STATE AND LOCAL GOVERNANCE

# Pension Reform

## *Conceptual Foundations and Practical Challenges*

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## 1. INTRODUCTION

Underfunded pension obligations are increasingly a factor of fiscal distress for local and state governments across the United States. Increased vigilance and the willingness to introduce statutory mandates to amortize the unfunded liability exerts enormous fiscal pressure on cities' budgets. Statutory mandates reflect that unfunded pensions constitute a grave financial risk that can, in the extreme case, result in Chapter 9 bankruptcy filings. Pension obligations have played an important role in the majority of all significant Chapter 9 bankruptcies in the last twenty-five years. Prominent examples include Detroit, Michigan; San Bernardino, California; Stockton, California; Vallejo, California; and Central Falls, Rhode Island, as well as the recent bankruptcy of Chester, Pennsylvania. Other negative effects of the large pension liabilities come in the form of higher borrowing cost in the municipal bond market (Boyer, 2018; Giesecke, Mateen, and Sena, 2022) and increases in tax—predominantly property taxes for local governments. Higher property taxes incur separate costs. Giesecke and Mateen (2022) show that higher property taxes induce net migration, which has a negative effect on house price valuations and has the potential to amplify the fiscal pressure on local governments (Giesecke, 2022). Other forms of external discipline include that the state government steps up supervisory measures: e.g., the states of Michigan, California, and Connecticut have increased the monitoring of their municipalities and intervene if necessary. Lastly, rating agencies remain vigilant about pension funding.

To put the pension cost into perspective: Under the premise to make enough contributions to prevent the unfunded pension liability from rising, the required employer contributions are equivalent to 21.1 percent of total tax revenue (Giesecke and Rauh, 2022b). Cities have recognized this and increasingly look for possibilities to reform their funds. Interestingly, the private sector has recognized the financial risk of defined benefit (DB) plans and has gradually shifted toward defined contribution (DC) plans. As of 2020, only 16 percent of employees in the private sector had access to a DB plan, while about 83 percent of public sector employees

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were enrolled in a DB plan (Bureau of Labor Statistics, 2020; NASRA, 2021). A detailed breakdown of pension liabilities and cost can be found on our public pension dashboard, which is available at https://publicpension.stanford.edu. It provides an interactive tool to explore the cross-sectional variation across pension sponsors, and the time-series development for state, county, and city pension plans.

We propose five general principles to guide pension reform considerations. First, DB plans are more expensive than what is commonly reported. The discrepancy between actual and recognized service cost has led to an accumulation of a large total unfunded pension liability of $6.501 trillion (Giesecke and Rauh, 2022b). Second, the forward-looking true economic pension cost should be the primary measure to assess all available policy options. The pension sponsor has the ability to affect the future cost of offering pensions but little choice in paying the accrued liability. Any evaluation of pension alternatives should be based on a transparent comparison of the true economic cost of offering pension benefits going forward. Third, the amortization of the unfunded liability should reflect the risk and duration profile of economic liability. Actuarial recommendations that accelerate the payment profile are economically unfounded and have historically been applied inconsistently. The amortization profile should first and foremost represent the profile of the economic liability. Fourth, public employees value DB plans less than commonly perceived (Giesecke and Rauh, 2022a; MissionSquare Research Institute, 2022; Fuchsman, McGee, and Zamarro, 2023). As an alternative, DC plans provide the employee with the optionality to rebalance pension benefits and take-home pay. This is particularly beneficial to general employees who are often underrepresented in collective bargaining agreements. Finally, pension plan alternatives that limit the risk to the pension sponsor are available and well established (Novy-Marx and Rauh, 2014). These include defined benefit plans with risk-sharing components, cash balance plans, and defined contribution plans.

Pension reforms are difficult but possible. Economic, political, and statutory factors constitute potential impediments for reform. Despite these frictions, several cities have successfully reformed their pension plans; often due to the consensus of all stakeholders that the status quo is unsustainable. Some salient examples include Baltimore, Maryland, which enacted a wide-ranging pension reform in 2013; Norfolk, Virginia, which enacted a soft-freeze of the city plan and enrolled new employees in the state pension plan in 2022; Jacksonville, Florida, which closed its DB plan for general employees and introduced a mandatory DC plan in 2017; and Ann Arbor, Michigan, which transitioned all employees to a hybrid plan in 2017. After rating downgrades and a downward trend in the funding ratio, Fort Worth, Texas, and Birmingham, Alabama, additionally conducted a reform in 2019 and 2021, respectively.

Current actuarial practices constitute a major deterrent to pension reforms. These practices provide artificial changes unrelated to the economic fundamentals of the pension plan that often leave the city without a choice other than maintaining the status quo. While the revision of the Actuarial Standards of Practice (ASOP) no. 4 introduces new disclosure requirements, it has little effect on addressing the pension sponsors' disincentives that prevent more widespread reforms.

The report is structured as follows: Section 2 discusses the role of pension liabilities in the fiscal position of state and municipal governments. Section 3 provides a systematic overview of recent pension reforms and discusses some of the reforms in more detail. Section 4 outlines the general principles for pension reform, and section 5 discusses the application of these general principles to concrete case studies in which pension reforms have been enacted or are actively considered. We conclude in section 6.

## 2. THE ROLE OF PENSION LIABILITIES IN FISCAL POSITION

*Magnitude of pension-related debt* Pension liabilities and related other postemployment liabilities account for approximately 60 percent of all outstanding liabilities for state and local governments (Board of Governors of the Federal Reserve, 2023). As such, they even surpass debt obligations at the municipal bond market. In absolute terms, Giesecke and Rauh (2022b) estimate the market value of the unfunded liability to be approximately $6.501 trillion, while under governmental accounting standards, it is reported to be $1.076 trillion as of fiscal year 2021.[1] Regardless of whether measured at book or market values, pension liabilities and related other postemployment liabilities have grown in magnitude to such extent as that a sizeable share of local governments are operating with negative equity, as highlighted by Giesecke, Mateen, and Sena (2022).

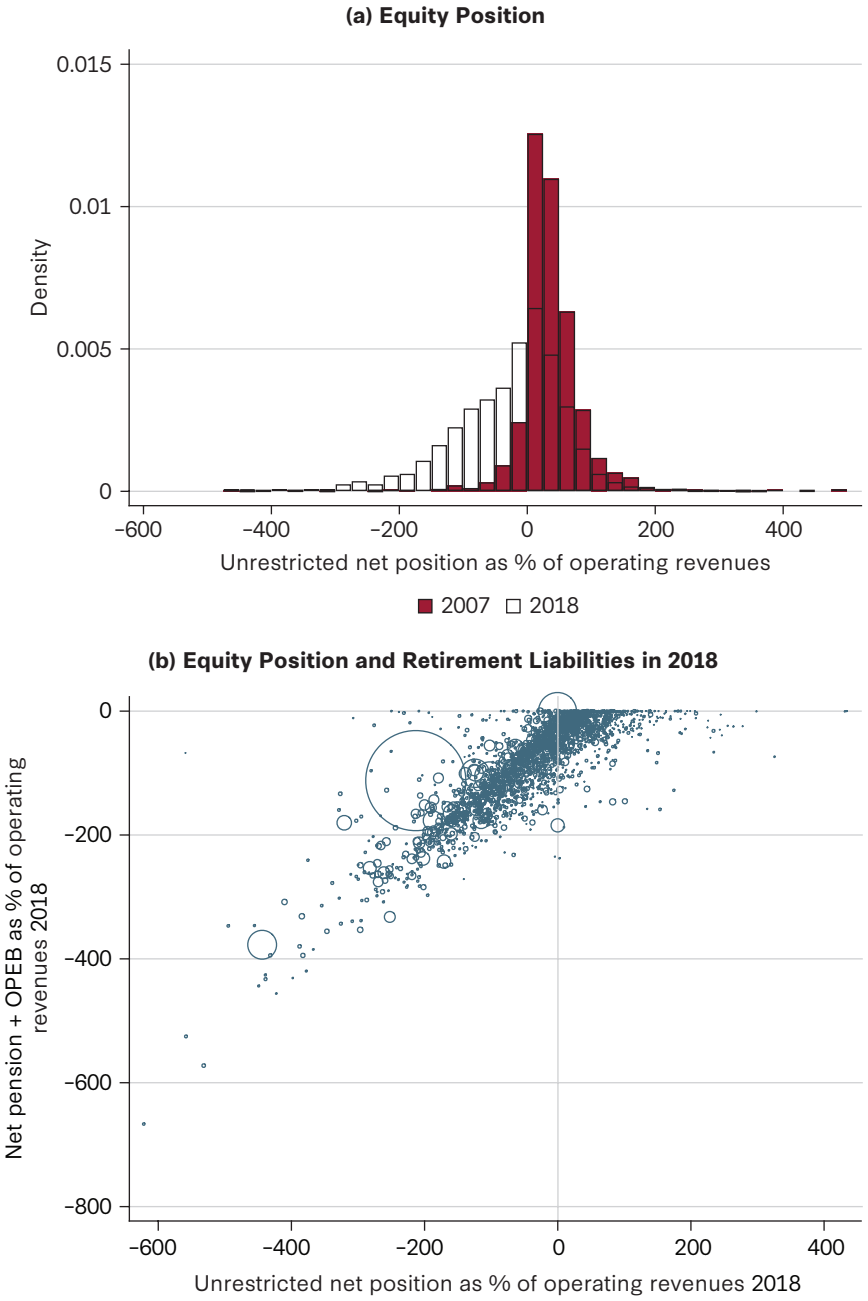
Figure 1, panel (a), shows that a sizeable share of local governments operate with a negative unrestricted net position—akin to a negative book equity position in the corporate context. Concretely, in 2018 approximately 60.95 percent of local governments have negative equity, a remarkable increase from approximately 18 percent in 2007. Net pension and other postemployment benefits (OPEB) liabilities account for the largest fraction of the unrestricted net position and are the predominant contributors to the negative equity position as figure 1, panel (b), demonstrates.

*Unfunded pension obligations increase borrowing cost* In the extreme case, unfunded pension obligations result in Chapter 9 bankruptcy. More likely, however, unfunded pensions increase the borrowing costs. Giesecke, Mateen, and Sena (2022) show that unfunded pension obligations, and a more broadly defined measure that captures the equity of local governments, are associated with higher spreads in the municipal bond market as shown in figure 2. The magnitude is significant. For an increase of the unfunded pension obligations as a percentage of operating revenues by 100 percent, we find that municipal bond markets demand an extra 11.1 basis points on average.

