to workers who will not spend a full career in the plan.

Other ideas for redistributing benefits among employees include moving to a 401(k)-type plan, either as a supplement to the current system or as a replacement for it. In a 401(k)-type plan, all participants could receive the same employer contribution relative to their salaries, regardless of age or years of service, and their retirement accounts could continue to grow until they begin collecting benefits, even after they leave public employment.

A better option might be a cash balance plan, which combines features of traditional DB plans and 401(k)-type defined-contribution plans. Cash balance plans establish notional retirement accounts for each plan member. Employers and employees both contribute to the accounts, which are pooled and professionally managed and earn investment returns each year. The plan benefit is expressed as an account balance, but members may always elect to receive their benefit as a lifetime annuity. This kind of plan would not be new to the state. The Texas Municipal Retirement System already runs cash balance plans for more than 800 cities (Pew Charitable Trusts 2014).

Like 401(k) plans, cash balance plans could treat all employees fairly because employers could contribute the same share of a member's salary to all retirement accounts regardless of a member's age or years of service. Both types of plans would expose government employees to some investment risk (their pensions could shrink if interest rates or equity returns fall). However, prudent investing could reduce the risk, especially over the long run, and shifting some investment risk to public employees would free taxpayers from shouldering the entire investment risk themselves.

# Appendix A. Methods and Assumptions

For the actuarial projections of assets and liabilities, we adopted the pension cost model developed by McGee and Welch (2016). Our projections are based on equations 22 and 23 in their study. Liabilities *L* in year *t* can be expressed as:

$$L_t = L_{t-1}(1 + r_d) + NC - B_t(1 + r_d)^{0.5}$$

Assets *A* in year *t* can be expressed as:

$$A_t = A_{t-1}(1 + r_i) + TC - B_t(1 + r_i)^{0.5}$$

In these equations, *NC* is total normal cost, *TC* is total annual required contributions, and *B* is total annual benefits paid by the plan. Total required contributions equal the total normal cost, which is the amount needed to finance the future liabilities of the pension system, plus any amortization costs to cover unfunded liabilities that have accumulated over time. The variable $r_d$ is the discount rate and $r_i$ is the investment return rate, which are assumed to be equal in our analysis.

For the actuarial benefit models, we based our mortality assumptions on the Society of Actuaries' RP 2014 tables (Society of Actuaries 2014). We blended male and female rates equally to generate unisex mortality rates and then applied a static projection with Scale MP-2014 defined in the calendar year 2018 so that we could apply these rates to teachers employed that year. We used the TRS actuaries' salary growth schedule and separation rates for new hires adopted in their most recent valuations. The separation rates indicate the likelihood that a new hire will leave after a certain number of service years. The salary growth schedule specifies the total nominal salary increase for each year of service. To calculate lifetime benefits, we assumed that teachers were hired at age 25 and earned a starting annual salary of $40,000.

In every service year of the simulation, we assumed that the employee chooses the larger of the present value of the benefit annuity or the value of the retirement account. The value of the retirement account is the amount that the worker could withdraw upon leaving employment. For current TRS members, that account value equals the employee contributions plus accrued interest. The present value of the annuity is calculated using the standard benefit formula adjusted by early retirement penalties.

