STATE AND LOCAL GOVERNANCE INITIATIVE

Status and Trends of Unfunded Liabilities of State and Local Pension Funds

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Abstract

This study analyzes the status of US public pension systems at the end of fiscal year 2023, covering over 90 percent of public pension assets across states, cities, and counties. At the close of FY 2023, total reported net pension liabilities were approximately $1.65 trillion, with unfunded liabilities continuing to exceed the size of the US municipal bond market. While pension contributions rose by $12 billion to $262 billion, or 27.7 percent of payroll, they remain insufficient to fully address the growing pension shortfalls. Market-based valuations estimate a net pension liability of $4.6 trillion. To stabilize pension systems, state and local governments would need to contribute an additional $96 billion annually, bringing total contributions to 12.7 percent of own-source revenue. Assumed discount rates rose for the first time after declining continuously for the last eight years and average 6.86 percent at the end of fiscal year 2023—substantially higher than the duration-matched risk-equivalent market rates that were at 3.83 percent. As a result, the unfunded liability and the annual pension costs for new benefit accrual remain substantially understated. Asset-weighted investment returns were 5.76 percent—approximately 1 percent below assumed returns—in fiscal year 2023. As a result, 51.7 percent of pension plans did not meet their assumed return targets. Employer contributions remained at a high level, with the contribution rate as percentage of payroll at 27.7 percent, exceeding the market-based service cost in the last two consecutive fiscal years.

This study updates and expands a previous report, Oliver Giesecke and Joshua D. Rauh, "State and Local Pension Funds 2022," Hoover Institution, State and Local Governance Initiative, March 2024.

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INTRODUCTION

State and local governments provide access to defined benefit (DB) pension plans for most of their employees, while the private sector has largely moved toward defined contribution (DC) pension plans. At the beginning of 2024, 86 percent of public sector employees had access to a DB plan, while only about 15 percent of employees in the private sector had access to a DB plan.[1] Defined benefit plans expose the plan sponsor to the risk of accumulating large unfunded liabilities.[2] In this essay, I provide the status of public pensions in the United States at the end of fiscal year 2023.[3] I provide a granular analysis for pension systems of US states, the largest cities, and counties. The sample comprises a total of 646 pension plans that account for approximately 90 percent of all public pension assets. I find that unfunded pensions remain the largest liabilities of sub-national US government entities—exceeding the liabilities in the municipal bond market. For some pension sponsors—predominantly at the city and county level—the unfunded liability has the potential to exert existential financial distress.[4]

I analyze the costs and liabilities as reported under current actuarial standards and provide additional market-based valuations, which provide a more accurate assessment of the economic cost. In addition, I separate the economic cost of serving current employees with the required funding for legacy obligations. Furthermore, I calculate the debt-neutral contributions that would be required to prevent unfunded obligations from growing, as well as the contributions that are required under a full funding mandate over the next 25 years.

At the end of fiscal year 2023, the total reported net pension liability is $1.638 trillion, similar in magnitude to the end of FY 2022 when it was $1.599 trillion. The reported average funding ratio increased marginally to 75.3 percent, up from 75.0 percent at the end of FY 2022. The market-based net pension liability decreased from $5.183 trillion to $4.582 trillion due to a further increase in risk-equivalent discount rates between FY 2022 and FY 2023. As a result, the liability-weighted aggregate funding ratio under market valuation rose to 52.2 percent from 48.1 percent in the previous year. The market values reflect the fact that accrued pension promises are a form of government debt with strong rights, and should thus be measured using default-free discount rates.[5]

Further increases in total contributions, both in absolute and relative to covered payroll terms, helped in stabilizing the unfunded liability. Contributions increased more than $12 billion to a total of $262 billion. The increase in contributions was driven by employer contributions, which reached a historical maximum of $199.2 billion, equivalent to 21.1 percent of payroll. That is, for every dollar of payroll, public sector employers make an additional 21.1¢ in pension contributions. Total contributions, consisting of employer and employee contributions are 27.72 percent of payroll, the second highest since 2014. This level of pension contributions surpasses the market-based service cost for the second time in a row and provides a cautiously optimistic development.

Expressing the pension cost as a fraction of state and local governments' own-source revenue and tax revenue puts the actual and required contributions into perspective. State and local government entities in the sample received general revenue from own sources of a combined

$2,328 billion in 2023, while making actual pension contributions of $199.2 billion. Thus, contributions were 8.6 percent of own-source revenue in 2023, up from 8.4 percent in fiscal year 2022. Under governmental accounting, total contributions exceeded the break-even contribution to prevent the unfunded liability from rising if the assumed return targets had been realized. Yet in fact these contributions fell short by $96.0 billion due to the difference between assumed and market-based discount rates. The total contributions that would be economically required to prevent the unfunded pension liability from increasing thus amount to $295.2 billion ($199.2 billion + $96.0 billion), which would account for about 12.7 percent of own-source revenue in 2023. In terms of tax revenues, the actual reported contribution accounts for 12.1 percent in 2023, up from 11.9 percent in 2022. Considering the additional contributions to prevent the net pension liability from rising, the total required contribution amounts to 17.9 percent of total tax revenue. These calculations do not include any contributions that would be required to amortize the unfunded pension liability. There is substantial cross-sectional variation in the extent to which contributions cover the service cost on an actuarial and market-based valuation. Figure 13 shows the variation for state pension funds expressed as a percentage of contributions minus service cost normalized by total payroll.

As more and more states adopt full funding mandates for unfunded pension obligations, it is useful to also measure the budgetary impact by including the amortization payment. Thus, I provide an alternative measure that captures both service cost and amortization payments over the next 25 years.[6] Under this measure, the required annual payment totals $416.60 billion, which represents 17.90 percent of own-source and 25.32 percent of tax revenues. The overall numbers mask significant heterogeneity in the cross section of state and local governments. The necessary contribution to pay for the ongoing pension cost and the amortization of the unfunded liability ranges from 4.10 percent of own-source revenues at the 10th percentile to 33.76 percent of own-source revenues at the 90th percentile. At the right tail of the distribution, the required payment poses the risk of existential financial distress to the pension sponsor.

The ongoing pension costs, the so-called service cost, have fallen marginally.[7] The decrease in pension cost is a reflection of overall less generous benefit terms. Reported service cost decreased from 13.1 percent to 12.8 percent of payroll between FY 2022 and FY 2023. Under market values, the payroll-weighted average service cost is 20.3 percent. That is, for every dollar of payroll, public sector employers make, on average, economic pension promises worth 20.3¢. To draw a parallel to private sector employers, this is akin to contributing more than 20 percent of employees' salary into their 401(k).

The asset-weighted investment return was 5.67 percent. This stands in contrast to the liability-weighted discount rate of 6.86 percent in FY 2023. More than half of the pension funds (51.7 percent) failed to meet their target return. The volatility in returns is a reflection of the riskiness of the asset portfolio, which has gradually shifted toward equities, alternative investments, and corporate bonds.[8]

The downward trend in discount rates reversed in FY 2023. Between 2014 and 2022, pension boards cut assumed discount rates, which narrowed the gap between assumed rates and the economically justified rate. This positive development was reversed in FY 2023.

The liability-weighted average discount rate of state and local governments rose for the first time and is 6.86 percent at the end of FY 2023. While risk-free interest rates have increased between FY 2022 and FY 2023, the duration-matched risk-appropriate discount rate was 3.83 percent at the end of FY 2023, more than 3 percent lower than the assumed discount rate. This reversal in the long-standing trend may indicate that pension boards give in to pressure to raise assumed discount rates given the new interest rate environment. The discrepancy between the assumed discount rate and the risk-appropriate discount rate motivates the revaluation of pension cost and liabilities.[9] We use the US Treasury yield curve to discount pension liabilities, based on the fact that the curve is the primary benchmark for discounting default-free future payments.[10]

Higher than expected salary increases led to an upward revision in benefits and an upward adjustment in the total pension liability. The salary increases that were negotiated during the inflationary post-pandemic period exceeded the actuarial assumed salary increases often by a large margin. As a result, the actuaries accounted for the differences between actual and expected experience with a significant one-off adjustment. Adjustment as captured by differences between actual and expected experience, changes in demographic assumptions, changes in benefit terms, and administrative expenses resulted in a combined total of $385 billion. Future surprises in these three categories may lead to further revaluations and pose a potential risk for pension funds, independent from market returns that underperform assumed discount rates.

The post-pandemic trend to use budgetary surpluses to shore up pension funding continued in fiscal year 2023. Another notable trend is to tighten already existing amortization policies or enact new ones.[11] Additional pension funding includes the one-time payments various state employees' pension funds made in Texas. Similarly, Tennessee, North Dakota, Montana, Missouri, Michigan, Arizona, and Massachusetts made extra payments to their respective pension funds. More ambitious amortization requirements/funding policies were enacted in Hawaii, Maryland, Montana, and Louisiana.

Complementary to this study, I provide several breakdowns of the data at the Stanford pension dashboard, which is accessible at https://publicpension.stanford.edu/. The pension dashboard 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. The dashboard includes additional important variables that are omitted from this study due to space constraints. It also serves as a platform for timely updates to reflect newly published information.

DATA SOURCES

PENSION DISCLOSURES FROM GASB 67 STATEMENTS

The data comes from the disclosures under Governmental Accounting Standards Board statement number 67 (GASB 67) of all state pension systems, plus a sample of local and other municipal plans. The local plans consist of all municipal plans in the top 170 cities

TABLE 1 THE TABLE PROVIDES SUMMARY STATISTICS FOR STATE AND LOCAL PENSION PLANS AS OF FISCAL YEAR 2023. GASB = GOVERNMENTAL ACCOUNTING STANDARDS BOARD

	State Pensions	Local Pensions	State and Local Pensions
Number of Plans Total	270	376	646
($ amounts in billions)			
I. Assets and Liabilities			
GASB 67 Standards			
Total Pension Liability (TPL)	$5,524	$1,113	$6,637
Assets	$4,162	$837	$4,999
Net Pension Liability (NPL)	$1,362	$276	$1,638
Funding Ratio	75.3%	75.2%	75.3%
Market Value Standards			
Accumulated Benefit Obligation (ABO)	$7,980	$1,597	$9,577
Assets	$4,158	$837	$4,994
Unfunded Market Value Liability (UMVL)	$3,822	$760	$4,582
Funding Ratio	52.1%	52.4%	52.2%
II. Discount Rates			
GASB 67 Standards			
Average Discount Rate			
Liability Weighted	6.85%	6.89%	6.86%
Liability Unweighted	6.72%	6.74%	6.73%
Market Value Standards			
Average Discount Rate			
Liability Weighted	3.82%	3.86%	3.83%
Liability Unweighted	3.83%	3.95%	3.90%
Average Duration			
Liability Weighted	11.31	11.14	11.28
Liability Unweighted	11.03	10.52	10.73
III. Flows			
Benefits and Refunds	$303.7	$62.2	$365.8
Employer Contributions	$135.4	$35.6	$171.0
Member Contributions	$52.7	$9.7	$62.4
State Contributions	$27.7	$0.5	$28.2
Total Contribution	$215.8	$45.8	$261.6
IV. Accrual Basis			
Additional Necessary Contributions			
to prevent rise in NPL under expected return	$(33.3)	$(8.7)	$(41.8)
to prevent rise in NPL under Treasury rate	$84.1	$11.9	$96.0

by population according to the US Census and the top one hundred counties by population. Additionally, the data covers the associated school district and transportation authority pension systems where applicable. The results are 646 state and local funds: 270 state funds and 376 local funds. There is a full list of funds that are part of the sample in the appendix. The sample covers approximately 90 percent of the public pension fund universe as measured by assets. The GASB 67 disclosures contain reconciliations of total pension liabilities from the beginning to the end of the fiscal year, as well as reconciliations of total pension assets from the beginning to the end of the fiscal year. In addition, GASB disclosures provide interest rate sensitivities of the unfunded pension obligation of each plan, which makes a revaluation under different interest rate scenarios possible.

STATE AND LOCAL GOVERNMENT REVENUE DATA

Data on state and local government revenues come from the individual unit files of the US Census Annual Survey of State and Local Government Finances (ASSLGF), which contain detailed financial information on state and local government finances. I use two measures of revenue. The first measure is "general revenue from own sources," which is defined by the Census as general revenue less intergovernmental revenue. From here on, I will refer to this measure as "own-source revenue." Importantly, this measure excludes insurance trust revenues (which are mostly the returns of pension funds themselves), intergovernmental revenues (which are primarily transfers from the federal government but also transfers from state governments to local governments and vice versa), and revenue from public utilities. The second measure is tax revenue alone. The idea behind the latter is to consider how state and local governments could pay for unfunded pensions through traditional taxation sources like income taxes, sales taxes, and property taxes. Compared to own-source revenue, scaling by tax revenue assumes that states will not raise fees for services such as university tuition and waste management services to pay for unfunded pension liabilities—or at least not raise sufficient revenue from such fee increases considering the possibility of private economy competition in the provision of such services.