Boyer (2018) demonstrates that the relationship between unfunded pensions and higher bond spreads is indeed causal. In addition, the paper further suggests that markets believe that pension obligations are senior to debt obligations in many states, which is consistent with the treatment of pension obligation in the majority of Chapter 9 bankruptcy proceedings as we elaborate below.

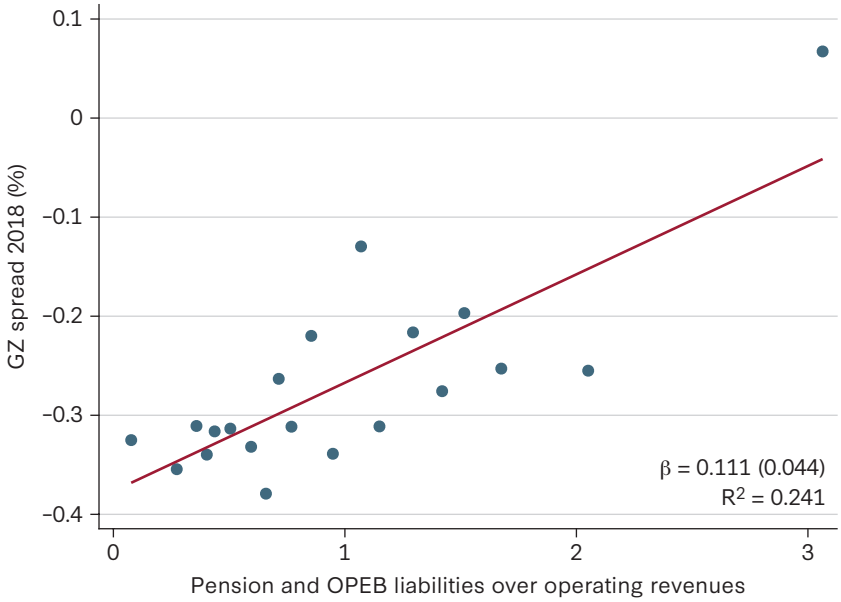
*Unfunded pension obligations demand higher property tax rates* Empirically, we find a positive relationship between the size of the net pension obligations and property tax rates

**FIGURE 1** Pension liabilities and equity position




**Notes:** Panel (a) plots the unrestricted net position (equity position) over operating revenues in 2007 and 2018. Panel (b) plots the unfunded OPEB and pension liability and the unrestricted net position (equity position) over operating revenues in 2018. The size of the circle corresponds to the total operating revenues of the corresponding local government. The sample contains all local governments for which the unrestricted net position is available in both 2007 and 2018. Data is obtained from Moody's Investors Service. More details on the unrestricted net position and sample selection can be found in Giesecke, Mateen, and Sena (2022).

**FIGURE 2** Pension liabilities and secondary market spread



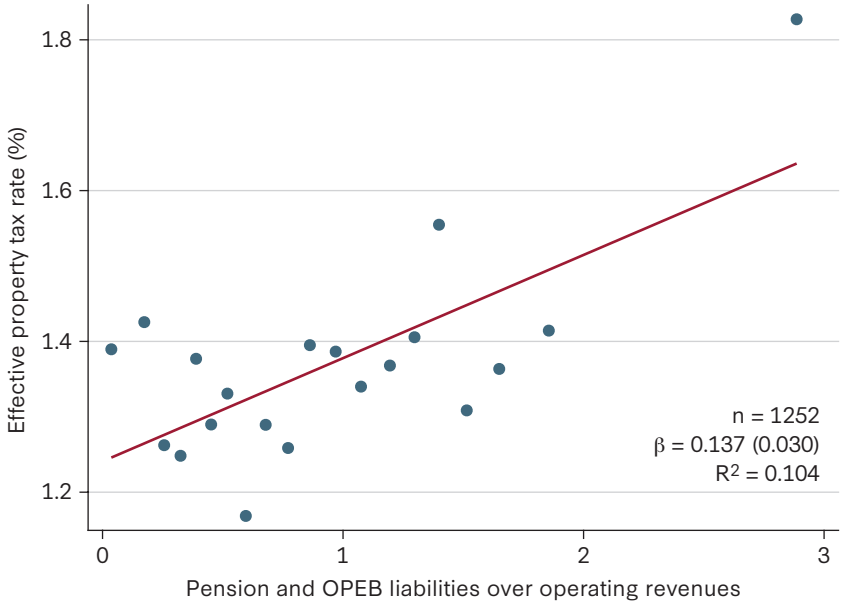

**Notes:** The figure plots the relationship between the GZ spread (Gilchrist and Zakrajšek, 2012) in 2018, a duration matched yield spread, for issuances with maturity of over one year at issuance, tax-exempt status, and classified as full general obligation and the pension liabilities defined as the unfunded pension and OPEB liability as a share of operating revenues. Data on pension and OPEB liabilities obtained from Moody's Investors Service and municipal bond information is obtained from the Mergent Municipal Bond Database and the Municipal Securities Rulemaking Board (MSRB). More details on the spread calculation are found in Giesecke, Mateen, and Sena (2022). The figure shows binscatters of the twenty quantiles after controlling for per capita income, racial composition, and home ownership rates from the 2010 decennial census.

across the United States as shown in figure 3.[2] This positive relationship is of great importance because Giesecke and Mateen (2022) have shown that an increase in property taxes leads to net migration, which erodes the tax basis of cities and thus jeopardizes the fiscal sustainability even further. Giesecke (2022) shows that the increase in property taxes, and thus the loss in relative competitiveness, can amplify the initial fiscal burden through this local financial constraint channel.

*The role of unfunded pensions in municipal bankruptcies* Pension obligations have been a prominent cause of Chapter 9 bankruptcy filings over the last twenty-five years. Approximately one-fifth of all forty-two general purpose Chapter 9 bankruptcy filings since 1998 have been caused by unfunded pensions. Unfunded pensions are a particularly salient cause for larger cities for which liabilities are of disproportionate magnitude. Figure 4 shows the cities for which unfunded pension obligations was named as the primary cause for the Chapter 9 bankruptcy filing.[3] The list includes many prominent cases such as Detroit, Michigan; San Bernardino, California; Stockton, California; and Central Falls, Rhode Island, as well as the recent bankruptcy of Chester, Pennsylvania.

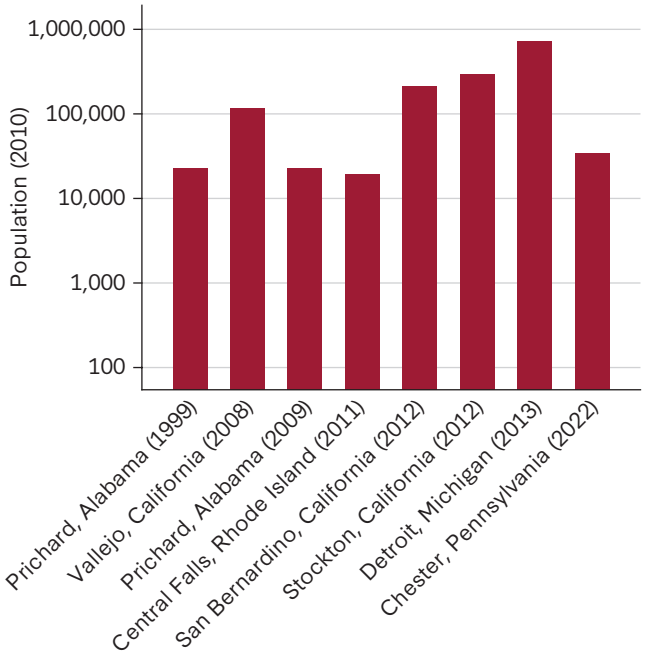
One interesting question is whether Chapter 9 filings provide relief from the pension burden. The evidence of historical Chapter 9 filings points toward seniority of pension obligations

**FIGURE 3** Pension liabilities and property taxes




**Notes:** The effective property tax rate is computed as the tax amount over the market value of the property to avoid differences in assessment methodology across jurisdictions. Microdata on property taxes is obtained from CoreLogic and more details on the procedure are available in Giesecke and Mateen (2022). Pension debt and OPEB are the reported liabilities and are obtained from Moody's Investors Service. Details on the sample selection can be found in Giesecke, Mateen, and Sena (2022). The figure shows binscatters with twenty quantiles after controlling for per capita income, racial composition, and home ownership rates from the 2010 decennial census.

**FIGURE 4** Pension-related bankruptcies




**Note:** The figure displays the population of every municipality as of the 2010 Census that has sought bankruptcy for pension-related reasons since 1998.

over debt obligations, with pension typically experiencing little to no haircut. For the majority of pension-related bankruptcy filings, municipal debt holders and pension plan participants are the largest creditors, and the relative seniority determines to what extent the liability is paid. Local governments have some leeway in the treatment of pension obligations during Chapter 9 proceedings, with cuts to the existing pension obligations a potential option.[4] The historical evidence, however, supports the seniority of pension obligations over other liabilities. Among reasons for the protection of pension benefits are the contractual and statutory provision and the argument that a cut of pension benefits would impair the ability to attract public-sector employees in the future. Concretely, Stockton, California; San Bernardino, California; and Vallejo, California, have chosen to impair the claims of bondholders over pension plan participants (Chaudhury, Levitin, and Schleicher, 2019; Dick, 2018; Shedlock, 2011).[5] Detroit is another interesting example where public pensions saw relatively mild haircuts. Public safety employees experienced no haircut to their accrued benefits but had to tolerate COLA reductions by 55 percent, while accrued pensions for general employees were reduced by 4.5 percent. In contrast, debt holders had to bear a much larger haircut to their claims under the terms of the "grand bargain" (Buccola, 2014). Central Falls, Rhode Island, adopted a somewhat separate treatment. The city reorganized its debts by cutting benefits for current members while leaving bondholder claims essentially untouched (Dawson, 2014). Most notably, the city did so with the permission of the pensioners themselves (Church and Ludsin, 2012).