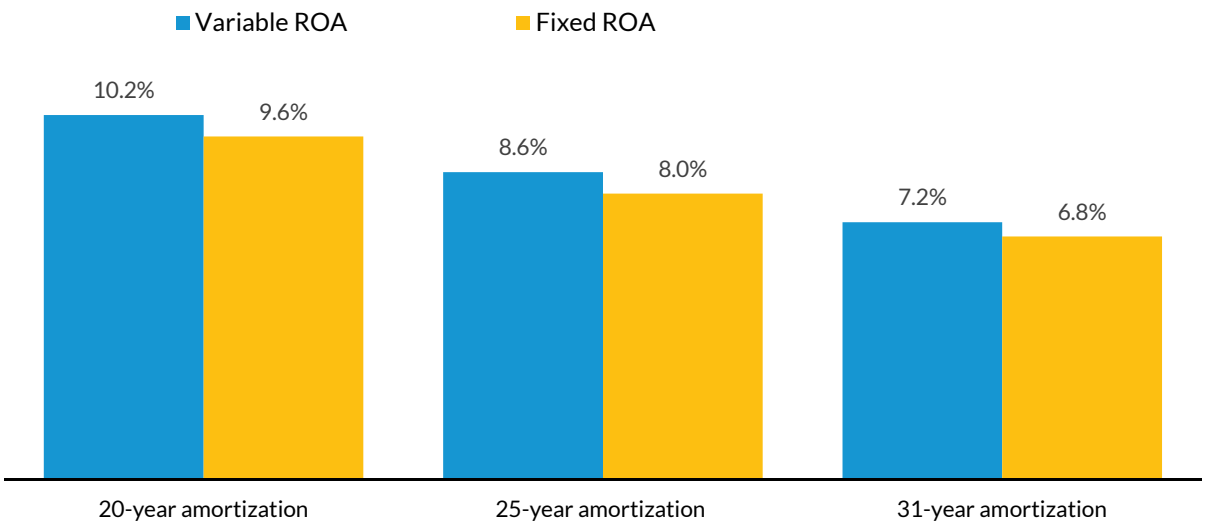
# Appendix B. Variable Return on Assets

In this section, we conduct some additional sensitivity testing to better understand how shifting market returns affect the financial status of TRS. We consider a scenario in which the ROA varies over time, with an overall average return rate of 6 percent and a standard deviation of about 3.3 percent. We used the Excel random number generator to simulate the ROA each year. We ran the generator multiple times until the values averaged 6 percent. This example models uncertainty more realistically because actual annual return rates fluctuate over time, sometimes dramatically. As with our other simulations, we calculate the total contribution rate hikes that would be needed under this investment return scenario to reach amortization periods of 31, 25, and 20 years.