The latest individual unit files available are for fiscal year 2022. I estimate 2023 revenues by using an out of sample extrapolation by drawing on national aggregates of the national income and product accounts (NIPA) from the Bureau of Economic Analysis (BEA) and the State and Local Government Finance Historical Datasets and Tables of the Census Bureau. For extrapolation, I use the BEA National Income and Product Accounts for state and local governments (NIPA Table 3.3) to compute the growth rate between 2022 and 2023. I use this growth rate to obtain an estimate for the revenues of state and local governments. The overall revenue growth for state and local governments was 0.49 percent between 2022 and 2023. Using the aggregate growth rates ignores likely differences in revenue growth rates at the state and local level. In order to estimate a growth rate for own revenue, I use historical data from the individual unit files. For each entity, a regression was run between the individual growth rate in own-source revenues and the aggregate growth rate at the state and local level over time horizon between 1972 and 2022. These results were then used to estimate own revenue growth rates from 2022 to 2023. Each estimated growth rate was then applied

to the individual government units. Again, this method does not account for likely differences in revenue growth rates at the state and local level. The median own-source revenue growth rate, using this methodology, for all entities in the sample is 0.52 percent between 2022 and 2023. I apply an analogous methodology for tax revenues.

DISCOUNT RATES

As described in a number of papers,[12] the correct discount rate for measuring the market value of pension obligations should be a default-free rate, rather than relying on discount rates that reflect the higher expected returns of portfolios of riskier investments. This perspective is based on the understanding that pension promises, similar to debt obligations, must be honored irrespective of pension fund investment performance. Pension liabilities, therefore, should be measured using rates that mirror the nature of pension promises, as obligations that remain constant regardless of the underlying asset performance. This approach is supported by both financial theory and legal considerations. The actuarial standards of practice (ASOP) No. 4, which went into effect in February 2023, require disclosure of the pension obligations using a discount rate similar to the one I use in this paper. At the moment, the valuation under market discount rates is a disclosure requirement only and does not affect GASB reporting or funding requirement. Thus, these disclosure requirements are expected to have limited impact on actual pension funding practices. I use the US Treasury yield curve to measure the value of pension liabilities using market valuation standards. I refer readers to Section 3 of Giesecke and Rauh (2023) for an extensive explanation.[13]

DETAILED ANALYSIS

As of fiscal year 2023, the total reported unfunded liability under governmental accounting standards is $1.638 trillion. In contrast, I calculate that the market value of the unfunded liability is approximately $4.582 trillion. As a result of the revaluation, the reported liability-weighted funding ratio of 75.3 percent falls to 52.2 percent under a market-based valuation. The market values reflect the fact that accrued pension promises are a form of government debt with strong rights, and should thus be measured using default-free discount rates.[14] The estimates of the pension liabilities based on this sample and methodology are broadly consistent with those of the Board of Governors of the Federal Reserve System. However, there are several differences that make this methodology exhibit a tighter relationship with current market conditions. The Federal Reserve follows the methodology of the Bureau of Economic Analysis.[15] The assumed discount rate broadly reflects market condition in the corporate bond market, although with only rare adjustments over time. For example, the Federal Reserve uses a discount rate of 4.0 percent for the period 2019–2023. Figure 1 shows the estimates based on this sample and methodology and those of the Federal Reserve. As of 2023, the sample of local and state pension plans covers about 92.4 percent of total assets reported by the Federal Reserve.[16] While assets are a relatively stable fraction of the assets of the Federal Reserve's estimates, the revalued total pension liability in the sample shows more variation. The difference in the methodology results in the estimate of the total pension liability to be approximately 112.9 percent of the estimate of the Federal Reserve in 2023.

The difference in the estimates has shrunk substantially over the last year due to the convergence in market rates and the assumed discount rate of the Federal Reserve.

The time series of the liability-weighted funding ratio, shown in figure 4, shows a limited variation over time. However, I find large cross-sectional variation in the funding status across states as shown in figure 10. In terms of market values, New Jersey, Kentucky, Mississippi, and Connecticut are the states with the lowest funding ratio in 2023, with a funding status as low as 32.7 percent. While Connecticut still ranks at the fourth-lowest position among state governments, the state has made substantial improvements in its funding ratio. Extraordinary contributions led to an increase in the funding ratio by about 8 percentage points in the last two years. At the other end of the spectrum, the state of Wisconsin, Tennessee, and South Dakota have funding ratios that range between 69.9 percent and 72.6 percent. This means that even the best-funded states exhibit large legacy pension obligations under market valuations. At the local government level, the variation in the funding ratio is even larger as shown in figure 11. Chicago, IL, New Haven, CT, and Hamden, CT, rank at the bottom in terms of market-based funding ratios, with 17.1 percent, 25.2 percent, 25.8 percent, respectively. Among the bottom 25 local governments the market-based funding ratio never exceeds 40 percent. Among the lowest-ranked cities, Hamden, CT, and East Hartford, CT, have recently stepped up their contributions as shown in table 4.[17] On the other end of the spectrum, there are several plans with market-based and reported funding ratios of close to 100 percent. This includes the Lancaster Parking Authority, PA, Tucson, AZ, and Norwalk, CT.

In comparison to fiscal year 2022, three factors affected the market value of the unfunded pension liability. First, risk-equivalent market interest rates increased further after the initial rise in Q2 2022. Concretely, the liability-weighted market discount rate increased from 3.2 percent to 3.8 percent. Second, contributions were large in comparison to the historical average. Third, differences between actual and expected experience, changes in demographic assumptions, and changes in benefit terms led to a substantial increase in the liability. The contribution of each of the components is visualized in figure 2. Among all components, the increase in the market interest rates had by far the largest impact, which reduced the unfunded pension liability by close to $890 billion. Contributions remained strong at 27.7 percent of payroll—the second-highest share over the last ten years—as shown in figure 6. In contrast, the differences between actual and expected experience, changes in demographic assumptions, and changes in benefit terms increased the unfunded pension liability by $385 billion. The primary driver was salary increases that exceeded expectations. Since benefits are calculated as a function of the employees' final salaries, salary increases also affect future benefits and thus the total pension liability. Thus, salary increases—negotiated during an economy with above-average inflation—affect the pension liability above and beyond the impact through automatic stabilizers, such as cost-of-living adjustments, so-called COLAs. Future positive surprises in salary may lead to further revaluations and pose a potential risk on pension funds, independent from market returns that underperform assumed discount rates. Table 3 and table 4 show the state and local governments with the largest increase in contributions on a contributions as percentage of payroll basis, respectively. Among state governments, the increase was largest in Michigan, Alaska, and

Missouri. At the local level, the largest increases in contributions are observed for Fulton County, GA, Normal, IL, and Hamden, CT. As a result of the year-over-year changes, the market value of the unfunded liability is approximately $4.582 trillion, corresponding to a liability-weighted aggregate funding ratio of 52.2 percent in fiscal year 2023, a substantial decrease from $5.183 trillion to $4.582 trillion in fiscal year 2022. The full summary statistics for fiscal year 2022 and 2023 are shown in table 2.

There are important differences in the development of the year-over-year funding ratio. While the majority of state pension systems experienced an increase in the market-based funding ratio, driven by the valuation effect of interest rates, it was –4.1 percent for Iowa. Iowa experienced a decrease in the funding ratio because of mediocre investment returns and insufficient employer contributions. The changes in the funding ratio for state pension funds are shown in figure 17. At the local level, the change in funding ratios was even more heterogeneous. Tucson, AZ, Norwalk, CT, Granby, CT, and Arlington Heights, IL, experienced significant increases in their market-based funding ratio, which was facilitated by large supplemental contributions. For Arlington Heights, IL, and Granby Town, CT, the increase in the funding ratios reversed the major decline in the prior fiscal year. In fiscal year 2023, Jackson County, MI, North Broward Hospital District, FL, Cincinnati, OH, and Hialeah, FL, reported the largest declines in market-based funding ratio. The decreases in the funding ratio were primarily driven by negative investment returns. An overview of the local governments with the 25 largest increases and 25 largest declines in the market-based funding ratio is provided in figure 19.

Investment returns recovered from the prior fiscal year but underperformed relative to the assumed discount rates. The asset-weighted investment return was 5.67 percent in fiscal year 2023. This investment return contrasts with the liability-weighted discount rate of 6.86 percent in FY 2023. As a result, more than half of the pension funds, 51.7 percent, failed to meet their target return as shown in figure 9. There is substantial dispersion in the investment return of funds. The realized 5th percentile return was –7.1 percent while the 95th percentile was 11.2 percent. The large cross-sectional dispersion in returns is also visible in the time series. In the period since 2014, investment returns were lower than assumed returns six out of ten times. The volatility in returns is a reflection of the riskiness of the asset portfolio. As of 2017, public pension funds were invested to 43 percent into equities, 19 percent into alternative investments, and 9 percent into corporate bonds on average.[18] The shift toward a riskier asset allocation has been documented independently. Begenau, Siriwardane, and Liang show that public pension funds have shifted their asset allocation more and more toward alternative investments (e.g., private equity, hedge funds, and real estate, since 2006); partly as a result of shifting beliefs about alternative investments' returns and risks.[19] For a more detailed discussion of the asset allocation, confer Giesecke and Rauh (2024).[20]

The large revaluation of the pension liability originates from the discrepancy between assumed discount rates and what the principles of financial economics require. Figure 3 shows the total liability-weighted average discount rate for state and local plans between 2014 and 2023 as reported under GASB 67. One notable development in fiscal year 2023 is

that the downward trend in discount rates reversed both at the state and local government level. As a result, the liability-weighted average discount rate of state and local governments increased to 6.86 percent. One could argue that this mirrors the increase in risk-free interest rates between FY 2022 and FY 2023. However, this argument ignores that the duration-matched risk-appropriate discount rate was 3.83 percent at the end of FY 2023, more than 3 percent lower than the assumed discount rate. The reversal in the long-standing trend may indicate that pension boards give in to pressure to raise assumed discount rates to make public pensions appear less underfunded than they are.[21] To account for the discrepancy between risk-equivalent interest rates and discount rates, I revalue liabilities and pension cost using market-based interest rates. The choice of the discount rate should not reflect political motivations but rather economic fundamentals. The choice of a higher than justified discount rate means that future pension liabilities are lower than under more realistic return assumptions. Thus, pension funds with large unfunded liabilities have an incentive to take on riskier investments to increase expected returns and thus increase their discount rate.[22] The evidence in Andonov, Bauer, and Cremers (2017) supports this hypothesis.[23]

Using a market-based interest rate also affects the value of the service cost. The service cost is the present value of future pension benefits that an employee earns in the fiscal year. As such, it is sensitive to the discount rate. Figure 5 shows the reported and revalued service cost as percentage of payroll between 2014 and 2023. The increase of market rates led to a further reduction in the market-based service costs between 2022 and 2023. Under market valuations, the public employer has to contribute, on average, about 20.3¢ out of $1 in payroll to fund the newly accruing pension liability. In contrast, pension funds report an average service cost of 12.8 percent of payroll. The discrepancy in cost of 7.5¢ out of $1 in payroll is economically meaningful as it determines the employers' contribution decision. Thus, not recognizing the full cost of employees' pensions leads to lower-than-adequate contributions. Only recently, in 2022 and 2023, have the contributions exceeded the service cost at market values by a comfortable margin as shown in figure 7. The differences between the true pension cost and the contributions are even more pronounced in the cross section. Figure 12 shows the cross-sectional distribution of the service cost as percentage of payroll at the state level. The service cost is predominantly determined by the generosity of the benefit terms, and the extent to which newer employees have been placed in less generous pension tiers.

The service cost represents the expense to the sponsor to offer a pension plan if the pension plan were fully funded. As such, measuring the service cost as a share of own-source revenues provides an estimate of the cost of the current contractual terms. Across all plans of the sample, the aggregate service cost under market valuation is $191.3 billion and the aggregate own-source revenue is $2,328 billion in 2023. Thus, service costs account for about 8.2 percent of own-source revenue on average. However, the aggregate masks the large differences among pension sponsors. Figure 14 shows the distribution in the cross section of state governments. At the top of the distribution, newly accruing benefits represent 17.5 percent of own-source revenues in Nevada. On the other end of the spectrum are Indiana (3.4 percent) and Michigan (2.9 percent), states that are unusual in that many public employees are currently in defined contribution as opposed to defined benefit pension plans.

An alternative way to express the actual cost of pensions is through the lens of the required contributions that are necessary to maintain the current value of the unfunded pension liability. This measure captures both newly accruing pension benefits and the interest cost for the unfunded liability. As such, this measure can be interpreted as the recurring cost of pension benefits, which includes the cost from new benefits and the cost from the legacy liability. It is important to emphasize that this measure does not capture any amortization payment to repay the unfunded liability and thus may be perceived as a lower bound of the required contribution. Alternatively, we could ask what contributions are necessary to fully fund state and local pension systems across the United States over the next 25 years, as I do with the amortization payment calculation.

The total contribution that would be economically required to prevent the unfunded pension liability from increasing amounts to $295.2 billion ($199.2 billion + $96.0 billion), which account for about 12.7 percent of own-source revenue or 17.9 percent of total tax revenue in 2023. Figure 8 visualizes the relationship between the actual contribution, the required contribution under market valuations, and the required contribution under the assumed discount rates. I express all measures as a percentage of own-source revenues to facilitate interpretation as a measure of fiscal capacity. The complete cross-sectional distribution of the actual and required contributions of the state, city, and county governments in the United States leads to similar conclusions. Even under the aggressive assumed discount rates, actual contributions do not meet the required contributions for a large share of state governments, as shown in figure 15. The discrepancy between actual contributions and required contributions is also visible at the county and city government levels as shown in figure 16, which lists the 25 cities and 25 counties with the highest required contribution in the sample. Persistently insufficient contributions to cover the economic cost of pension benefits by definition ultimately leads to an exhaustion of plan assets.