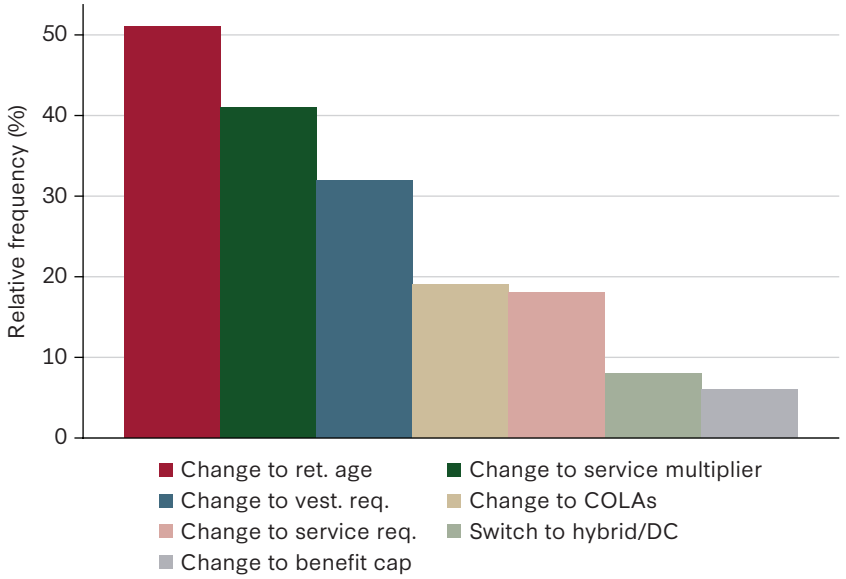
## 3. PENSION REFORMS

Economic, political, and statutory factors constitute potential impediments for reform. Despite these frictions, several cities have successfully reformed their pension plans—often due to the consensus of all stakeholders that the status quo is unsustainable.

Figure 5 provides a systematic overview of pension reforms since 2008. The figure shows the relative frequency of the seven most frequent pension reform measures that have been undertaken. Often a reform includes between one and three of these measures. The top three measures are a change of the retirement age, followed by a change in the generosity of the benefits (the service multiplier), and a change in the vesting requirements. This is followed by a change in the cost-of-living adjustments (COLAs) and a change in the service requirements. More decisive pension reforms that involve a switch to a hybrid plan or a DC-only plan are relatively infrequent and account for only about 8 percent in our sample. A detailed tabulation of pension reforms and the conducted measures is presented in table A.2.

Some salient examples of pension reforms include Baltimore, Maryland, which enacted a wide-ranging pension reform in 2013. The city introduced a hybrid system for public-sector employees. The reform also rebalanced the benefit compensation package, decreasing pension costs and increasing take-home pay and other benefits, among other measures. Norfolk, Virginia, enacted a soft-freeze of the city plan in 2022; the city pension plan is closed to new employees and new employees are now enrolled in the state pension plan. Jacksonville, Florida, closed its general employee defined benefit plan altogether in 2017. All new employees simply receive a 401(a) account. Ann Arbor, Michigan, took a similar step

**FIGURE 5** Relative frequency of certain provisions in select pension reforms since 2008




**Notes:** The graph displays the frequency of common measures of pension reforms since 2008. We obtained the data from Urban Institute (2014) and the individual member handbooks of each plan. Frequencies do not sum to 100 percent, as often a reform includes several of these measures. A detailed tabulation of pension reforms and the conducted measures is presented in table A.2.

in 2017, opting to reduce the defined benefit terms for new employees and provide them with a DC plan to compensate. Birmingham, Alabama, adjusted the benefit terms, increased employer and employee contributions, and enacted an amortization mandate of the unfunded pension liability in 2021. Fort Worth, Texas, introduced a risk-sharing component in its DB plan, increased employer and employee contributions, and enacted an amortization mandate in its 2018–19 reform.

## 4. GENERAL PRINCIPLES

This section outlines five general principles for pension reform considerations. These principles are sufficiently general to be widely applicable. We elaborate on how these principles are applied to concrete reform considerations in the subsequent section.

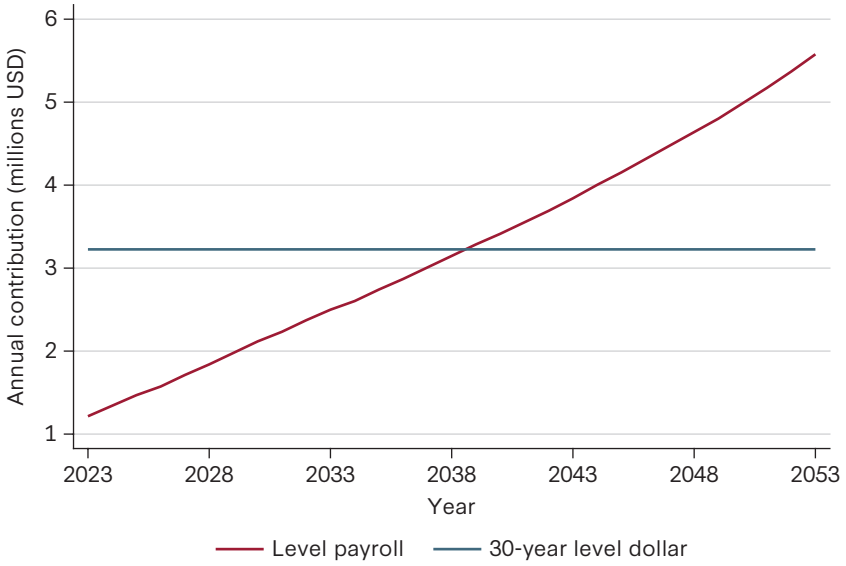
1. **DB plans are more expensive than commonly reported and constitute a serious financial risk.** The true economic cost of DB plans is often higher than recognized due to several actuarial assumptions that misrepresent the true liability of accruing pension benefits. Giesecke and Rauh (2022b) estimate the employer service cost to be 20.7 percent of payroll versus the 7.7 percent that is reported. This discrepancy creates the incentive to defer payment even if the employer makes the full actuarial contribution, which has historically not always been the case. As a result of insufficient contributions, state and local governments have accumulated total unfunded pension liabilities of $6.5 trillion as of 2021 (Giesecke and Rauh, 2022b).

Policy makers have increasingly recognized the financial risk originating from pension liabilities and have reacted with two primary measures. First, several jurisdictions have introduced statutory funding mandates. Funding mandates require that the unfunded liability has to be amortized over a fixed horizon; often a period between twenty and thirty years. These funding mandates result in sharp increases in the required contributions. In the case of Milwaukee, Wisconsin, the projected increase of required contribution from $81 million to $166 million between fiscal years 2022 and 2023 is mainly driven by the funding mandate. The increase of $85 million accounts for approximately one-quarter of discretionary revenues and exerts enormous strain on the city's budget. Second, states have markedly tightened their supervision of municipalities. For example, the state audit office of California created a database of high-risk cities to actively monitor changes in cities' finances and set up a process to engage proactively if certain financial indicators flash red. Similarly, the state of Michigan asked cities to provide a plan to re-establish fiscal discipline if the pension funding status of its cities drops below a certain threshold. Paradoxically, while this increased vigilance contributes to the long-term stability of the cities, it often induces enormous fiscal strain in the near term. External pressure, however, does not come from the state government alone. Rating agencies have increasingly downgraded cities' credit ratings due to their unfunded pension liabilities. Birmingham saw a downgrade of its credit rating due to pension underfunding in 2019; Fort Worth experienced the same in 2018.

2. **Forward-looking pension cost is the primary measure to assess policy options.** The consideration of pension alternatives should evaluate the forward-looking economic cost of each policy option regardless of the legacy liability. For DB plans, the true economic cost is best described by the market value of the employer service cost. As mentioned in the previous principle, this can often be considerably higher than the reported employer service cost. For DC and cash balance plans, the economic cost is simply the required employer contribution. It is important to realize that the legacy liability has to be paid for, regardless of whether the pension plan is continued or closed (Rauh, Stefanescu, and Zeldes, 2020). While theoretically this point is obvious, our conversations with partner cities have revealed that the treatment of the legacy liability typically results in cities favoring the status quo (the DB plan). As such, the consideration of the legacy liability has some analogy to a sunk cost fallacy. To reiterate our main point, pension alternatives should be solely assessed based on future pension cost.

3. **Amortization of the unfunded liability should reflect the risk and duration profile of economic liability.** A separate but related point to the previous point is the amortization of the unfunded pension liability. It has to be amortized whether the plan is continued or whether the plan is closed ("soft-freeze" or "hard-freeze"). Despite the unchanged economics of the legacy liability, actuaries often prescribe a change in actuarial assumptions that sharply accelerates the amortization and thus increases the required amortization payments. The first of the three salient changes in actuarial assumptions is the change from a *level-percent of payroll* to a *level-dollar* amortization. As the overall projected payroll of the city is typically increasing over time, the level-percent of payroll amortization implies an increasing payment profile, as shown in figure 6 with the red line. The

**FIGURE 6** Level-percent vs. level-dollar

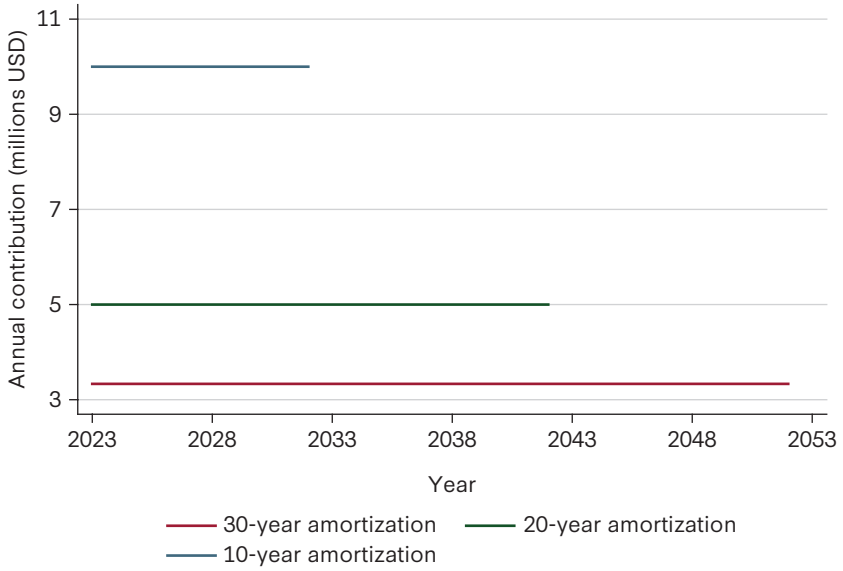



switch toward a level-dollar amortization requires equal amortization payments over time, as shown by the blue line, and thus leads to a shift of the payment profile toward the present. It is important to remember that this shift in the payment profile happens regardless of unchanged benefit payments—that is the future cash flows of the fund. The second change is a shortening of the amortization period. Figure 7 illustrates the effect of a shortening of the amortization period of a $100 million liability for ten years, twenty years, and thirty years. As the amortization period shrinks, the yearly required contribution increases. Thus, the city faces much higher payments in the near term, which would exert enormous pressure on the budget. This shortening of the amortization period happens despite the fact that the expected benefit payments associated with the liability do not change. The benefits are already accrued with active or vested members and have to be paid regardless of whether the plan is continued or closed. We consider the cash flow profile of the benefit payments as the determining factor that should guide the choice of the amortization length.