FIGURE A.1

**Total Contribution Rate Increase Needed to Achieve Various Amortization Targets, for Variable and Constant ROA**

*ROA averges 6 percent per year*



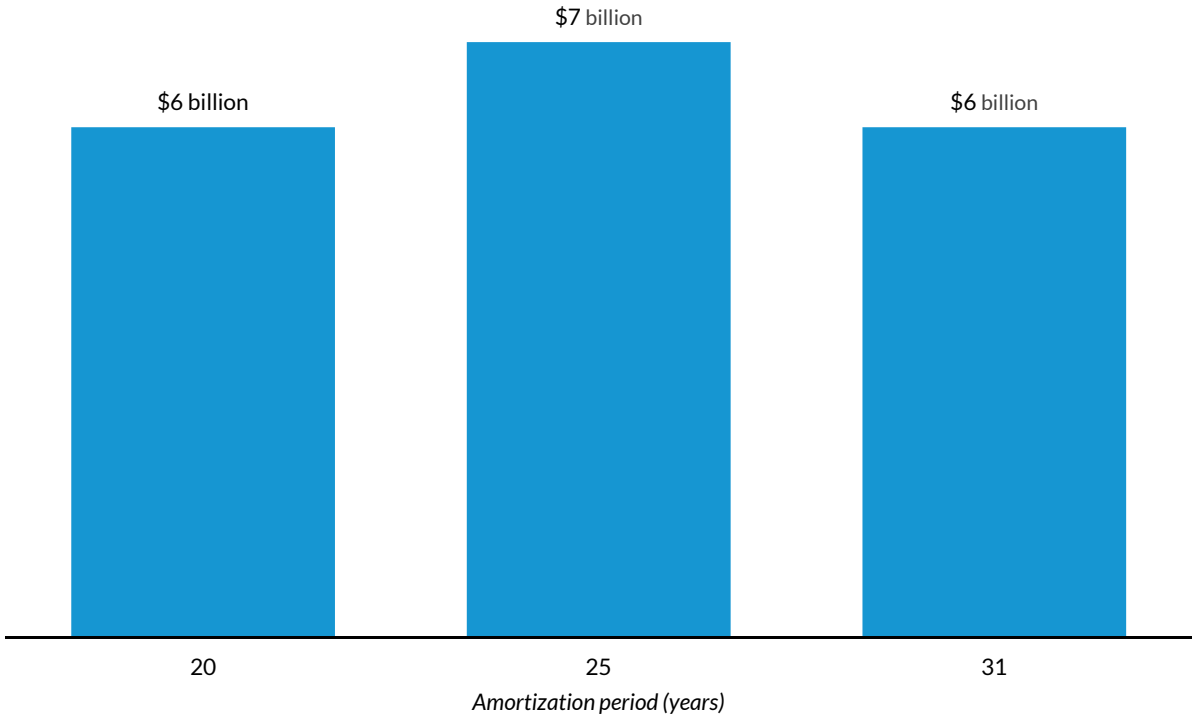

**Source:** Authors' calculations.
**Notes**: ROA = return on assets. Projections assume a payroll growth rate of 3 percent, an average salary growth rate of 3.3 percent, and no benefit enhancements for retirees.

Projections based on a constant ROA can generate different cost estimates than those based on a fluctuating ROA with the same average return. Under the medium-risk scenario, for example, one simulation with a fluctuating ROA that averages 6 percent over time generates longer amortization

periods than a constant 6 percent ROA. To pay unfunded liabilities within 31 years, the variable ROA scenario requires an increase in total contributions of 7.2 percent of teacher salaries, whereas the constant ROA scenario requires a total contribution rate hike of only 6.8 percent (figure A.1). These contribution increases are given relative to 2018 levels. To achieve a 20-year amortization period, the variable ROA scenario requires a 10.2 percent contribution rate hike, compared with a 9.6 percent increase for the fixed ROA scenario. Compared with a fixed ROA, the fluctuating ROA scenario that we modeled would require an additional $6 billion to $7 billion in contributions over 31 years (figure A.2).

FIGURE A.2

**Estimated Increase in Total Contributions over 31 Years Needed to Reach Varous Amortization Targets**




**Source:** Calculations from authors.
**Notes**: The figure shows the additional contributions required under the fluctuating ROA scenario than under the constant ROA scenario. Projections assume a payroll growth rate of 3 percent, an average salary growth rate of 3.3 percent, and no benefit enhancements for retirees.

# Notes

[1] Another increasingly common kind of DB plan is the cash balance plan, which accumulates value like a defined-contribution plan but guarantees a certain rate of return. Upon retirement, the worker has the option of taking the value of the account as a lump sum.

[2] All retirees receive a minimum of $150 a month, even if the benefit formula generates a smaller annuity payment.

[3] Hazel Bradford, "Gap between Haves, Have-Nots Is Growing," *Pensions and Investments*, September 17, 2018.

[4] Investment experience studies are common among public pension plans and are often done at regular intervals.

[5] Christine Williamson, "Texas Teachers Drops Return Rate 75 Basis Points to 7.25%," *Pensions and Investments*, July 27, 2018.

[6] See S.B. 12, Texas Legislature, accessed September 3, 2019, https://capitol.texas.gov/tlodocs/86R/billtext/html/SB00012F.htm.

[7] Alex Samuels, "Texas Teachers' Pay Is Average. But Their Pensions Are among the Lowest in the Country," *Texas Tribune*, April 20, 2018.

[8] Alex Samuels, "Texas Teachers' Pay Is Average. But Their Pensions Are among the Lowest in the Country."

[9] This is a standard assumption in the pension literature. In 2012, the Governmental Accounting Standards Board recommended a new method for calculating the discount rate that applies to pension systems with a projected "depletion date," the point at which benefit payouts would exceed pension assets (Winningham 2014). Under this proposal, the discount rate should be a combination of the long-term investment return rate and a municipal bond rate. However, TRS does not face an imminent depletion date, and so we assume that the discount rate equals the ROA to simplify the calculations.

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