A recent trend among policymakers in the United States is to impose mandates to fund the unfunded pension liability. These mandates range from full funding requirements (e.g., Connecticut and Wisconsin) to mandates that require a specific funding ratio (e.g., South Dakota, New Jersey, Illinois, Louisiana, and Michigan). These funding mandates are a double-edged sword because on the one hand, they address the risk originating from the large unfunded liability, but on the other hand, require large payments from the pension sponsor[24]. Hence, I provide transparency about the anticipated payment as a share of own-source revenues if a full funding mandate over the next 25 years were imposed. I provide these estimates at market valuation and independent of the actual funding requirement for comparability across jurisdictions. Figure 8 shows that the combined required contribution to cover the service cost and the amortization payment for the unfunded pension liability ranges between 17.9 percent and 30.1 percent over the sample horizon. Thus, the required contribution to fund the unfunded liability over the next 25 years would consume at least an additional 11.3 percent of own-source revenues, a substantial burden on the state and local governments' budgets. Among state governments, the largest payments of own-source revenues are observed in Hawaii, South Dakota, and New Hampshire, as shown in figure 18. For these three states, the payment surpasses 20 percent of own-source revenues. In contrast,

Louisiana, Utah, and Indiana have the smallest burden with 2.1 percent, 1.5 percent, and 1.0 percent, respectively. The variation is even greater at the local level. Several county governments, special districts, and city governments would be seriously challenged if a full funding amortization mandate was adopted as shown in figure 20.

Budgetary surpluses allowed pension sponsors to make extraordinary contributions to their pension funds in fiscal year 2023. Texas appropriated more than $1.7 billion for their three state employee pension funds: ERS, LECOS, and JRS. Similarly, Tennessee, North Dakota, Montana, Missouri, Michigan, Arizona, and Massachusetts made major supplementary contributions. For a comprehensive list of supplementary contributions, confer NASRA (2024). Another major trend is to tighten existing amortization requirements or impose new ones. Hawaii enacted legislation to accelerate the payoff of its pension unfunded liability. The law reduces the maximum amortization period from 30 years to 20 years (phased in by FY 2029) for the Employees' Retirement System's remaining unfunded balances. Similarly, Wyoming and Montana adopted funding policies that pay off the unfunded liability at a much faster rate. In the case of Wyoming, the estimates suggest that full funding is reached 16 years earlier than originally anticipated.

The post-pandemic trend to use budgetary surpluses to shore up pension funding continued in fiscal year 2023. Another notable trend is to tighten already existing amortization policies or enact new ones.[25] Additional pension funding includes the one-time payment to various state employees' pension funds in Texas. Similarly, Mississippi and Missouri made extra payments to their respective pension funds. More ambitious amortization policies were enacted in Hawaii, Maryland, and Louisiana.

CONCLUSION

Unfunded public pension obligations remain the largest liability for state and local governments in the United States. Addressing the large unfunded liability has increasingly moved up in the priority list of policymakers, as reflected by increasing pension contributions. Total contributions exceeded the market-based service cost for two consecutive fiscal years—the first time since the systematic collection of these data. Although the impact on state and local budget remains manageable in the nationwide average, the aggregate metrics obscure the degree of financial pressure that some states and cities face. These budgetary pressures become an existential risk when considering the necessary amortization payment for the unfunded pension liability. As more and more states are moving to full funding mandates, the pressure from these payments will become more salient. A positive development is the slight decrease in the service cost, which is a reflection of the overall less generous pension benefits. It remains to be seen whether this is a temporary or permanent development. On the negative side, the increase in the discount rates reverses the positive developments in the last several years. The reversal indicates that pension boards are willing to aggressively discount future pension promises to deflate their liabilities and cost, concealing the true economic cost and unfunded liabilities of pension systems across the United States.

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NOTES

1. Bureau of Labor Statistics, "Employee Benefits in the United States, March 2024," 2024.

2. Robert Novy-Marx and Joshua D. Rauh, "The Liabilities and Risks of State-Sponsored Pension Plans," *Journal of Economic Perspectives* 23, no. 4 (2009): 191–210; Robert Novy-Marx and Joshua D. Rauh, "Public Pension Promises: How Big Are They And What Are They Worth?," *Journal of Finance* 66, no. 4 (2011), 1211–49; Seamus Duffy and Oliver Giesecke, "Pension Reform: Conceptual Foundations and Practical Challenges," (2023), available at SSRN 4432839.

3. For the prior fiscal year, see Oliver Giesecke and Joshua Rauh, "State and Local Pension Funds 2022," Hoover Institution, State and Local Governance Initiative (March 2024); Oliver Giesecke and Joshua Rauh, "Trends in State and Local Pension Funds," *Annual Review of Financial Economics* 15 (2023): 221–38; and Joshua D. Rauh, "Fiscal Implications of Pension Underfunding," Discussion paper, Stanford University and Hoover Manuscript (2018).

4. Oliver Giesecke, Haaris Mateen, and Marcelo Jardim Sena, "Local Government Debt Valuation," (2022), available at SSRN 4160225; Duffy and Giesecke, "Pension Reform."

5. Jeffrey R. Brown and David W. Wilcox, "Discounting State and Local Pension Liabilities," *American Economic Review* 99, no. 2 (2009): 538–42; Novy-Marx and Rauh, "Liabilities and Risks"; Jeffrey R. Brown and George G. Pennacchi, "Discounting Pension Liabilities: Funding Versus Value," *Journal of Pension Economics and Finance* 15, no. 3 (2016): 254–84.

6. Examples of states that enacted full funding requirements are Wisconsin and Connecticut. Other states, including South Dakota, New Jersey, Illinois, Louisiana, and Michigan have adopted minimum funding requirements (e.g., 80 percent of the reported total pension liability).

7. An alternative interpretation of the service cost under market valuation is that it represents the economic cost of offering pension benefits under the current contractual terms if pension plans were fully funded. It excludes the interest and amortization cost for the unfunded liability.

8. Giesecke and Rauh, "Trends in State and Local Pension Funds." As of 2017, public pension funds were invested on average 43 percent into equities, 19 percent into alternative investments, and 9 percent into corporate bonds. 2017 is the last year for which detailed information about the asset composition is available due to changes on how the Annual Survey of Public Pensions (ASPP) is conducted. Alternative investment includes private equity, venture capital, and infrastructure and hedge funds.

9. The rediscounting not only affects the pension liabilities but also recurring pension cost as they represent a present value of future expected pension benefits.

10. While the liquidity of nominal Treasury bonds certainly reduces the overall level of the Treasury yield curve (Arvind Krishnamurthy and Annette Vissing-Jorgensen, "The Aggregate Demand for Treasury Debt," *Journal of Political Economy* 120, no. 2 [2012]: 233–67), and pension promises are much less liquid than Treasury bonds, many pension promises are at least partially inflation linked, suggesting a need for lower discount rates. Novy-Marx and Rauh ("Public Pension Promises," 2011) find that approximately 40 percent of state pension plans are fully or partially linked to consumer price inflation, with an additional 20 percent receiving ad hoc adjustments that are generally connected to inflation.

11. For a comprehensive study of past reforms until fiscal year 2022, see Duffy and Giesecke, "Pension Reform."

12. Including Brown and Wilcox, "Discounting State and Local Pension Liabilities"; Novy-Marx and Rauh, "Liabilities and Risks"; Novy-Marx and Rauh, "Public Pension Promises"; Robert Novy-Marx, "Logical Implications of the GASB's Methodology for Valuing Pension Liabilities," *Financial Analysts Journal* 69, no. 1 (2013): 26–32; and Brown and Pennacchi, "Discounting Pension Liabilities."

13. Giesecke and Rauh, "Trends in State and Local Pension Funds."

14. Brown and Wilcox, "Discounting State and Local Pension Liabilities"; Brown and Pennacchi, "Discounting Pension Liabilities."

15. More details in David G. Lenze, *State and Local Government Defined Benefit Pension Plans: Estimates of Liabilities and Employer Normal Costs by State, 2000–2011*, (BEA, 2013); and Marshall Reinsdorf, David Lenze, and Dylan Rassier, "Bringing Actuarial Measures of Defined Benefit Pensions into the US National Accounts," in Working Papers, International Association for Research in Income and Wealth, 33rd General Conference, Rotterdam, the Netherlands, August 24–30, 2014.

16. Between 2014 and 2023, the coverage of the sample varies between 87 percent and 92.4 percent.

17. Portland, OR, is the city with the lowest funding ratio in the sample. I leave it out from the analysis because the plan operates very different from others. In Portland, members and the sponsors do not contribute to the plan. Instead, the plan is funded with property taxes only.

18. Giesecke and Rauh, "Trends in State and Local Pension Funds." 2017 is the last year for which detailed information about the asset composition is available due to changes on how the Annual Survey of Public Pensions (ASPP) is conducted. Alternative investment includes private equity, venture capital, hedge funds, and real estate.

19. Juliane Begenau, Emil Siriwardane, and Pauline Liang, "Unpacking the Rise in Alternatives," (2022), available at SSRN 4105813.

20. Giesecke and Rauh, "State and Local Pension Funds 2022."

21. Changes in the discount rates can be highly political since it affects the sponsors' pension cost. One example is the resistance of the League of California Cities to reconsider the discount rate by CalPERS as announced by League of California Cities (2021).

22. Return expectations of public pension funds are positively related to differences in past performance, thus suggesting that investment managers extrapolate past investment performance. Aleksandar Andonov and Joshua D. Rauh, "The Return Expectations of Public Pension Funds," *Review of Financial Studies* 35, no. 8 (2022): 3777–822.

23. Aleksandar Andonov, Rob M. Bauer, and K. J. Martijn Cremers, "Pension Fund Asset Allocation and Liability Discount Rates," *Review of Financial Studies* 30, no. 8 (2017): 2555–95.

24. Duffy and Giesecke, "Pension Reform."

25. For a comprehensive study of past reforms until fiscal year 2022, see Duffy and Giesecke, "Pension Reform."

REFERENCES

Andonov, Aleksandar, Rob M. Bauer, and K. J. Martijn Cremers. 2017. "Pension Fund Asset Allocation and Liability Discount Rates." *Review of Financial Studies* 30 (8): 2555–95.

Andonov, Aleksandar, and Joshua D. Rauh. 2022. "The Return Expectations of Public Pension Funds." *Review of Financial Studies* 35 (8): 3777–822.

Begenau, Juliane, Emil Siriwardane, and Pauline Liang. 2022. "Unpacking the Rise in Alternatives." Available at SSRN 4105813.

Brown, Jeffrey R., and George G. Pennacchi. 2016. "Discounting Pension Liabilities: Funding Versus Value." *Journal of Pension Economics and Finance* 15 (3): 254–84.

Brown, Jeffrey R., and David W. Wilcox. 2009. "Discounting State and Local Pension Liabilities." *American Economic Review* 99 (2): 538–42.

Bureau of Labor Statistics. 2024. "Employee Benefits in the United States, March 2024." https://www.bls.gov/ebs/publications/employee-benefits-in-the-united-states-march-2024.htm.

Duffy, Seamus, and Oliver Giesecke. 2023. "Pension Reform: Conceptual Foundations and Practical Challenges." Available at SSRN 4432839.

Giesecke, Oliver, Haaris Mateen, and Marcelo Jardim Sena. 2022. "Local Government Debt Valuation." Available at SSRN 4160225.

Giesecke, Oliver, and Joshua Rauh. 2023. "Trends in State and Local Pension Funds." *Annual Review of Financial Economics* 15: 221–38.

Giesecke, Oliver, and Joshua Rauh. 2024. "State and Local Pension Funds 2022." Hoover Institution, State and Local Governance Initiative (March). https://www.hoover.org/sites/default/files/research/docs/Giesecke-Rauh_WebreadyPDF.pdf.

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen. 2012. "The Aggregate Demand for Treasury Debt." *Journal of Political Economy* 120 (2): 233–67.

League of California Cities. 2021. "CalPERS to Consider Further Adjustments to the Discount Rate; Cities Can Offer Testimony During CalPERS Board Meeting." September 8. https://www.calcities.org/home/post/2021/09/08/calpers-considers-further-adjustments-to-the-discount-rate-cities-urged-to-offer-testimony-during-upcoming-board-meeting.

Lenze, David G. 2013. *State and Local Government Defined Benefit Pension Plans: Estimates of Liabilities and Employer Normal Costs by State, 2000–2011*. Bureau of Economic Analysis (December).

NASRA. 2025. "Selected States Appropriating Funds Above the ADEC to Public Pension Plans Since FY 21." July. https://www.nasra.org/files/Compiled%20Resources/States%20Appropriating%20Excess%20Funding%20to%20Public%20Pension%20Funds.pdf.

Novy-Marx, Robert. 2013. "Logical Implications of the GASB's Methodology for Valuing Pension Liabilities." *Financial Analysts Journal* 69 (1): 26–32.

Novy-Marx, Robert, and Joshua D. Rauh. 2009. "The Liabilities and Risks of State-Sponsored Pension Plans." *Journal of Economic Perspectives* 23 (4): 191–210.

Novy-Marx, Robert, and Joshua D. Rauh. 2011. "Public Pension Promises: How Big Are They and What Are They Worth?" *Journal of Finance* 66 (4): 1211–49.