The third change in assumptions is a decrease of the discount rate upon the closing of a plan. Economic principles require that the discount rate reflects the risk profile of the pension liability (Brown and Wilcox, 2009; Novy-Marx and Rauh, 2009, 2011; Brown and Pennacchi, 2016). As discussed previously, the payment of the accrued benefits and its risk profile does not change with the closure of the plan. As such, the change of the discount rates is not warranted.

Summarizing the main takeaways of this principle: The economics of the legacy liability do not change whether the plan is continued or closed. As a consequence, the change of the actuarial assumptions is not warranted. Instead, we strongly recommend that the amortization profile reflects the risk profile and maturity of the economic liability. While we have seen multiple examples in which the changes discussed above were

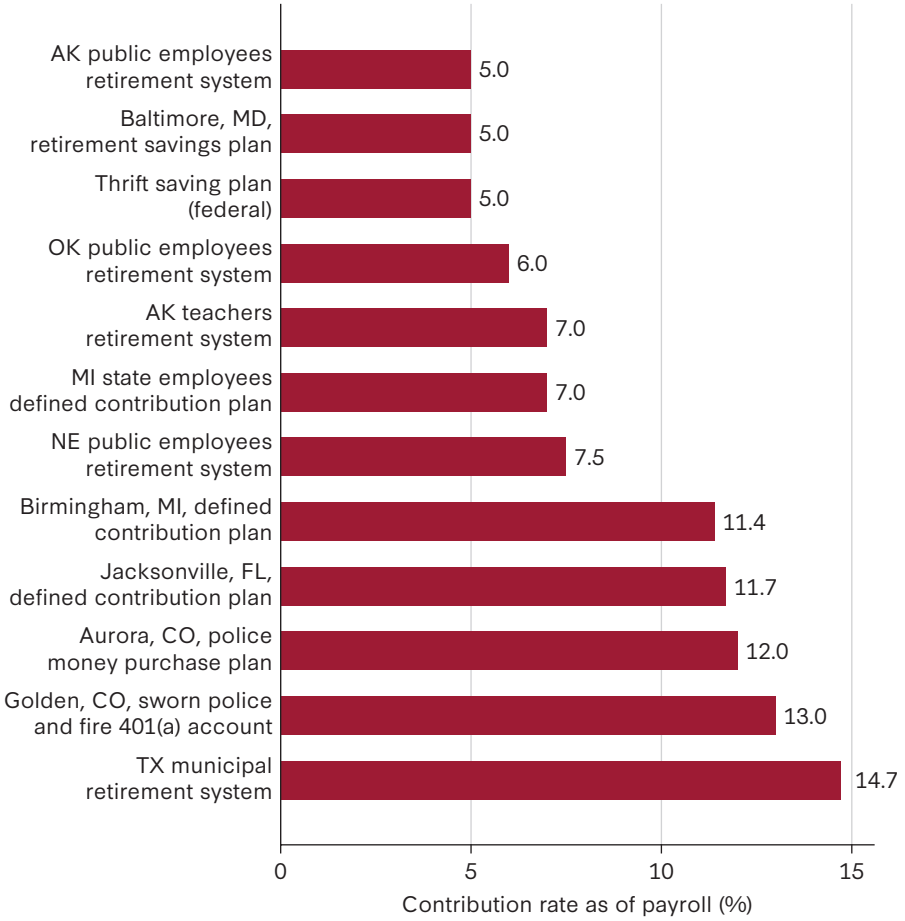
**FIGURE 7** Amortization period




recommended by actuaries with a reference to the Actuarial Standards of Practice (ASOPs), it turns out that actuaries have historically provided conflicting recommendations. For instance, the same actuary firm provided contradictory advice for the states of Kansas and Kentucky. In the case of Kansas, the actuary clarified that there was no compelling actuarial reason to accelerate payments upon closing of the DB plan if the amortization payment was based on total payroll. In the case of Kentucky, the same actuary stated that the Governmental Accounting Standards Board (GASB) requires an acceleration of amortization payments upon closing of the DB plan (Costrell, 2012).[6]

4. **Public employees' interest in participating in DC plans is higher than often perceived.** Both survey evidence and active public-sector DC plans demonstrate employees' support for DC plans. Giesecke and Rauh (2022a) conducted a large-scale survey among public employees across the United States. They found that 89.2 percent of public-sector employees are willing to accept a DC plan, with the median required employer contribution being 10.0 percent. Separately, MissionSquare Research Institute (2022) surveyed fellowship candidates for the Lead For America program. The survey population was overwhelmingly young candidates—with a median age of twenty-two. The survey found that candidates' top priority is workplace culture. Among compensation components, the ranking of retirement benefits was generally last, while salary was second. Furthermore, the survey found that 83 percent found public-sector benefits to be overall competitive, but only 32 percent found public-sector salaries to be the same in comparison to the private sector. Fuchsman, McGee, and Zamarro (2023) surveyed the pension preferences in a nationally representative survey of teachers and found that teachers value traditional DB pensions less than e.g., salary growth, retirement age, or other benefits, such as health insurance or social security. This survey provides additional evidence for a beneficial rebalancing of retirement benefits and take-home pay.[7]

**FIGURE 8** Active DC and cash balance plans and contribution rates




**Notes:** The figure shows the employer contribution rates of various active public-sector DC and cash balance plans, including federal, state, and municipal retirement systems. Contribution rates are obtained from member handbooks.

In addition, we find many examples of DC public-sector plans that fall into a range that is consistent with the survey responses. For instance, Birmingham, Michigan, has a DC-only plan with an employer contribution rate of 11.4 percent.[8] Jacksonville, Florida, has a DC plan with an 11.7 percent employer contribution rate for general employees. Golden, Colorado, contributes 13 percent into the city's public safety 401(a) accounts. More broadly, we have identified a set of public-sector DC plans for which the employer contribution rate ranges between 5.0 percent and 14.7 percent, which we illustrate in figure 8. Further evidence of the popularity of DC-only plans comes from employees' selection in Baltimore, Maryland. Employees are provided with the option to enroll either into a hybrid plan or DC-only plan. By default, employees are enrolled into the hybrid plan but about 40 percent actively opt into the DC-only plan.

There are several reasons why public employees prefer a DC plan over a conventional DB plan—even if the employer contributes less to the DB plan than the true economic cost of the DB plan. First, DC plans offer employees the ability to rebalance pension

benefits and take-home. This option helps to avoid the risk of over-annuitization relative to preferences and with liquidity constraints. DB plans are highly prescriptive as the employer makes a fixed contribution and often requires the employee to make an additional contribution. Thus, employees have little choice than to accept the predetermined division between take-home pay and retirement benefits. This arrangement does not adapt to individual needs or life circumstances. Thus, individuals may find themselves in a situation in which they are liquidity constrained as a significant fraction of their income is annuitized. This is a particular concern for employees in the early stage of their career. Brown, Ivković, and Weisbenner (2015) find empirical evidence for this. The paper finds that individuals prefer the annuitization payment if they have higher incomes and are not liquidity constrained, whereas individuals who expect higher risk are more likely to take the earlier income stream. Cole and Taska (2022) also find that retirement benefits are valued more among employees with high salary. Overall, with an appropriately designed DC plan, e.g., with base and matching contribution by the employer, public employees can rebalance pension benefits and take-home pay. This may contribute to the satisfaction of current employees and may increase the attractiveness of the employer, especially for general and entry-level employees. Second, DB plans typically offer no discretion about investment decisions. Employees who value flexibility with regard to their investment decisions may accept lower contributions in exchange for the ability to allocate their assets based on their preferences. Relatedly, Beshears, Choi, Laibson, Madrian, and Zeldes (2014) find, in a survey about hypothetical annuitization choices, that individuals are less likely to annuitize if they are exposed to retirement plan descriptions that highlight flexibility, control, and investment. Third, portability of pension benefits is important for employees who prefer a more flexible career path. DB plans often have significant vesting periods—the minimum years of service to be eligible for retirement benefits—and convex accrual patterns. This makes a switch of the employer costly and unattractive. Cocco and Lopes (2011) find that employees in the UK who show higher job mobility are more likely to choose a transferable, less generous state pension plan than to contribute to the occupational, more generous, pension plan offered by their employer.

5. **Retirement plan options that limit pension sponsor's risk exist and are well established.** In a DB plan, the employer guarantees the retirement benefits and makes investment decisions regarding retirement assets on behalf of its employees. Importantly, any shortfall in investment returns must be offset by the employer, since the employer has guaranteed the benefit. This means that the employer bears all of the risk and the associated liability. This can lead to financial distress of the cities at the expense of other public services and, in the extreme, to bankruptcy. Cities could consider reimagining a partial shift of the risk. There are several options available that have proven to be successful. One of the possibilities to share risk between the employer and the employee is a DB plan with risk-sharing features. Typically, these plans make benefits and/or employee contributions dependent on the realized asset return of the pension fund. The Wisconsin Retirement System, for instance, makes benefits as well as the cost-of-living adjustment (COLA) dependent on the asset return of the fund. In contrast, Fort Worth Employees' Retirement Fund and Baltimore City Employees' Retirement System

divert employees' contribution to the DB plan if the funding status of the DB falls below a certain threshold. Alternatively, cash balance plans require the employer to make a fixed percent of payroll contribution, and the employee receives the account balance upon retirement. Regardless of the asset returns of the fund, the employer is not required to make additional contributions after the employee has retired. Thus, it limits the risk for the employer. Some prominent examples of cash balance plans are the Texas Municipal Retirement System, the Nebraska Public Employees Retirement System, and the Kentucky Retirement System. Last but not least, defined contribution plans offer another potentially attractive option. As previously discussed, in DC plans the employer and/or employee contribute a percent of payroll and the employees manage their individual investment accounts, which they can draw on upon retirement. Some cities and states that have implemented a DC-only plan include the Birmingham (Michigan) Defined Contribution Plan, the Aurora (Colorado) Police Money Purchase Plan, the Richmond (Virginia) Defined Contribution Plan, the Jacksonville (Florida) 401(a) Defined Contribution Plan, and the Alaska Public Employees Retirement Plan.

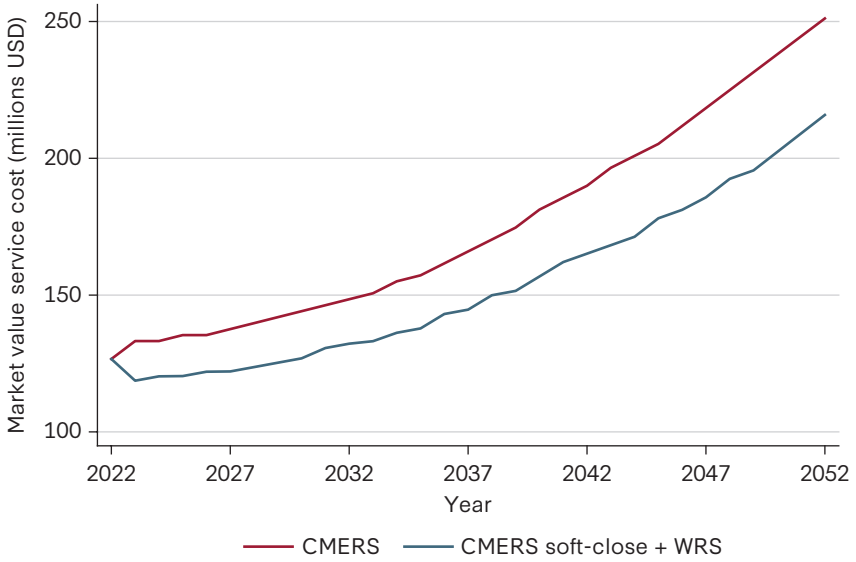
## 5. PRACTICAL CONSIDERATION OF PRINCIPLES

In this section, we demonstrate how the outlined general principles apply to several local governments that have recently executed or are actively considering a pension reform.

*Deliberations of policy choices* We demonstrate the evaluation of policy choices through the example of Milwaukee, Wisconsin. Milwaukee faces a pension-contribution profile that requires increasing contributions in the coming years primarily as a result of the full-funding mandate, which exerts enormous strain on the city's budget with possible cuts in other city expenditures and loss of public employment on the horizon. Consequently, the city considers a soft-freeze of the city plan, the City of Milwaukee Employees' Retirement System (CMERS) and the enrollment of new employees into the Wisconsin Retirement System (WRS). This consideration mirrors the pension reform of Norfolk, Virginia, in FY 2022; Creve Coeur, Missouri, in FY 2017; and Lafayette, Louisiana, in FY 2020.

As alternative retirement options are being considered, a first-order question for the policy maker is what fiscal implications the choice has on the city's finances. We evaluate this question following our general principle concerning forward-looking pension cost. For that, we compare the *true economic cost*, which can deviate from the reported pension cost. Specifically, we focus on the market value of the employer service cost instead of the reported service cost that is contingent on the actuarial assumption and ignores market conditions. This adjustment is particularly salient in Milwaukee's case as it changes the final policy recommendation.[9] While the service cost of a soft-close plus WRS exceeds the service cost of CMERS in the long term on a reported basis, the ranking switches after considering the true economic cost. Thus, evaluating the true economic cost is of utmost importance for sound economic policy decisions.

**FIGURE 9** Normal cost under alternative scenarios



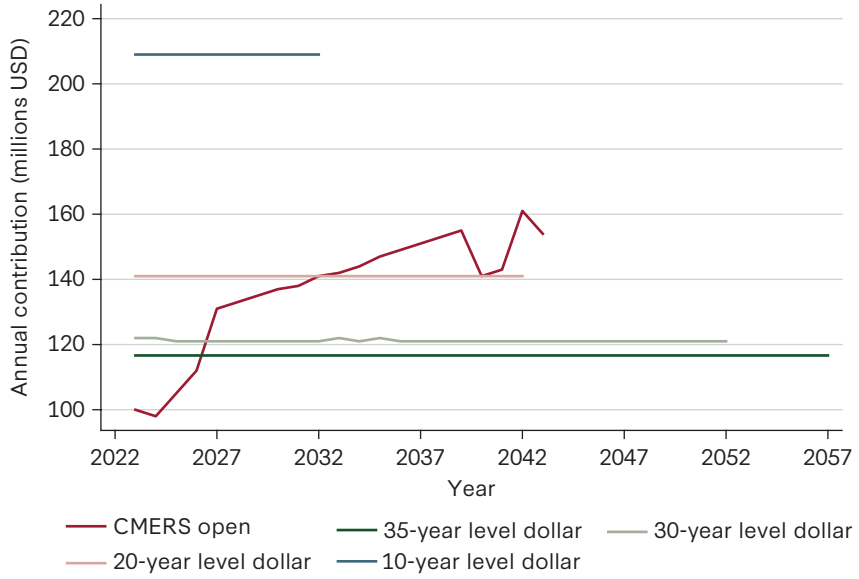

**Notes:** This figure shows the projections of service cost for both a scenario in which CMERS stays open and a scenario in which CMERS closes to new members and all incoming employees are enrolled in WRS. This figure utilizes the service cost figures provided by the actuary, albeit adjusting them to reflect the true economic liability of the plan in question. Note the increasing difference between WRS and CMERS.

Figure 9 shows the projected employer service cost under market valuations for the two scenarios. Overall, we find projected service cost under the soft-close plus WRS scenario to be lower than under a continuation of CMERS. Yearly savings are continuously increasing over the time horizon. The savings from the service cost should be understood as a lower bound for the total savings. Over time, administration and investment management services can be consolidated, which has the potential for additional savings of $10 million annually.

***Amortization of the unfunded liability should reflect the risk and duration profile of economic liability*** A common pitfall in considerations about retirement alternatives is to take the legacy liability into account. The main reason is that the actuaries require a change of the actuarial assumption when closing a plan, which affects the required contributions in the short-to-medium term. However, as outlined above, the change in the actuarial assumptions is economically unwarranted as the risk and duration profile of the legacy liability remains unchanged. The case study of the city of Milwaukee, Wisconsin, is an excellent example for how the change of the actuarial assumptions deters the city from conducting an economically prudent pension reform. We discuss this in the following three points:

1. **Amortization Period.** The current amortization period under the continuation of CMERS is twenty-one years, as shown in figure 10. The amortization period is one way to measure the timeliness of the repayment. One of its limitations is that it ignores the increasing payment profile. Instead, we propose to measure the amortization profile by its duration.

**FIGURE 10** Amortization scenarios (market valuation)




**Notes:** This figure displays the reported annual contribution schedule for the continuation under CMERS and level-dollar annuities with an amortization period of ten, twenty, and thirty years as presented in the memorandum of the actuary for a soft-close of CMERS. The thirty-five-year annuity is added by the authors as a reference point.

Duration reflects the length of the payment period as well as the cash flow profile and represents the time-weighted amortization period. The duration of the amortization profile in the scenario in which CMERS remains open with the results of the recent experience study and the estimated $5.5 billion market valuation of assets is 10.14 years.

In contrast, the baseline scenario under a soft-close is a level-dollar annuity of ten years, which has a duration of only 5.05 years. This essentially shortens the repayment profile of the unfunded actuarial liability (UAL) by half and comes with the side effect of higher contribution payments. Alternative amortization scenarios that are under consideration are a twenty-year and thirty-year level-dollar annuity, which have a duration of 9.02 and 12.44, respectively. If we instead match the duration of the current amortization profile with a duration of 10.14 years, the equivalent level-dollar annuity has an amortization period of about twenty-four years. Interestingly, the duration is larger than the amortization period, a reflection of the increasing payment profile (we will return to this point in the next section).

From an economic point of view, an important benchmark for the determination of the appropriate amortization period is the duration of future pension benefits. The premise is that the required benefits are paid equally from the asset stock as well as additional employer contributions for the UAL. Using the expected benefit payments, we find a duration of the benefit profile of 12.92 years. Thus, the economic liability has a duration that is considerably longer than the current amortization plan as well as the scenarios currently considered under the soft-freeze.[10] The duration of the economic liability is approximately matched by a level-dollar annuity with an amortization profile of about

thirty-five years. Thus, even under the longest amortization period being considered, the economic duration of the liability surpasses the duration of the amortization payment. Alternatively, the duration of the economic liability surpasses the base case amortization period of a ten-year annuity by more than six times.

2. **Level-Dollar vs. Level-Percent of Payroll.** Related to the amortization period is the amortization profile. The amortization profile determines whether most of the repayment is front- or back-loaded. As such, it determines how much of the contributions the city has to make in the near term versus further in the future.

   As is common among plans, CMERS uses a "level percent of payroll" amortization method, wherein the recommended contributions are expressed as some constant percentage of payroll. As payroll is projected to increase over time, so is the amortization payment. Figure 10 shows the resulting payment profile with the red line. The method back-loads the amortization payments, which results in near-term payments that are more palatable for the city.

   In contrast, the three scenarios of the amortization payment call for a level-dollar amortization. That is, the liability is spread into nominally equal payments across the amortization period. The twenty-year annuity serves as the closest comparison to the original amortization profile as the amortization period is closely comparable. In this comparison, the near-term contributions jump from about $100 million to about $140 million—a sizeable jump for the city of Milwaukee given the revenue constraints it faces. While GASB accounting standards require a shift in the amortization method to level-dollar if a DB plan is closed to new members, it is important to emphasize that GASB does not determine the funding policy. Thus, GASB does not dictate how much contributions the city has to make. The funding policy is set by the state or pension board alone (Costrell, 2012).

   As there is no GASB mandate to change the payment, the choice of the amortization profile is independent from the choice of the best economic pension policy. As such, it should not be discussed in the selection of pension alternatives. The amortization profile should instead be tailored to reflect the properties of the economic liability. As stated above, the duration of the benefit payment is 12.92 years, approximately equivalent to the duration of a thirty-five-year annuity. In principle, one could tailor the annuity profile even closer to the actual profile of the economic liability, which results in a hump-shaped repayment profile.