Rauh, Joshua D. 2018. "Fiscal Implications of Pension Underfunding." Unpublished manuscript, Stanford University and Hoover Institution.

Reinsdorf, Marshall, David Lenze, and Dylan Rassier. 2014. "Bringing Actuarial Measures of Defined Benefit Pensions into the US National Accounts." Paper prepared for the International Association for Research in Income and Wealth, 33rd General Conference, Rotterdam, the Netherlands, August 24–30.

TABLES AND FIGURES

TABLE 2 SUMMARY STATISTICS FY 2022 AND FY 2023

	State and Local Pensions, 2023	State and Local Pensions, 2022
Number of Plans Total	646	646
($ amounts in billions)		
I. Assets and Liabilities		
GASB 67 Standards		
Total Pension Liability (TPL)	$6,637	$6,402
Assets	$4,999	$4,764
Net Pension Liability (NPL)	$1,638	$1,599
Funding Ratio	75.3%	75.0%
Market Value Standards		
Accumulated Benefit Obligation (ABO)	$9,577	$9,986
Assets	$4,994	$5,404
Unfunded Market Value Liability (UMVL)	$4,582	$5,183
Funding Ratio	52.2%	48.1%
II. Discount Rates		
GASB 67 Standards		
Average Discount Rate		
Liability Weighted	6.86%	6.85%
Liability Unweighted	6.73%	6.70%
Market Value Standards		
Average Discount Rate		
Liability Weighted	3.83%	3.20%
Liability Unweighted	3.90%	3.32%
Average Duration		
Liability Weighted	11.28	11.28
Liability Unweighted	10.73	10.71
III. Flows		
Benefits and Refunds	$365.8	$352.8
Employer Contributions	$171.0	$164.1

TABLE 2 CONTINUED

	State and Local Pensions, 2023	State and Local Pensions, 2022
Member Contributions	$62.4	$59.1
State Contributions	$28.2	$26.6
Total Contribution	$261.6	$249.8
IV. Accrual Basis		
Additional Necessary Contributions		
to prevent rise in NPL under expected return	$(41.8)	$(71.8)
to prevent rise in NPL under Treasury rate	$96.0	$95.0

The table shows the summary statistics of state and local pension funds in fiscal year 2022 and 2023.

TABLE 3 LARGEST CONTRIBUTION INCREASE—STATE GOVERNMENTS

State	Contributions as percentage of Payroll (%), 2022	Contributions as percentage of Payroll (%), 2023	Δ Contributions as percentage of Payroll (%), 2022-2023	Δ Contributions (Millions USD), 2022-2023
Michigan	34.04	40.52	6.48	1125.61
Alaska	38.40	42.97	4.57	43.39
Missouri	14.36	18.13	3.78	683.45
Louisiana	28.38	31.52	3.14	533.85
New Hampshire	18.81	20.61	1.80	76.06
New Mexico	16.43	18.14	1.71	190.75
South Carolina	19.38	20.94	1.56	300.05
Connecticut	49.21	50.71	1.49	546.44
Georgia	20.58	21.72	1.14	486.70
Texas	5.33	6.39	1.06	877.21

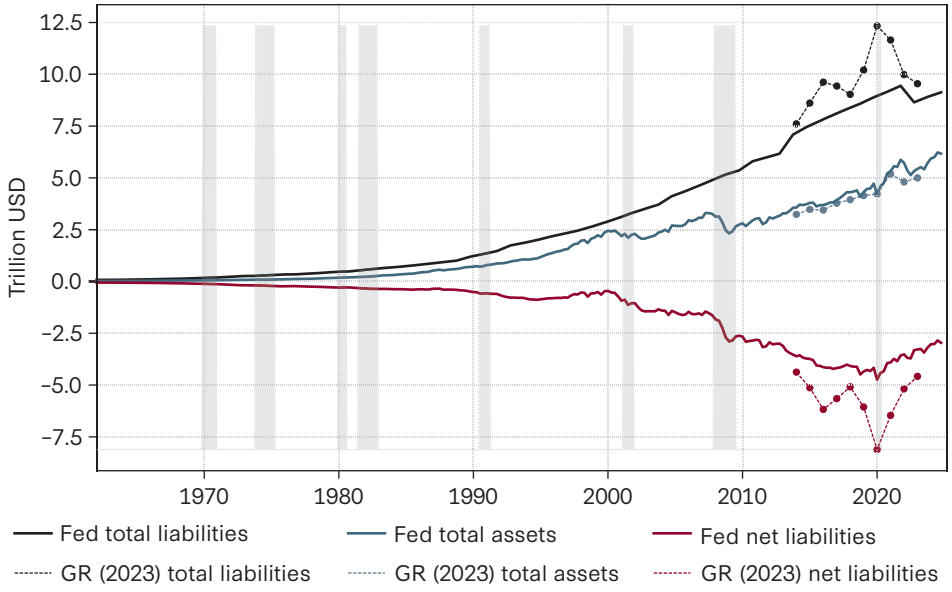
The table lists the states that saw the largest increase in contributions as percentage of payroll between fiscal year 2022 and 2023.

TABLE 4 LARGEST CONTRIBUTION INCREASE—LOCAL GOVERNMENTS

Local Government	Contributions as percentage of Payroll (%), 2022	Contributions as percentage of Payroll (%), 2023	Δ Contributions as percentage of Payroll (%), 2022-2023	Δ Contributions (Millions USD), 2022-2023
GA, Fulton County	905.23	1040.78	135.55	0.76
IL, Normal	46.52	109.76	63.25	7.88
CT, Hamden	106.17	133.94	27.77	1.16
FL, Orange County	25.73	42.08	16.35	0.50
TX, Harris County	39.74	53.63	13.89	8.00
FL, Pembroke Pines	106.22	117.16	10.94	3.63
CT, East Hartford	56.46	67.26	10.80	2.50
FL, Miami	28.43	36.37	7.94	36.63
CT, Torrington	40.99	48.74	7.75	0.41
WI, Milwaukee	20.98	28.54	7.56	49.47

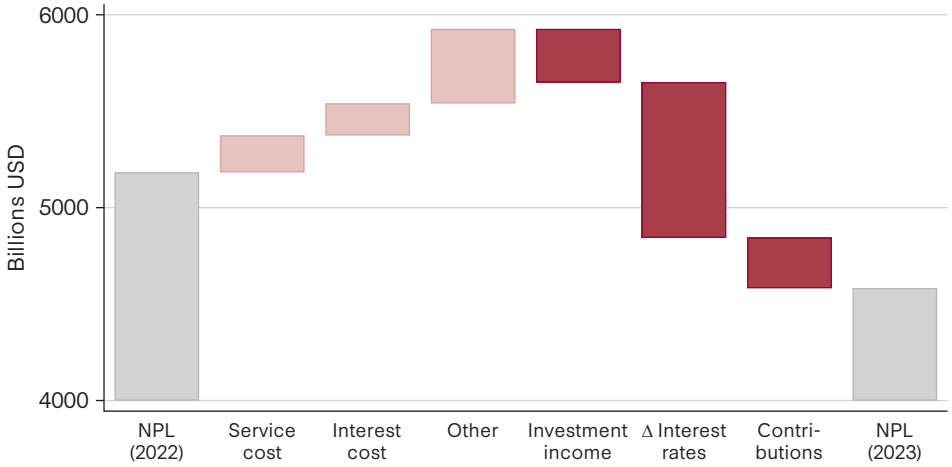
The table lists the local governments that saw the largest increase in contributions as percentage of payroll between fiscal year 2022 and 2023.

FIGURE 1 *Pension Asset and Liabilities*



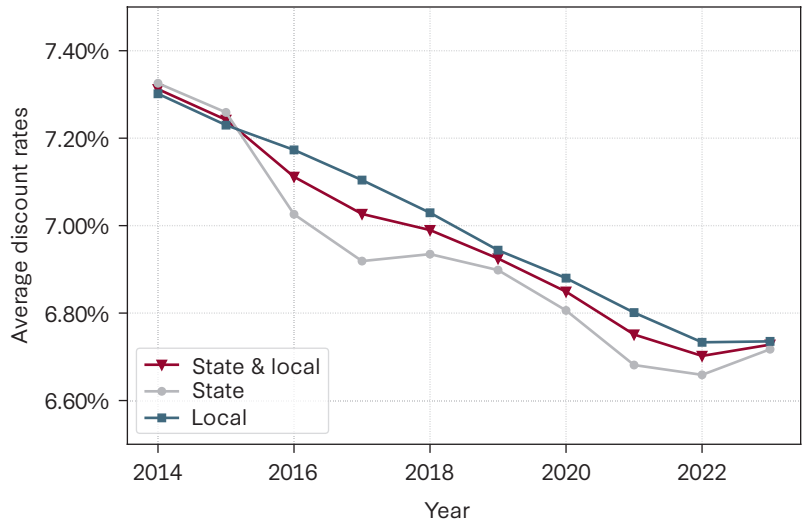
Notes: *The pension entitlements of state and local government, employees defined benefit retirement funds (Fed Total Liabilities), the total assets (Fed Total Assets), and the unfunded liabilities (Fed Net Liabilities) are estimates of the Board of Governors of the Federal Reserve and retrieved from FRED, Federal Reserve Bank St. Louis, with the series code BOGZ1FL224190043Q, BOGZ1FL222000075Q, BOGZ1FL223073045Q, respectively. The Sample Total Liabilities, the Sample Total Assets, and the Sample Net Liabilities are the calculations of the authors, which are based on the collected data of 646 city, county, and state pension funds. The total liabilities and net liabilities are restated to reflect the market valuation. The list of included pension funds is available in the appendix.*

FIGURE 2 *Net Change Unfunded Pension Liability, 2022–2023*



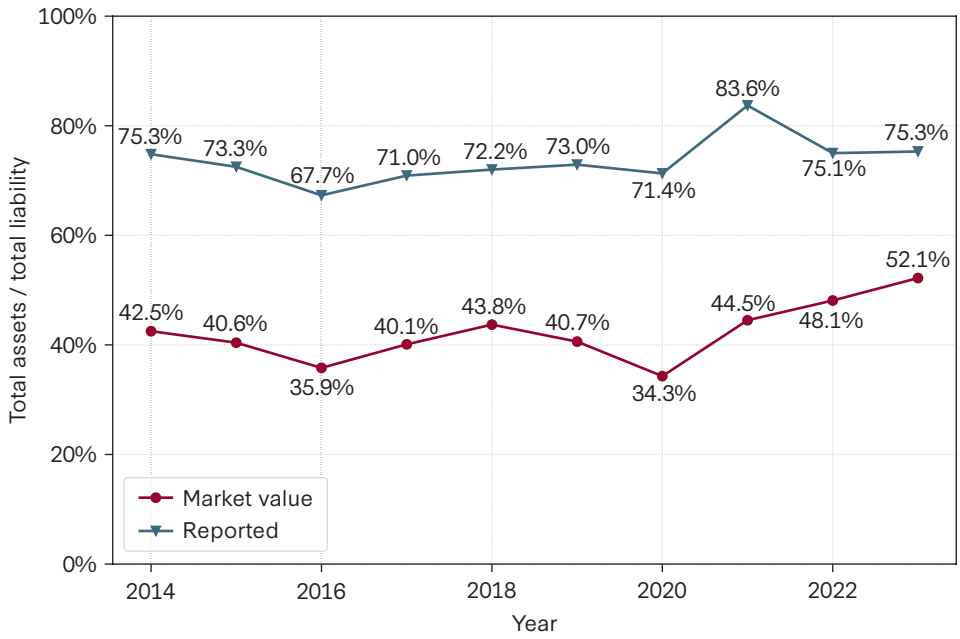
Notes: *The figure shows the components that contributed to the year-over-year changes in the unfunded pension liability (NPL) for all local and state plans between fiscal year 2022 and 2023. "Other" includes differences between actual and expected experience, changes in demographic assumptions, changes in benefit terms, and administrative expenses.*

FIGURE 3 *Discount Rates*



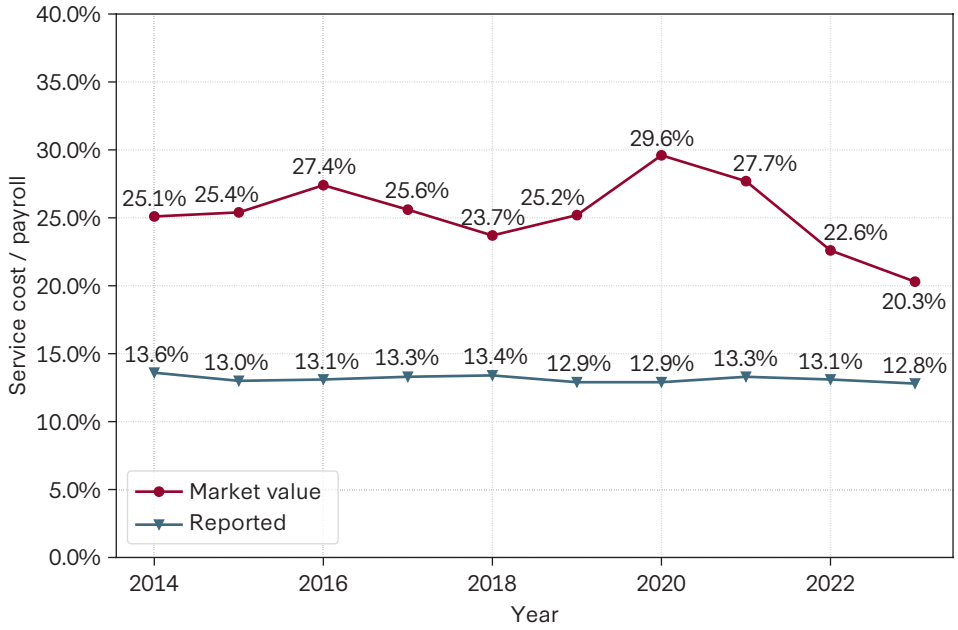
Notes: *The figure displays the liability-weighted discount rate for all 646 local and state plans between 2014 and 2023. The time series is constructed by weighting the plan specific discount rate by the total pension liability.*