3. **Discount Rate.** The last of the three changes in actuarial assumption is a lowering of the discount rate with the closure of the plan. As discount rates decrease, the actuarial liability increases as well. The result is that the required contributions are raised, providing an impediment to reform. This change in assumption is conducted despite the unchanged economic liability—benefit payments still have to be paid to the same members in the future. We understand that the rationale for the change in the valuation is based on the premise that the funding policy has to be changed if the fund closes. However, this ignores the fact that the valuation and the funding policy should be treated independently. The principles of financial economics require that the promised benefit

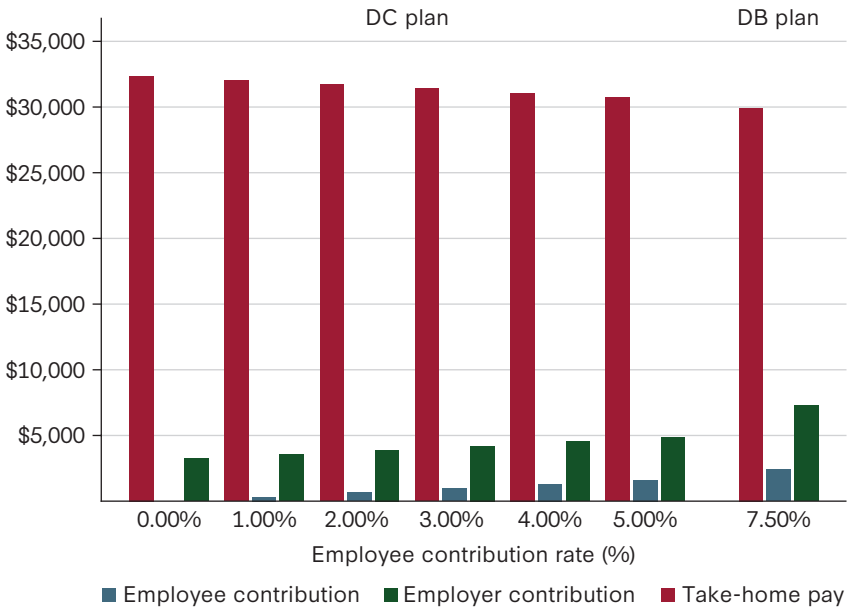
payments be discounted at the risk equivalent discount rate (Brown and Wilcox, 2009; Novy-Marx and Rauh, 2009, 2011; Novy-Marx, 2013; Brown and Pennacchi, 2016). A corollary of this is that pension benefit payments in CMERS should be discounted at a default-free interest rate for valuation purposes. As such, the valuation does not change regardless of whether the plan is to be continued or closed. If at all, the valuation of the open plan is overly aggressive to begin with (Giesecke and Rauh, 2022b).

*Attractiveness of DC plans and rebalancing of compensation package* Several local governments note that employee attraction is a key problem due to the low take-home pay. A drawback of defined benefit pension plans is that it often mandates significant employee contribution; this reduces employees' take-home pay. This is particularly relevant for young employees and general employees, who typically receive lower compensation than public safety employees. At the same time, survey evidence suggests that public employees value DB plans less than commonly perceived (Giesecke and Rauh, 2022a; MissionSquare Research Institute, 2022; Fuchsman, McGee, and Zamarro, 2023). As an alternative, DC plans provide the employee with the option to rebalance pension benefits and take-home pay.

We illustrate the change in take-home pay based on the example of Birmingham, Alabama, in which we propose a DC plan with a 10 percent employer base contribution and an optional 5 percent match contribution by the employer. In comparison, the majority of private-sector plans offer only matching contributions, without employer base contribution. According to Deloitte (2019), 63 percent of plans offer only matching contributions and/or catch-up contributions. An additional 29 percent offer profit-sharing contributions and/or matching contributions. Only a small fraction of plans offers employer base contributions. Out of all plans that offer matching contributions, only about 30 percent offer a 100 percent match of the employee contribution. Thus, we consider the proposed DC plan as generous relative to private-sector offerings. As we discuss in more detail in section 4, we have survey evidence that suggests that an overwhelming share of public-sector employees would accept the proposed plan and would be at least as satisfied as, if not more than, they are with their current DB plan. Second, current active public-sector DC plans generally fall toward the lower end of our proposed benefit terms, as shown in figure 8.

In Birmingham, Alabama, a typical entry-level city employee receives a total compensation of $32,363. Under the current DB plan, this employee contributes 7.5 percent of their salary, or $2,427, while the employer service cost is an additional 22.5 percent of the employee's salary, or $7,282. The employee takes home 92.5 percent of their salary, or $29,936, pretax.[11] Under the proposed defined contribution plan, this employee contributes between 0 percent and 5 percent of their salary, or $0 to $1,618. The employer contributes a floor of 10 percent of the employee's salary, or $3,236, and an additional 0 percent and 5 percent of the salary, or $0 to $1,618, for a total contribution of 10 percent to 15 percent, or $3,236 to $4,854. The employee takes home between 95 percent and 100 percent of their salary, or $30,745 to $32,363, pretax. If the employee decides to contribute nothing under the DC plan, their monthly take-home pay will increase by $202, a substantial boost to the household finances of entry-level employees. Even if the employee contributes the full amount, they will bring home an additional $67 each month. The employee receives generous employer contributions along with

**FIGURE 11** Rebalancing of compensation package, city of Birmingham




**Note:** Comparison of the proposed DC plan to Birmingham's DB plan for a typical entry-level employee with a total compensation of $32,363

increased take-home pay with the defined contribution plan, across all employee contribution rate options (0 percent to 5 percent) as shown in figure 11. A similar argument applies to Fort Worth, Texas, where take-home pay is significantly reduced by employee contributions of 9.35 percent and possibly differs considerably from employees' preferences. This is particularly dissatisfying for general employees because of their absence of representation in benefit negotiations. The comparison of several plan options for Fort Worth is shown in figure A.2.

In summary, the suggested DC plan allows employees to rebalance take-home pay and pension benefits according to their preferences. This rebalancing is particularly valuable for early-career employees for which take-home pay is a major constraint and highly valued (MissionSquare Research Institute, 2022; Fuchsman, McGee, and Zamarro, 2023). The proposed DC plan helps both the city to reduce its pension cost as well as aligning the compensation closer to employees' preferences.

*Risk sharing and alternative plan options* The Wisconsin Retirement System has long served as the prime example for state-contingent benefit payments, which result in a risk sharing between employer and employees of future investment returns (Novy-Marx and Rauh, 2014). The risk-sharing component of WRS requires a valuation of the liability with a discount rate that is 113 basis points above the rate that would prevail otherwise. While this seems to be a small adjustment, it has quantitatively important implications on the market valuation of pension liabilities and service cost; thus the recurring pension cost. Even at the municipal level, we have seen more and more plans that have adopted a risk-sharing feature (though often in more subtle forms). In the case of Baltimore, part of the DC contribution of the

hybrid plan is diverted when the DB plan's funding ratio falls below a certain threshold. Similarly, Fort Worth has introduced a risk-sharing component for its DB plan in the 2018–19 reform.

Another alternative that many municipalities in Texas have chosen is the enrollment into the cash balance plan—the Texas Municipal Retirement System (TMRS).[12] The current average employer contribution for TMRS is 14.7 percent of payroll, while the average employee contributes 6.7 percent of payroll. This option is cheaper than what the majority of employers contribute and increases the take-home pay for employees.

## 6. CONCLUSION

Early policy intervention is key to controlling the fiscal challenges that pension liabilities can create. The long lag between accrual and payment of pension benefits makes pension liabilities a likely candidate for fiscal distress. Full-funding mandates have resulted in sharp increases in required contributions, threatening city services and the employment of city employees. Further, unfunded pension liabilities have been key factors in cities' Chapter 9 filings over the last two decades. States and credit rating agencies have shown increasing focus on cities' pension situations. Even if it does not end in Chapter 9 bankruptcy, the cost to large unfunded pension obligations is substantial. It comes in the form of higher borrowing cost and higher property taxes. States such as Michigan, California, and Connecticut are demanding greater supervision over local plans. Rating agencies are increasingly citing pensions as primary reasons for downgrading cities' credit ratings. Current actuarial valuation practices of pension liabilities often dissuade cities from adopting sound policy reforms.

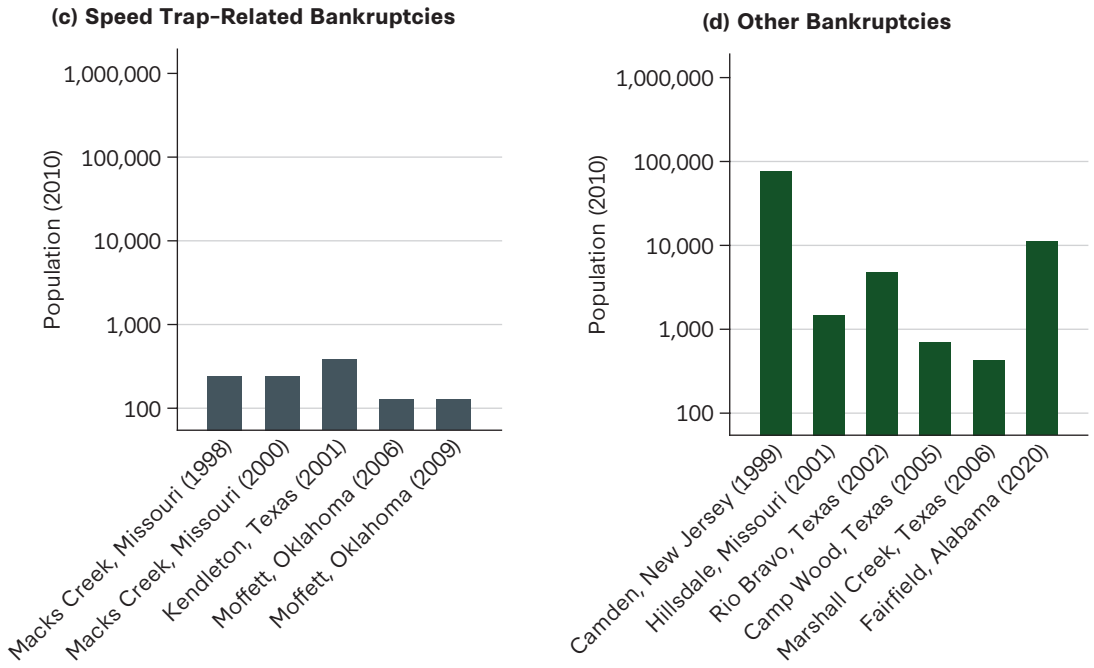
Given the financial risks of DB-only plans and the growing fiscal challenges resulting from these plans, now is a critical time for cities to enact meaningful pension reform. When considering potential reforms, we propose to consider five general principles: (1) The true economic cost of DB plans is often higher than recognized due to several actuarial assumptions that misrepresent the true liability of accruing pension benefits. (2) The consideration of pension alternatives should evaluate the forward-looking economic cost of each policy option regardless of the legacy liability. (3) The amortization of the unfunded liability should reflect the risk and duration profile of economic liability. (4) Public employees are more interested in DC plans than often perceived. (5) Risk-sharing components for DB plans or fixed-contribution plans provide policy alternatives that limit the risk to the pension sponsor.

Executing a pension reform is difficult but is entirely possible. Despite economic, political, and statutory impediments, municipalities across the United States have achieved success in implementing pension reform. Numerous cities serve as proof of successful reform: Baltimore, Maryland, and Ann Arbor, Michigan, with their hybrid systems; Jacksonville, Florida, and Golden, Colorado, with their DC plans; and Norfolk, Virginia, and Lafayette, Louisiana, with their decisions to soft-freeze their city plans and enroll new employees into their respective state plans. These cities have been most successful when all stakeholders understood that the status quo is unsustainable and when the reform was conducted as a "grand bargain" to balance several stakeholders' interests.

# APPENDIX

**FIGURE A.1** Municipalities' Chapter 9 filings by main cause (1998–2023)


FIGURE A.1 (*continued*)




**Notes:** The figures display municipalities and their corresponding population clustered by the primary reason of their Chapter 9 filing since 1998. An exhaustive list with more details can be found in Table A.1. Highland Park, Michigan, sought permission from the Michigan state government to file for Chapter 9 bankruptcy as of May 2023.

**TABLE A.1** LIST OF BANKRUPTCY FILINGS SINCE 1998

| Entity Name | Year of Filing | State | Cause |
|---|---|---|---|
| City of Macks Creek | 1998 | Missouri | Speed Trap Law |
| City of Camden | 1999 | New Jersey | Other |
| City of Prichard | 1999 | Alabama | Pension Costs |
| City of Westminster | 2000 | Texas | Infrastructure Costs |
| City of Tyrone | 2000 | Oklahoma | Legal Fees |
| City of Macks Creek | 2000 | Missouri | Speed Trap Law |
| City of Kendleton | 2001 | Texas | Speed Trap Law |
| Village of Hillsdale | 2001 | Missouri | Other |
| City of Desert Hot Springs | 2001 | California | Legal Fees |
| City of Rio Bravo | 2002 | Texas | Other |
| City of Reeds Spring | 2002 | Missouri | Legal Fees |
| Village of Brooklyn | 2003 | Illinois | Legal Fees |
| City of Iron Mountain Lake | 2003 | Missouri | Infrastructure Costs |

*Continued*

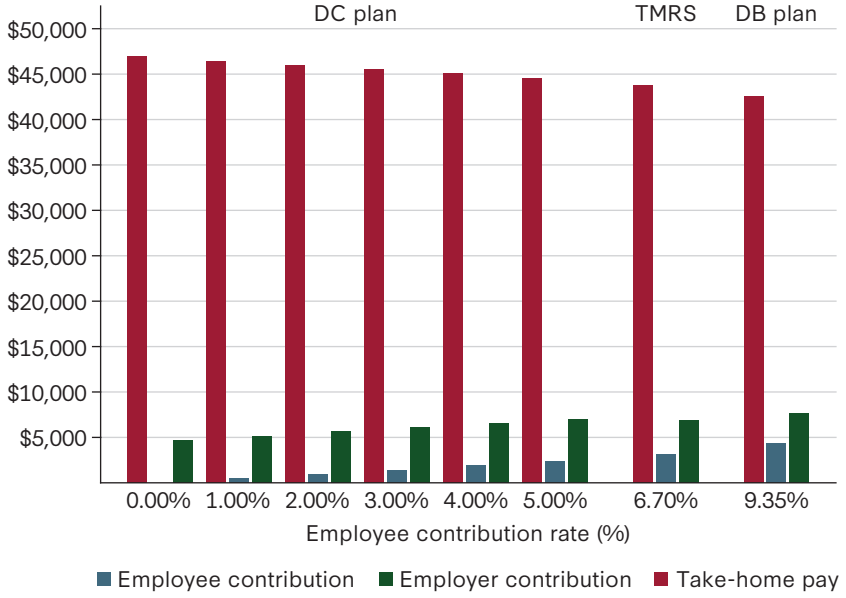
**TABLE A.1** LIST OF BANKRUPTCY FILINGS SINCE 1998 (*continued*)

| Entity Name | Year of Filing | State | Cause |
|---|---|---|---|
| City of Westminster | 2004 | Texas | Infrastructure Costs |
| Village of Washington Park | 2004 | Illinois | Legal Fees |
| Town of Millport | 2004 | Alabama | Infrastructure Costs |
| Village of Alorton | 2005 | Illinois | Legal Fees |
| Town of Muldrow | 2005 | Oklahoma | Infrastructure Costs |
| City of Camp Wood | 2005 | Texas | Other |
| Town of Marshall Creek | 2006 | Texas | Other |
| Town of Moffett | 2006 | Oklahoma | Speed Trap Law |
| Town of Marion | 2007 | Mississippi | Infrastructure Costs |
| City of Gould | 2008 | Arkansas | Legal Fees |
| City of Vallejo | 2008 | California | Pension Costs |
| Township of Westfall | 2009 | Pennsylvania | Legal Fees |
| Village of Washington Park | 2009 | Illinois | Legal Fees |
| Town of Moffett | 2009 | Oklahoma | Speed Trap Law |
| City of Prichard | 2009 | Alabama | Pension Costs |
| Boise County | 2011 | Idaho | Legal Fees |
| City of Central Falls | 2011 | Rhode Island | Pension Costs |
| City of Harrisburg | 2011 | Pennsylvania | Infrastructure Costs |
| Jefferson County | 2011 | Alabama | Infrastructure Costs |
| City of Stockton | 2012 | California | Pension Costs |
| Town of Mammoth Lakes | 2012 | California | Legal Fees |
| City of San Bernardino | 2012 | California | Pension Costs |
| City of Detroit | 2013 | Michigan | Pension Costs |
| City of Hillview | 2015 | Kentucky | Legal Fees |
| City of Perla | 2019 | Arkansas | Infrastructure Costs |
| City of Fairfield | 2020 | Alabama | Other |
| City of Chester | 2022 | Pennsylvania | Pension Costs |
| City of Highland Park* | 2023 | Michigan | Infrastructure Costs |

*Highland Park, Michigan, sought permission from the Michigan state government to file for Chapter 9 bankruptcy as of May 2023.

**Notes:** This table displays the list of entities which sought bankruptcy since 1998. Data is obtained from PACER.

**FIGURE A.2** Take-home pay, employee contributions, and city contributions across various retirement options for the city of Fort Worth




**Note:** Comparison of proposed DC plan, transition in TMRS, and Fort Worth's current DB plan for a typical entry-level employee with a total compensation of $46,927