FIGURE 4 *Funding Ratio*



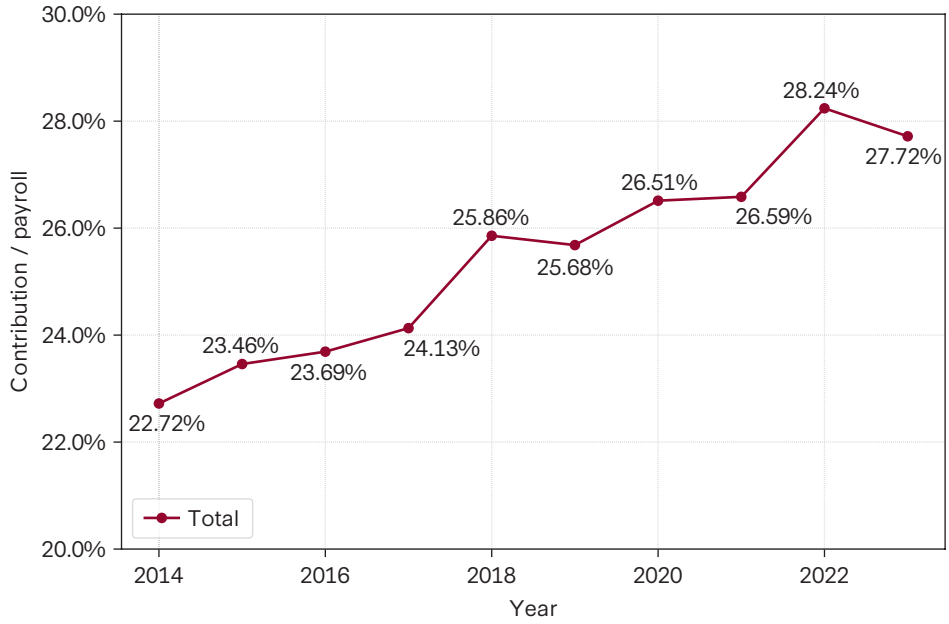
Notes: *The figure displays the funding ratio for all local and state plans from 2014 to 2023. The time series is constructed by weighting the funding ratio of each plan by the total pension liability.*

FIGURE 5 *Service Cost as Percentage of Payroll*



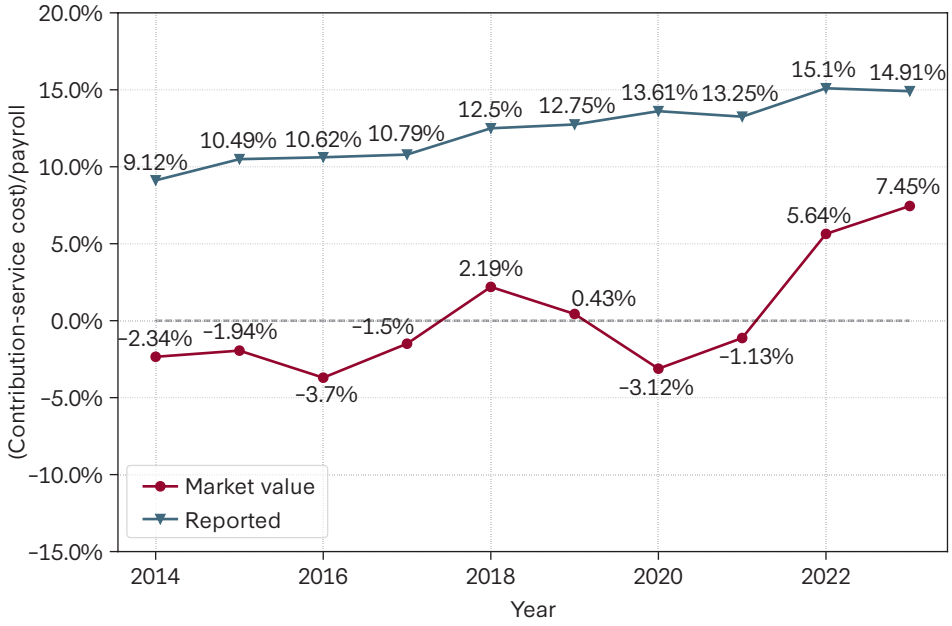
Notes: *The figure shows service cost as a share of covered employee payroll for all local and state plans from 2014 to 2023. The time series is constructed by weighting the service cost to covered employee payroll ratio by the covered payroll. The pink line uses the market value of service cost divided by covered employee payroll. The gray line uses the reported value service cost divided by covered employee payroll.*

FIGURE 6 *Contributions as Percentage of Payroll, 2014–2023*



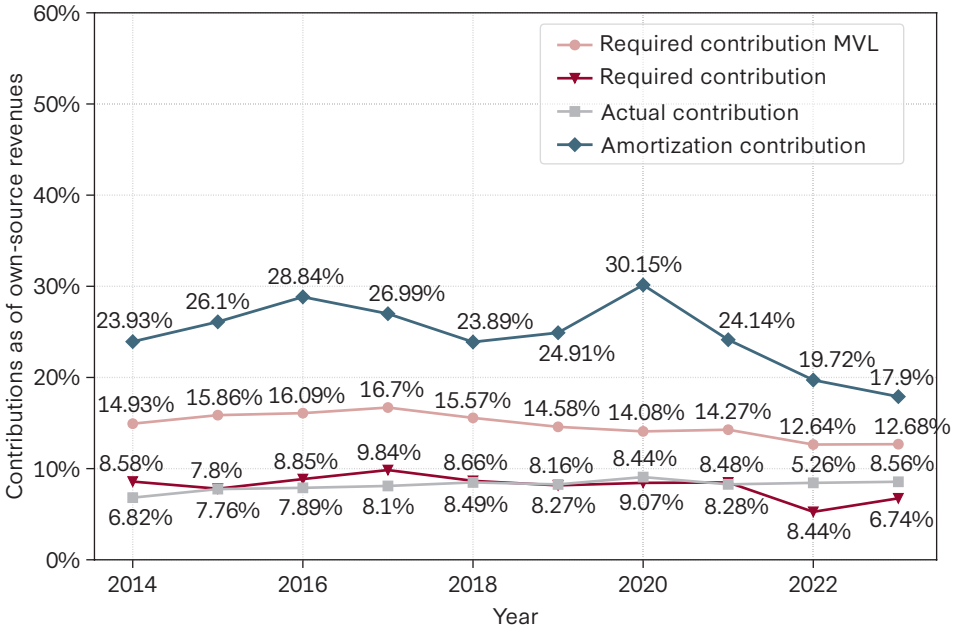
Notes: *The figure shows the actual contributions as a share of covered employee payroll for all local and state plans from 2014 to 2023. The time series is constructed by weighting the contribution as percentage of covered employee payroll ratio by the covered payroll.*

FIGURE 7 *Contribution Minus Service Cost as Percentage of Payroll*



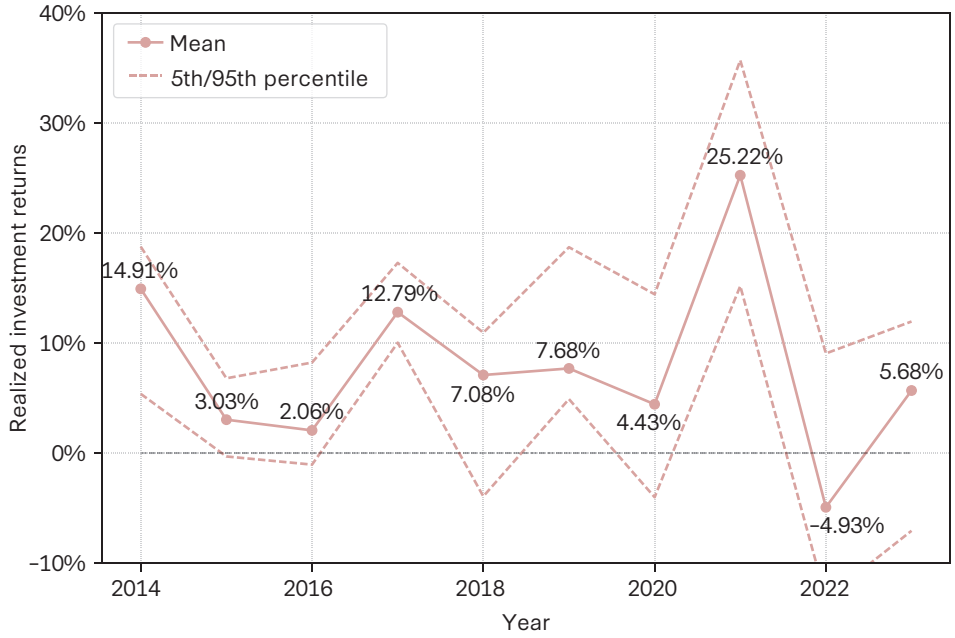
Notes: *The figure shows the actual contributions minus service cost as a share of covered employee payroll for all local and state plans from 2014 to 2023. The time series is constructed by weighting the service cost to covered employee payroll ratio by the covered payroll. The gray line uses the actual contributions minus the reported service cost divided by covered employee payroll. The pink line uses the actual contributions minus the market value of service cost divided by covered employee payroll.*

FIGURE 8 *Actual and Required Employer Contribution*

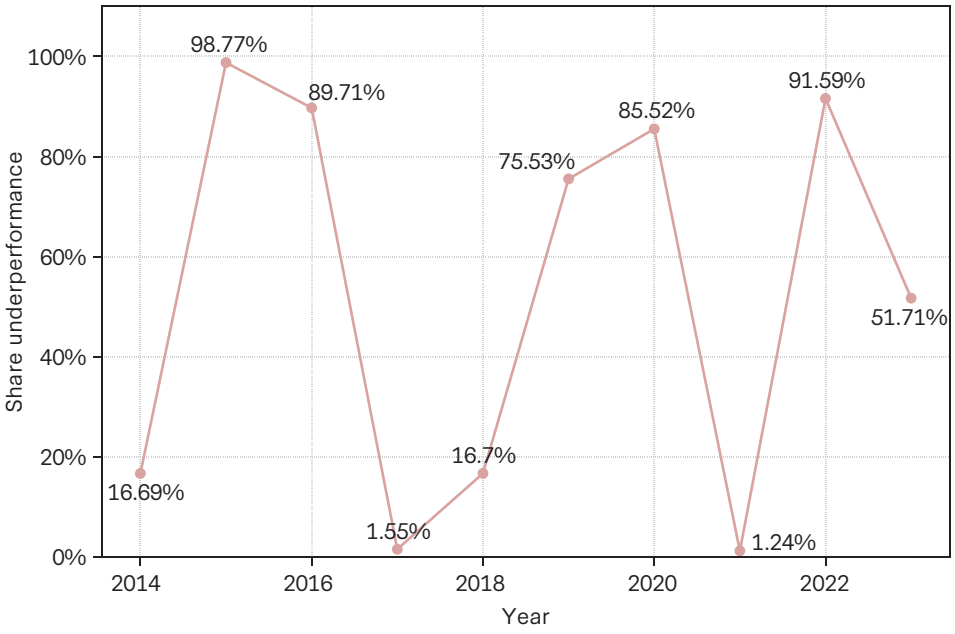


Notes: *The figure displays the actual contribution as a share of own-source revenues, the required contribution to keep the unfunded liability constant and the required contribution under market valuation to keep the unfunded liability constant for local, state and local, and state plans from 2014 to 2023. The time series is constructed by weighting the contribution to own-source revenue ratio by the own-source revenue of the entity.*