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Alabama Teachers Retirement System | | 2013 | Decreased service multiplier, introduced benefits cap |
| Alabama Employees Retirement System | State and Local General, Local Police | 2013 | Decreased service multiplier |
| Alabama Employees Retirement System | State Police | 2013 | Decreased service multiplier |
| City of Ann Arbor Employees Retirement System | | 2017 | Introduced hybrid plan |
| Arizona State Retirement System | | 2011 | Increased retirement age |
| Arizona Public Safety Personnel Retirement System | | 2012 | Increased service requirement, increased vesting period |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Baltimore City Public Employees' Retirement System | | 2014 | Introduced hybrid plan |
| Birmingham Retirement and Relief System | | 2021 | Increased contributions, increased retirement age, increased service requirement |
| California Public Employees' Retirement System (CalPERS) - State Miscellaneous | Tier 1 | 2011 | Decreased service multiplier |
| California Public Employees' Retirement System (CalPERS) - State Miscellaneous | Tier 1 | 2013 | Increased multiplier, increased retirement age |
| California Public Employees' Retirement System (CalPERS) - State Miscellaneous | Tier 2 | 2013 | Increased retirement age |
| California Public Employees' Retirement System (CalPERS) - State Peace Officers and Firefighters | Firefighters | 2011 | Increased retirement age |
| California Public Employees' Retirement System (CalPERS) - State Peace Officers and Firefighters | Firefighters | 2013 | Increased retirement age, decreased service multiplier, removed benefits cap |
| California Public Employees' Retirement System (CalPERS) - State Peace Officers and Firefighters | Police | 2011 | Increased retirement age, decreased service multiplier |
| California Public Employees' Retirement System (CalPERS) - State Peace Officers and Firefighters | Police | 2013 | Increased retirement age, removed benefits cap |
| California Public Employees' Retirement System (CalPERS) - California Highway Patrol | | 2011 | Increased retirement age |
| California Public Employees' Retirement System (CalPERS) - California Highway Patrol | | 2013 | Increased retirement age, decreased service multiplier, removed benefits cap |
| California State Teachers' Retirement System (CalSTRS) | | 2013 | Increased retirement age, decreased service multiplier |
| California Public Employees' Retirement System (CalPERS) - Local Miscellaneous Members | | 2013 | Increased retirement age, increased service multiplier |
| California Public Employees' Retirement System (CalPERS) - Local Safety Members | | 2013 | Increased retirement age, decreased service multiplier |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Colorado Public Employees' Retirement Association (PERA) | | 2011 | Increased retirement age |
| Connecticut State Employees Retirement System (SERS) | Tier III | 2011 | Increased retirement age, increased COLAs |
| Connecticut State Employees Retirement System (SERS) | Tier III Hazardous Duty | 2011 | Increased vesting period, increased COLAs |
| Creve Coeur Employee Retirement Plan | | 2017 | Closed plan, switched to LAGERS |
| Delaware State Employees' Pension Plan | | 2012 | Increased service requirements, increased vesting period |
| Florida Retirement System Pension Plan | | 2011 | Increased vesting period, increased retirement age |
| Fort Worth Employees Retirement Fund | | 2018 | Increased contribution rate, introduced risk sharing |
| Employees' Retirement System of Georgia (ERS) - GSEPS | | 2011 | Decreased service multiplier, introduced hybrid plan |
| Peace Officers' Annuity and Benefit Fund of Georgia | | 2010 | Increased retirement age |
| Employees' Retirement System of the State of Hawaii (ERS) | | 2012 | Increased vesting period, increased retirement age, decreased service multiplier, decreased COLAs |
| State Employees' Retirement System of Illinois | | 2011 | Increased vesting period, increased retirement age, decreased COLAs |
| Illinois Municipal Retirement Fund | | 2011 | Increased vesting period, increased retirement age, decreased COLAs |
| Teachers' Retirement System of the State of Illinois | | 2011 | Increased vesting period, increased retirement age, decreased COLAs |
| Iowa Public Employees Retirement System (IPERS) | | 2012 | Increased vesting period, increased retirement age |
| Jacksonville General Employees Pension Plan | | 2017 | Introduced DC plan |
| Kansas Public Employees Retirement System | | 2009 | Increased retirement age, increased service multiplier, decreased COLAs |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Kansas Public Employees Retirement System | | 2015 | Introduced DC plan |
| Kentucky Teachers' Retirement System | | 2008 | Decreased service multiplier |
| Kentucky Employees Retirement System | | 2008 | Decreased service multiplier |
| Kentucky Employees Retirement System | | 2014 | Introduced cash balance plan |
| Kentucky State Police Retirement System | | 2008 | Increased service requirement, decreased service multiplier |
| Lafayette City-Parish Retirement System | | 2020 | Closed plan, switched to LMERS |
| Teachers' Retirement System of Louisiana | | 2011 | Increased retirement age |
| Louisiana Municipal Employees' Retirement System (LMERS) | | 2013 | Increased retirement age, decreased vesting period |
| Louisiana State Police Retirement System | | 2011 | Increased retirement age, increased vesting period |
| Louisiana Municipal Police Employees' Retirement System (LMPERS) | | 2013 | Decreased service multiplier |
| Maryland State Employees' Retirement System | | 2011 | Increased retirement age, increased vesting period, decreased service multiplier |
| Maryland State Law Enforcement Officers' Pension System | | 2011 | Increased vesting period, decreased COLAs |
| Maryland Retirement System for State Police | | 2011 | Increased vesting period, increased service requirement, decreased COLAs |
| Maryland State Teachers' Pension System | | 2011 | Increased retirement age, increased vesting period, decreased service multiplier |
| Massachusetts Public Employee Retirement System | | 2012 | Increased retirement age |
| Michigan Public School Employees' Retirement System | | 2010 | Introduced hybrid plan |
| Michigan State Police Retirement System | | 2012 | Increased retirement age, decreased service multiplier, decreased COLAs |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Minnesota State Employees Retirement Fund | | 2010 | Increased vesting period |
| Minnesota State Patrol Retirement Fund | | 2010 | Increased vesting period |
| Minnesota Public Employees Police and Fire Fund | | 2010 | Increased vesting period, increased service requirement |
| Minnesota General Employees Retirement Fund | | 2010 | Increased vesting period |
| Mississippi Public Employees' Retirement System | | 2011 | Increased retirement age |
| Missouri State Employees Retirement System | | 2011 | Increased vesting period, increased retirement age |
| Missouri Dept of Transportation and Highway Patrol Employees' Retirement System | | 2011 | Increased vesting period |
| Public School Retirement System of Missouri | | 2013 | Decreased service multiplier |
| Montana Public Employee Retirement System (PERS) | | 2013 | Increased retirement age, decreased service multiplier, decreased COLAs |
| Nevada Public Employees' Retirement System | | 2010 | Increased service requirement, decreased service multiplier |
| New Hampshire Retirement System | | 2009 | Decreased cap on benefits |
| New Hampshire Retirement System | | 2011 | Increased retirement age, decreased service multiplier |
| New Jersey Teachers' Pension and Annuity Fund | | 2010 | Decreased service multiplier |
| New Jersey Teachers' Pension and Annuity Fund | | 2011 | Increased retirement age |
| New Jersey Public Employees' Retirement System (PERS) | | 2010 | Decreased service multiplier |
| New Jersey Public Employees' Retirement System (PERS) | | 2011 | Increased retirement age |
| New Jersey Police and Firemen's Retirement System (PFRS) | | 2011 | Decreased service multiplier |
| New Mexico Educational Retirement Board | | 2010 | Increased retirement age |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| New Mexico Public Employees Retirement Fund | | 2010 | Increased retirement age, increased cap on benefits, decreased COLAs |
| New Mexico Public Employees Retirement Fund | | 2013 | Increased vesting period, increased retirement age, decreased service multiplier |
| New York State and Local Employees' Retirement System | | 2010 | Increased vesting period, increased service requirement |
| New York State and Local Employees' Retirement System | | 2012 | Increased retirement age, decreased service multiplier |
| New York State and Local Police and Fire Retirement System | | 2010 | Increased vesting period, increased service requirement |
| New York State and Local Police and Fire Retirement System | | 2012 | Increased retirement age |
| New York State Teachers' Retirement System | | 2010 | Increased vesting period, increased service requirement |
| New York State Teachers' Retirement System | | 2012 | Increased retirement age, decreased service multiplier |
| Norfolk Employees Retirement System | | 2022 | Closed plan, switched to VRS |
| North Carolina Teachers' and State Employees' Retirement System (TSERS) | | 2011 | Increased vesting period, increased service requirement |
| North Dakota Teachers' Fund for Retirement | | 2008 | Increased service requirements, increased vesting period |
| North Dakota Public Employees Retirement System | | 2023 | Introduced DC plan |
| Ohio Public Employees Retirement System | | 2013 | Increased retirement age, decreased COLAs |
| Ohio Police and Fire Pension Fund | | 2013 | Increased retirement age, decreased COLAs |
| State Teachers Retirement System of Ohio | | 2015 | Increased service requirements, decreased service multiplier |
| Oklahoma Public Employees Retirement System (OPERS) | | 2011 | Increased retirement age |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Oklahoma Teachers Retirement System (TRS) | | 2011 | Increased retirement age |
| Commonwealth of Pennsylvania State Employees' Retirement System (SERS) | | 2011 | Increased vesting period, increased retirement age, decreased service multiplier |
| Commonwealth of Pennsylvania State Employees' Retirement System (SERS) | General Employees | 2018 | Introduced hybrid plan |
| Pennsylvania Public School Employees' Retirement System (PSERS) | | 2011 | Increased vesting period, increased retirement age, decreased service multiplier |
| Pennsylvania Public School Employees' Retirement System (PSERS) | | 2018 | Introduced hybrid plan |
| Employees' Retirement System of Rhode Island (ERSRI) | | 2009 | Increased retirement age, decreased service multiplier, decreased COLAs |
| Employees' Retirement System of Rhode Island (ERSRI) | | 2012 | Introduced hybrid plan |
| Rhode Island Municipal Employees' Retirement System (MERS) | | 2012 | Introduced hybrid plan |
| Rhode Island State Police Retirement Benefits Trust (SPRBT) | | 2012 | Increased service requirements, decreased service multiplier |
| South Carolina Retirement System | | 2012 | Increased service requirement |
| South Carolina Police Officers Retirement System | | 2012 | Increased service requirement |
| South Dakota Retirement System | | 2008 | Decreased service multiplier |
| Employees Retirement System of Texas | | 2009 | Increased retirement age, increased vesting period |
| Texas Law Enforcement and Custodial Officers Supplemental Retirement Fund | | 2009 | Increased service requirement, increased vesting period |
| Utah Public Employees Contributory Retirement System | | 2011 | Increased service requirement, decreased service multiplier, decreased COLAs |
| Vermont State Employees' Retirement System | | 2008 | Increased retirement age |

*Continued*

**TABLE A.2** SELECT PENSION REFORMS, 2008–2023 (*continued*)

| Plan Name | Tier | Year | Measures Enacted |
|---|---|---|---|
| Virginia Retirement System (VRS) | | 2010 | Increased service requirements, decreased service multiplier, decreased COLAs |
| Virginia Retirement System (VRS) | | 2014 | Introduced hybrid plan |
| State Police Officers' Retirement System (SPORS) | | 2010 | Decreased COLAs |
| Virginia Law Officers' Retirement System (VaLORS) | | 2013 | Decreased service multiplier, decreased COLAs |
| Wisconsin Retirement System (WRS) | | 2011 | Increased vesting period, decreased service multiplier, introduced risk sharing |
| Wyoming Public Employee Pension Plan | | 2012 | Increased retirement age, decreased service multiplier |

**Notes:** The table displays a select list of pension reforms since 2008, along with the associated measures taken. We obtain the data from Urban Institute (2014) and the individual member handbooks of each plan.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## NOTES

1. A recent change in the actuarial standards of practice (ASOP) no. 4, which went into effect in February 2023, requires transparency of the market value of the pension obligations. ASOP no. 4 requires a valuation methodology that is similar, if not identical, to Giesecke and Rauh (2022b). Thus, the results of Giesecke and Rauh (2022b) are likely an accurate representation of the actuarial disclosures that one can expect under ASOP no. 4 in fiscal year 2023 and beyond. In addition, the paper provides retrospective valuation results for fiscal years 2014 to 2021, which are available for a large sample of state and local governments and accessible through our public pension dashboard at https://publicpension.stanford.edu.

2. Giesecke and Mateen (2022) show that this positive relationship holds for the universe of municipalities in Connecticut.

3. The full list of municipal bankruptcies since 1998 is tabulated in table A.1.

4. The implication for pensioners is that they can be treated just as any other holder of debt, and subsequently must be wary of the impact their claims have on the financial stability of a city (Hylton, 2011). Anecdotally, this has been acknowledged by public-sector unions in recent pension reforms.

5. Stockton chose to cut pension benefits moving forward, but did not impair the claims of current participants.

6. The recent revision of ASOP no. 4 does not change the disincentives to pension reforms that current actuarial practices provide, as it is merely a disclosure requirement that does not affect the funding recommendations, the actuarial determined contributions. In addition, even after the revision, ASOP no. 4 does not require the disclosure of the economic relevant pension cost. Thus, it does not help the policy maker to make informed decisions about the best pension plan alternatives.

7. The perception of public employees' retirement preferences are often shaped by representatives of public safety employees. While public safety employees account for only 19.2 percent of local government public employees nationally, they have disproportionate representation in benefit negotiations due to their strong union presence. At the same time, public safety employees receive, on average, higher compensation. Nationally, public safety employees receive a total compensation of $64,534 versus the $55,996 received by other public-sector employees. As a result, collective bargaining agreements can be particularly burdensome for general employees as the increase of employee contribution cuts into their lower baseline compensation.

8. Birmingham, MI, successfully soft-closed its DB plan and initiated a DC-only plan as part of the 2012 pension reform.

9. We make our policy recommendation based on the plan that has the lowest employer cost. We acknowledge that other nonfinancial considerations may be taken into account.

10. All calculations are performed under the treasury curve from February 1, 2023.

11. For the Birmingham Retirement and Relief System during FY 2021, 17.8 percent is the employer contribution rate.

12. Sandy Oaks, Todd Mission, Orchard, Sullivan City, Garrett, and Uhland chose to participate in TMRS in FY 2021–22. In a cash balance plan, the employer makes a fixed percentage contribution as of payroll and guarantees a moderate rate of return. In contrast to DB plans, the rate of return is typically based on some risk-free equivalent, such as the thirty-year treasury rate. Thus, under prudent management the cities' recurrent contributions are sufficient to cover the full pension promise upon retirement. The employee is given the option at retirement to take their account balance as an annuity or as a lump sum.

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***Synopsis***

Underfunded pensions are the largest liability for state and local governments nationwide. With increasing recognition of the associated risks, recent mandates have led to sharp increases in required contributions, threatening city services and employee bases. Pension reform offers a viable tool for prudent economic policy. This paper offers five general principles to guide pension reform and illustrates their application in the context of several local governments.



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