FIGURE 9 *Investment Returns*



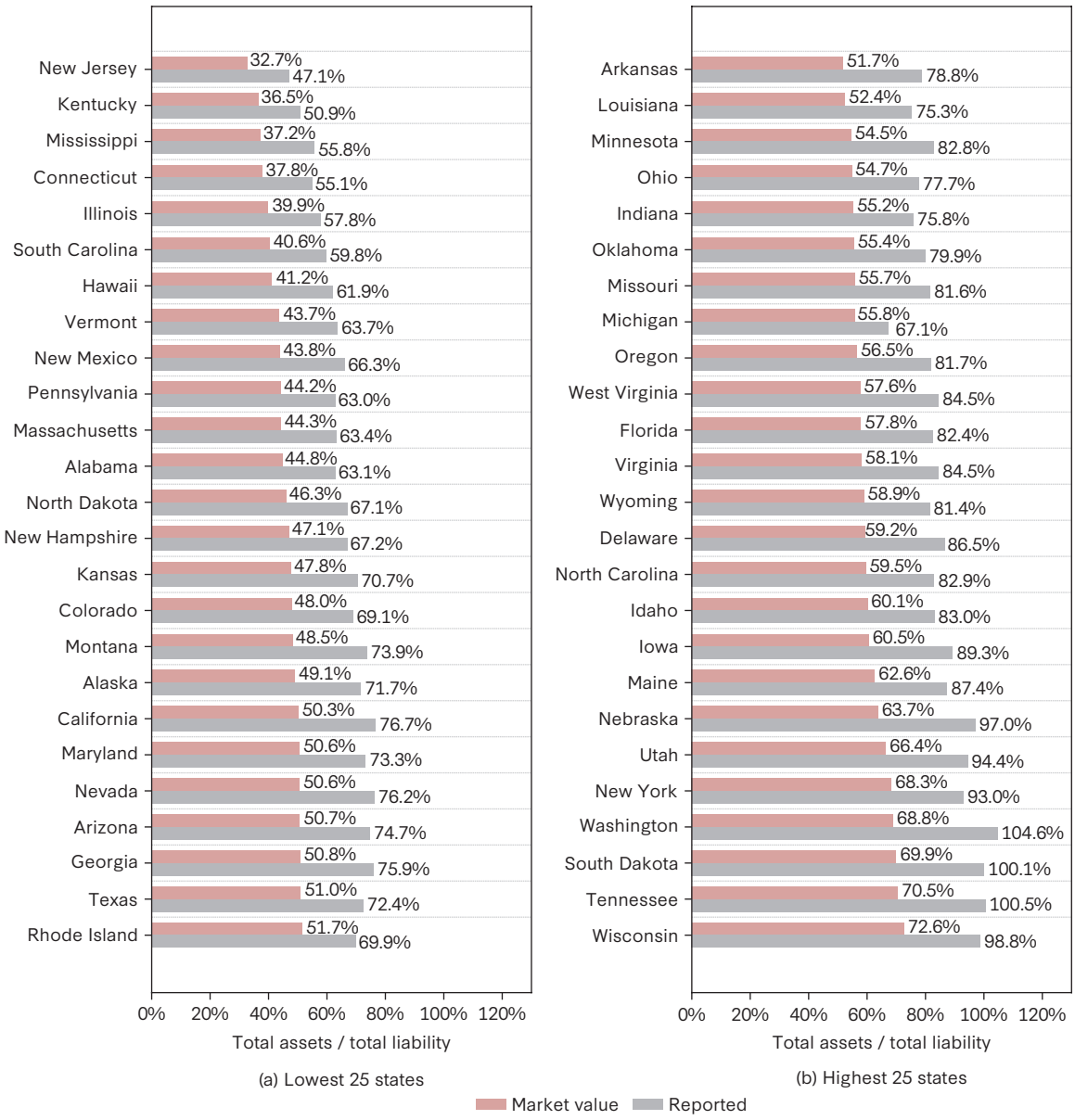
(a) Realized returns



(b) Share underperformance

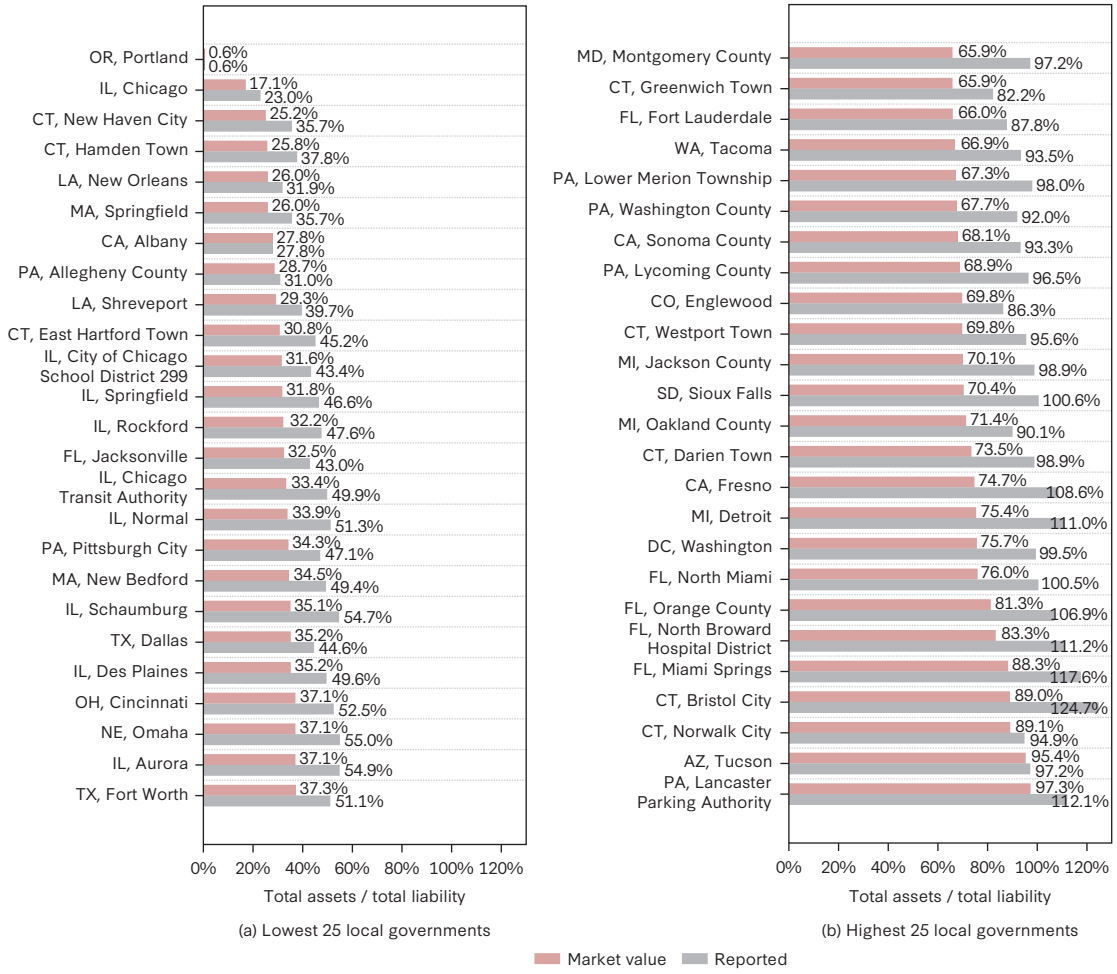
Notes: *Panel (a) displays the mean, the 5th and 95th percentile of the yearly realized investment returns for local, state, and local and state plans between 2014 to 2023. The time series is constructed by weighting the investment returns of each plan by the fiduciary net position (asset). Panel (b) plots the share of pension funds whose realized returns are below the assumed discount rates. The share represents the fiduciary net position (assets) weighted proportion of underperforming funds.*

FIGURE 10 *State Funding Ratio*



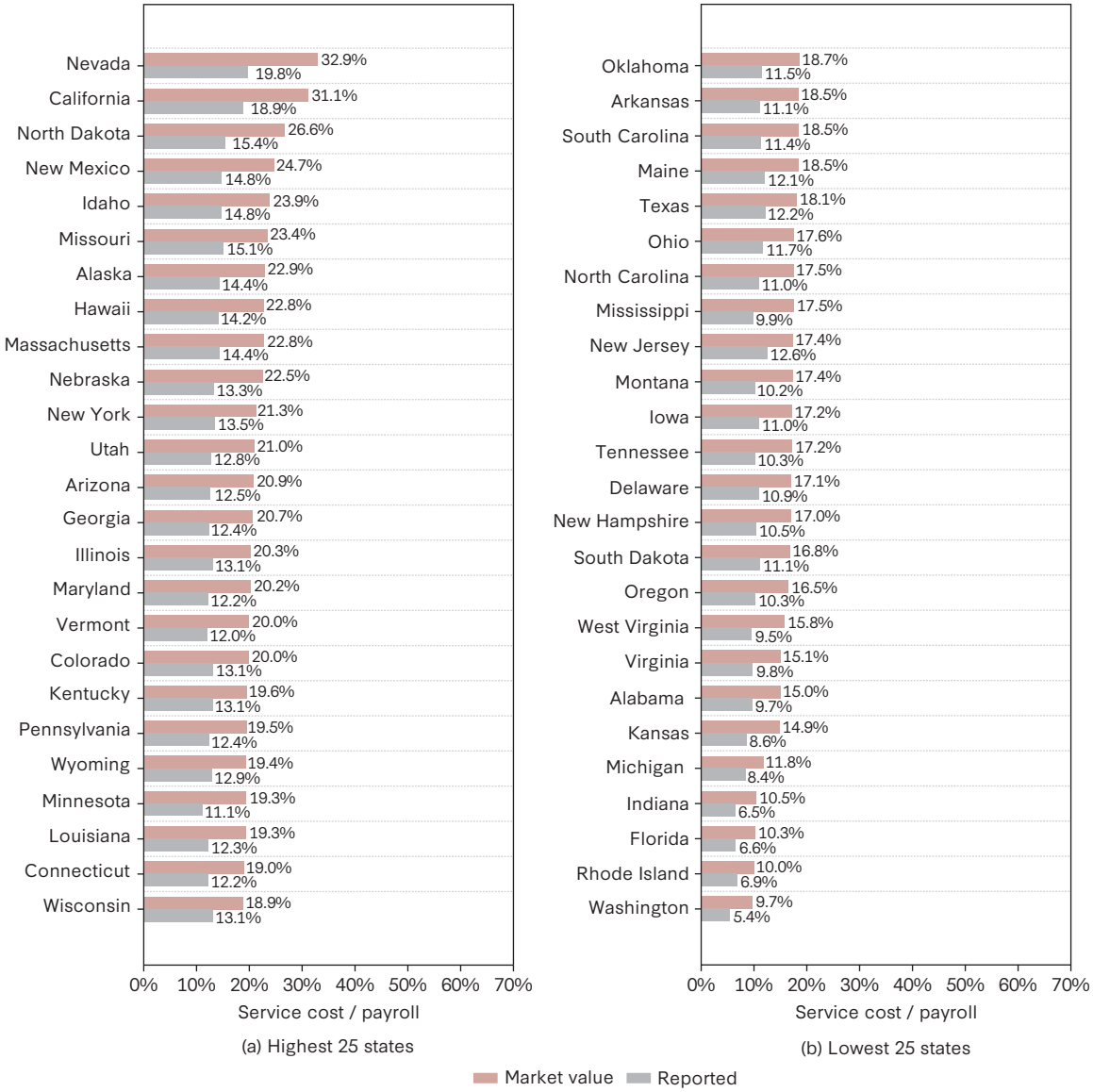
Notes: *Panel (a) plots the funding ratio for the 25 states with the lowest funding ratio under market values in 2023. Panel (b) plots the funding ratio for the 25 states with the highest funding ratio under market values. The pink bar represents the funding ratio, which is calculated as the ratio of the reported pension assets and the restated total pension liability under market values. The gray bar represents the reported funding ratio, which uses the ratio of reported total pension assets divided by reported total pension liability.*

FIGURE 11 *Local Government Funding Ratio*



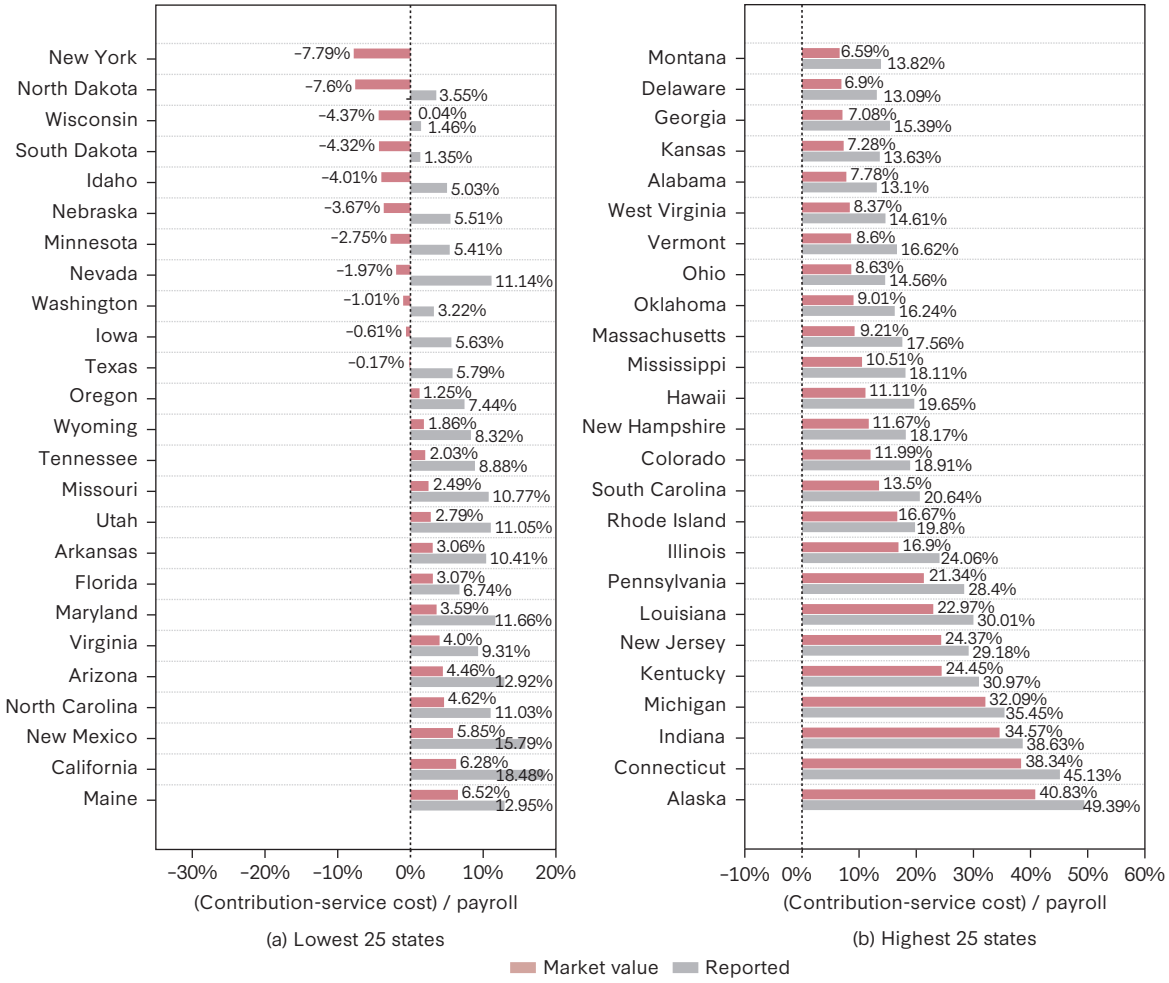
Notes: *Panel (a) plots the funding ratio for the 25 local governments with the lowest funding ratio under market values in 2023. Portland, OR, represents an outlier as benefits are paid directly by local property taxes. Panel (b) plots the funding ratio for the 25 local governments with the highest funding ratio under market values. The pink bar represents the funding ratio, which is calculated as the ratio of the reported pension assets and the restated total pension liability under market values. The gray bar represents the reported funding ratio, which uses the ratio of reported total pension assets divided by reported total pension liability.*

FIGURE 12 *State Service Cost as Percentage of Payroll*



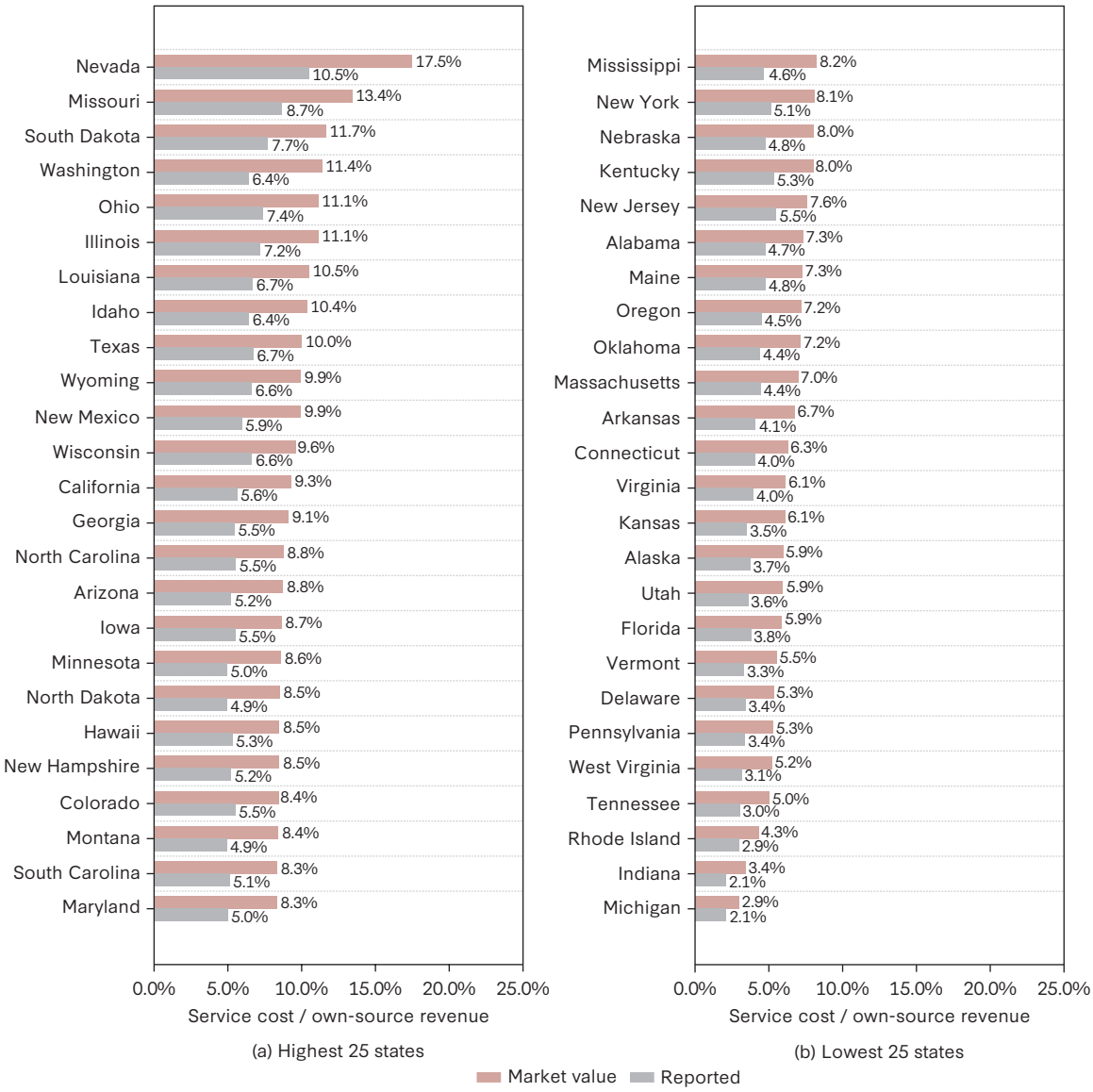
Notes: *Panel (a) plots the 25 states with the highest service cost as percent of payroll under market valuation in 2023. Panel (b) plots the 25 states with the lowest service cost as percent of payroll under market valuation. The reported service cost as a percent of payroll normalizes the service cost by the payroll paid in the current period. It provides a measure of newly accrued pension liability per unit of payroll. The market value of the service cost as a percent of payroll uses the market valuation of the service cost by restating the service cost using a zero-coupon Treasury yield curve instead of the reported discount rate.*

FIGURE 13 *State Contribution Minus Service Cost as Percentage of Payroll*



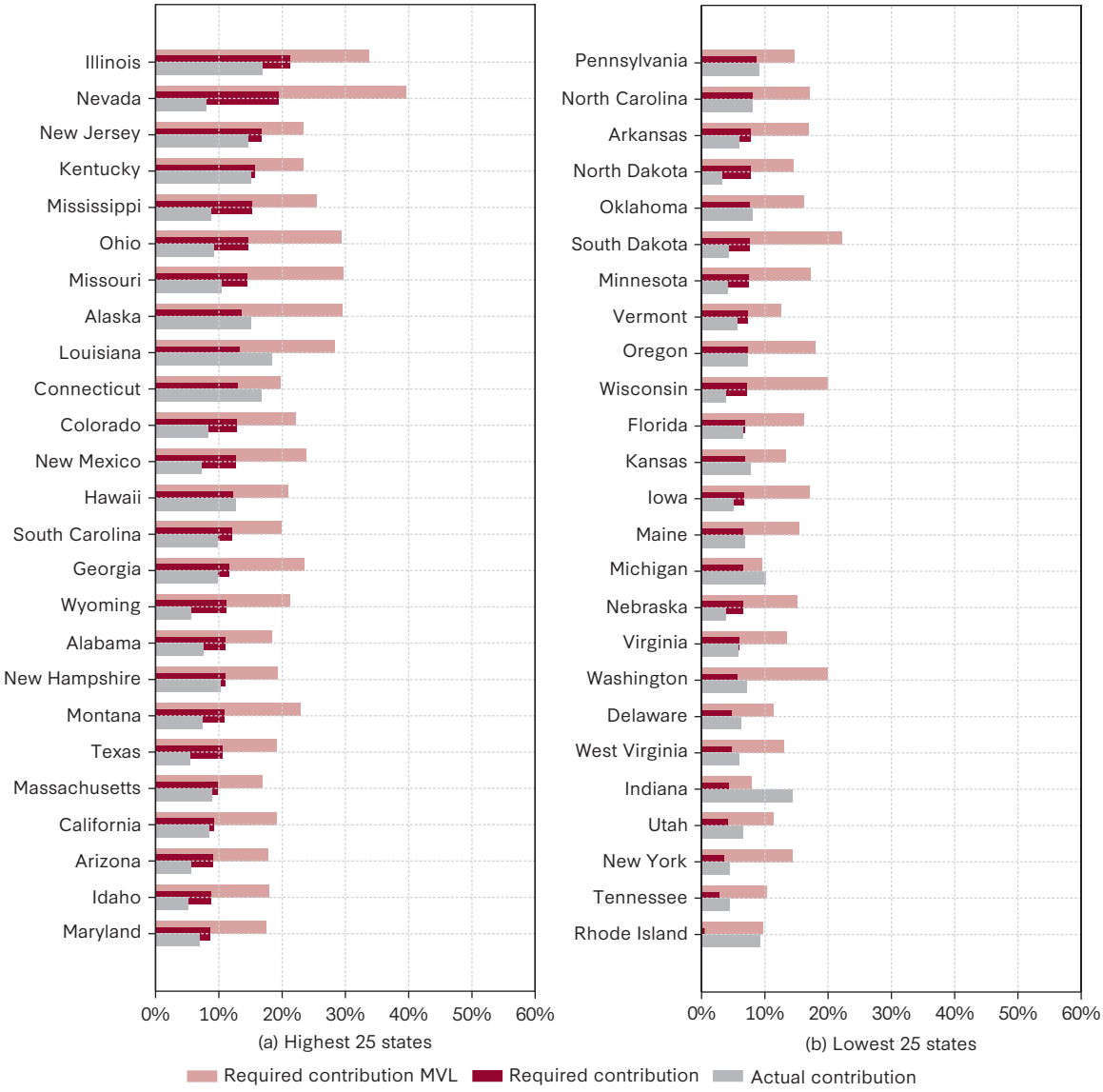
Notes: *Panel (a) plots the states with the lowest values of the contribution minus service cost as percent payroll under market valuation in 2023. Panel (b) plots the states with the highest 25 values of the same measure. Under the market valuation, I restate the value of the service cost using a zero-coupon Treasury yield curve instead of the reported discount rate.*

FIGURE 14 *State Service Cost as Percentage of Own-Source Revenue*



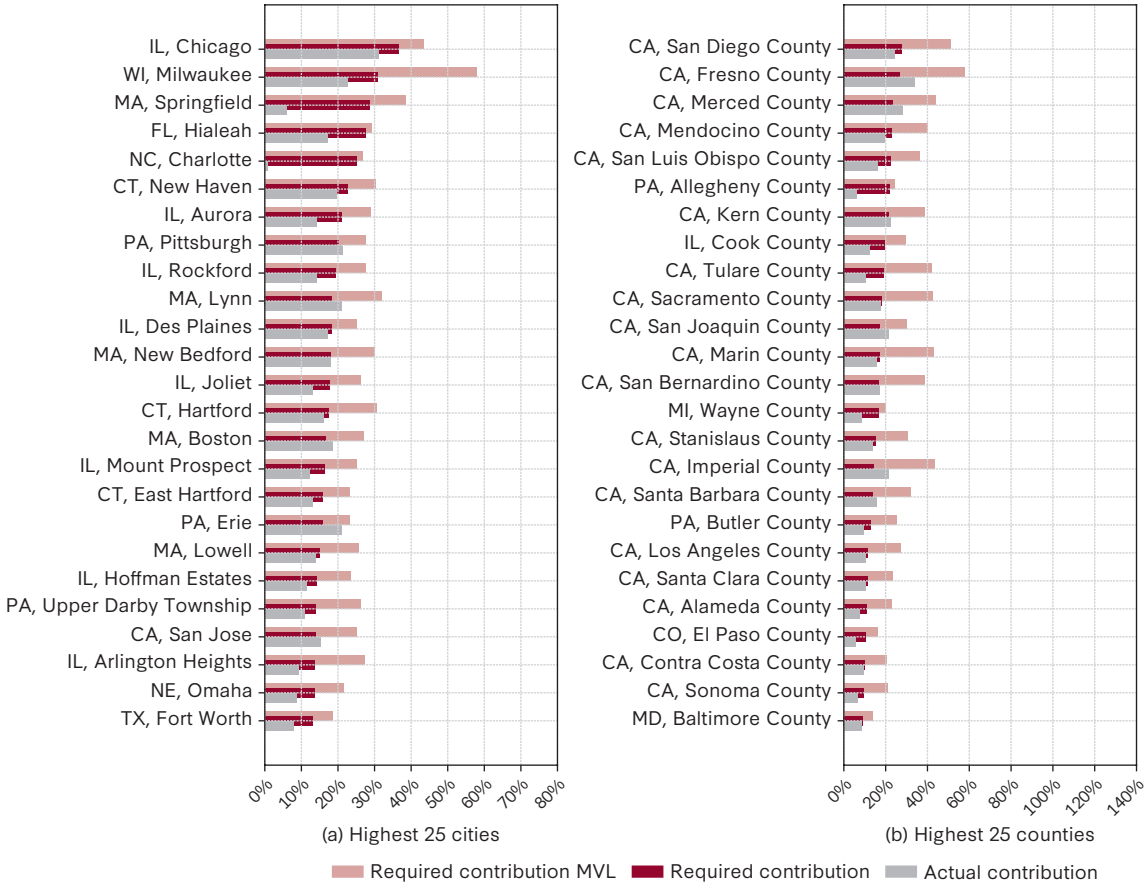
Notes: *Panel (a) displays the states with the highest service cost as a percent of own-source revenue under market valuation in 2023. Panel (b) shows the states with the lowest service cost as a percent of own-source revenue under market valuation. The market value of service cost as a percent of own-source revenue restates the service cost as a percent of own-source revenues by using a zero-coupon Treasury yield curve instead of the assumed discount rate.*

FIGURE 15 *Contribution as of Own-Source Revenue States*



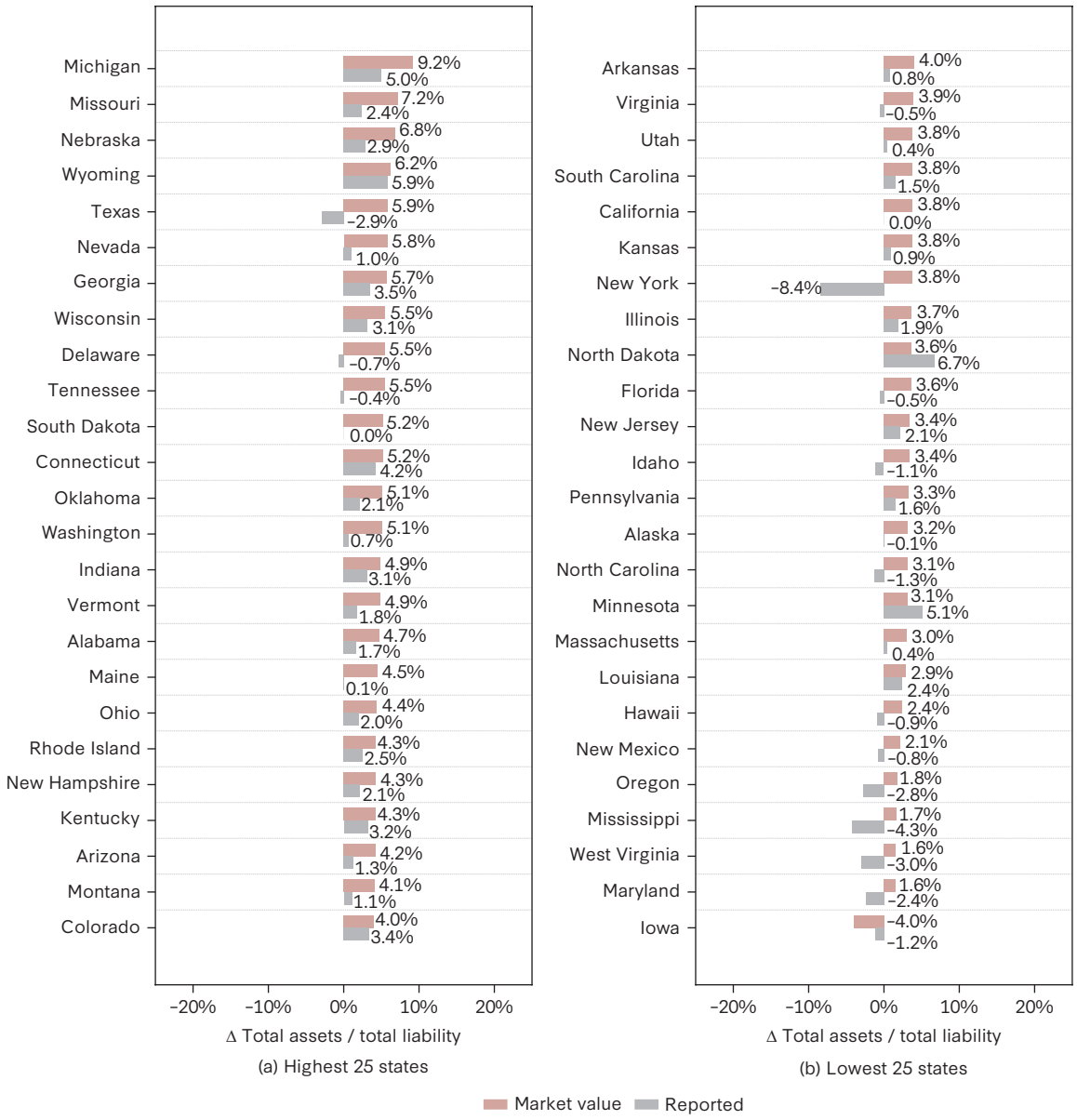
Notes: *Panel (a) displays the 25 states with the highest required contribution to prevent the unfunded liability from rising as of own-source revenue in fiscal year 2023. Panel (b) shows the 25 states with the lowest required contribution to prevent the unfunded liability from rising. The required contribution under market valuation restates the interest and service cost, as well as investment returns under a duration-matched zero-coupon Treasury yield curve instead of the stated discount rate.*

FIGURE 16 *Contribution Scenario Cities and Counties*



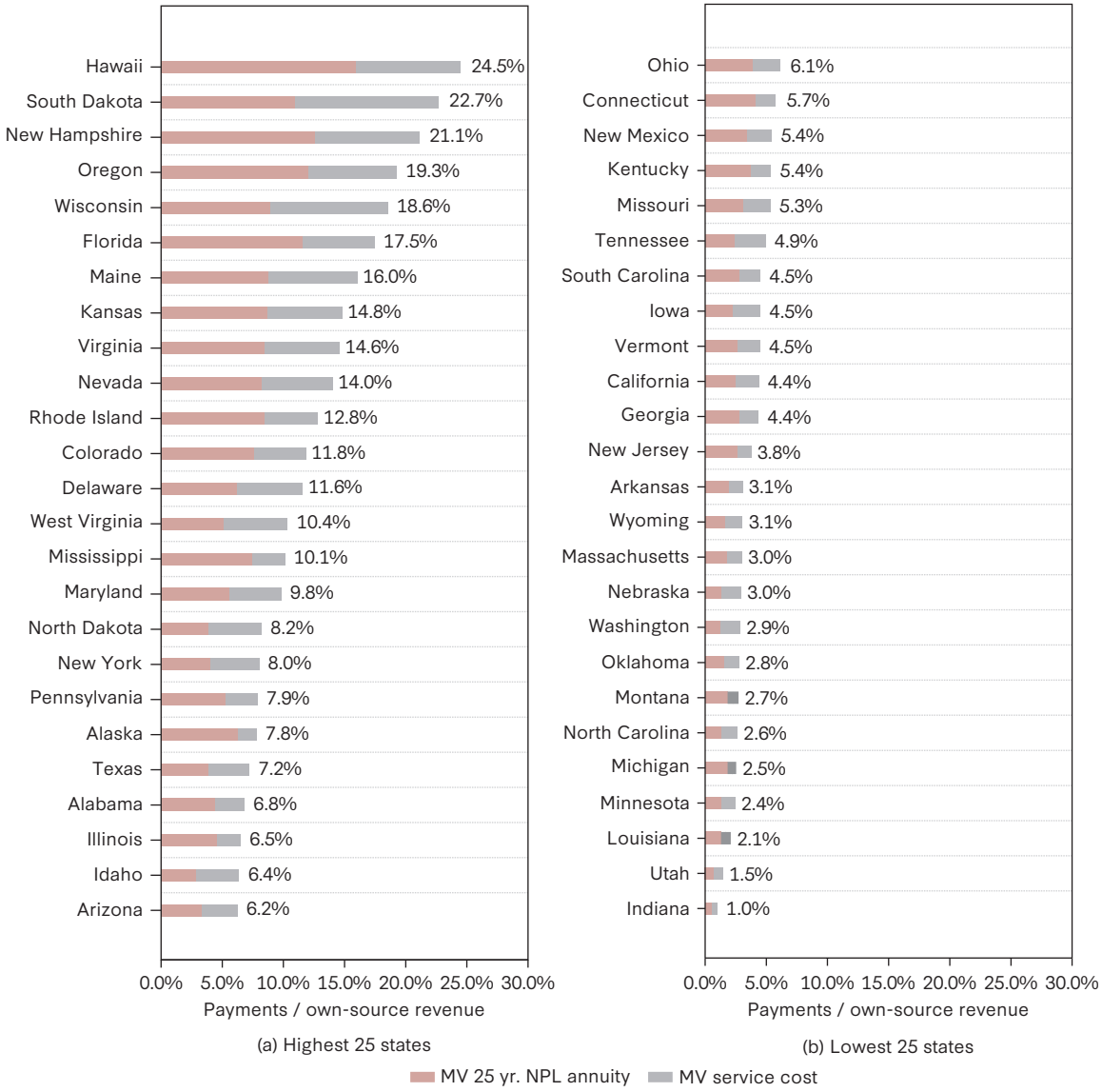
Notes: *Panel (a) displays the 25 cities with the highest required contribution to prevent the unfunded liability from rising as of own-source revenue in fiscal year 2023. Panel (b) shows the 25 counties with the highest required contribution to prevent the unfunded liability from rising. The required contribution under market valuation restates the interest and service cost, as well as investment returns under a duration-matched zero-coupon Treasury yield curve instead of the stated discount rate.*

FIGURE 17 *Change in State Funding Ratio, 2022–2023*



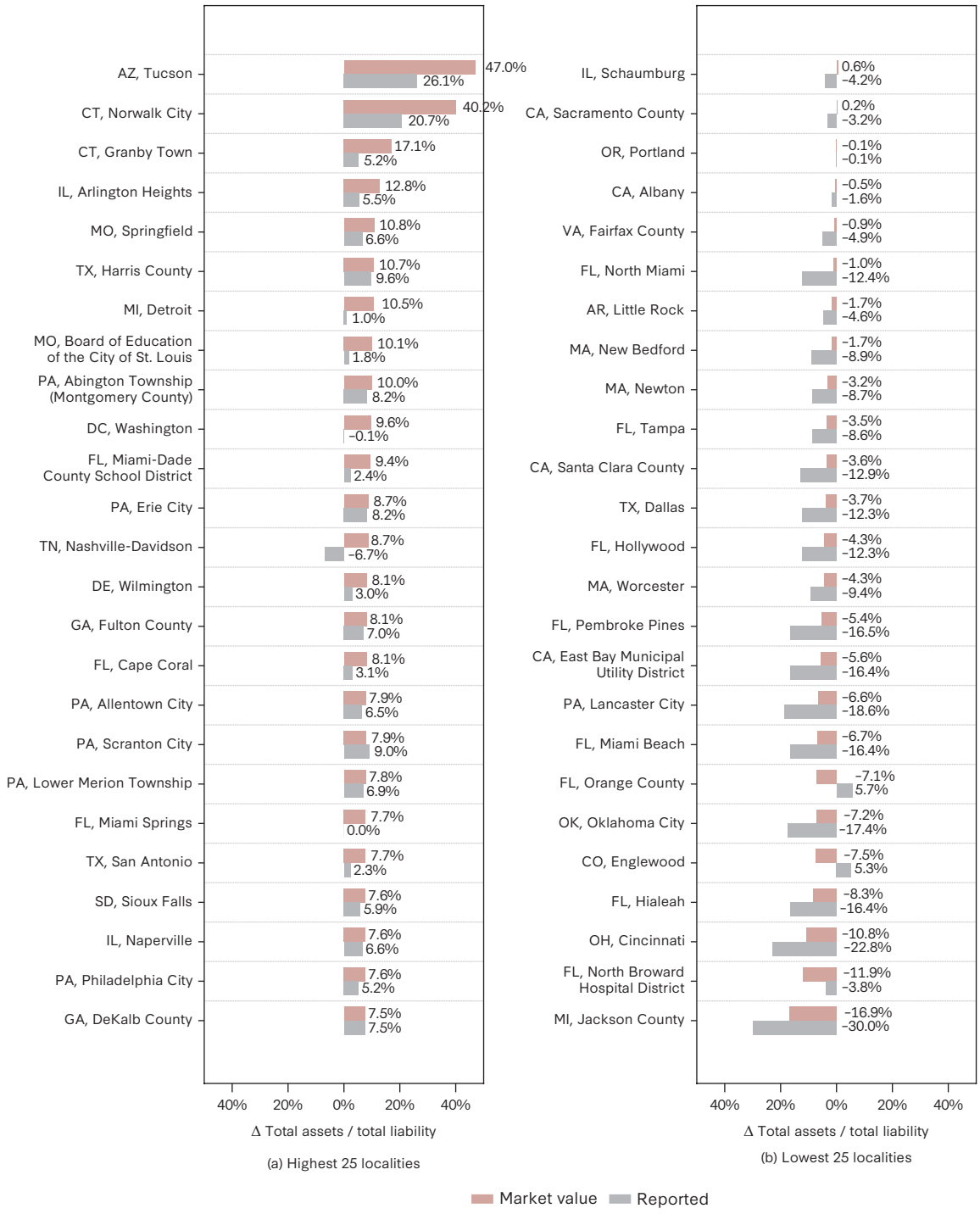
Notes: *Panel (a) displays the states with the largest change in the funding ratio based on market values between 2022 and 2023. Panel (b) displays the states with the smallest change in the funding ratio based on market values between 2022 and 2023. The funding ratio based on market values is computed using a zero-coupon Treasury yield curve instead of the assumed discount rate.*

FIGURE 18 *Annuitization of State NPL, Service Cost as Percentage of Payroll*



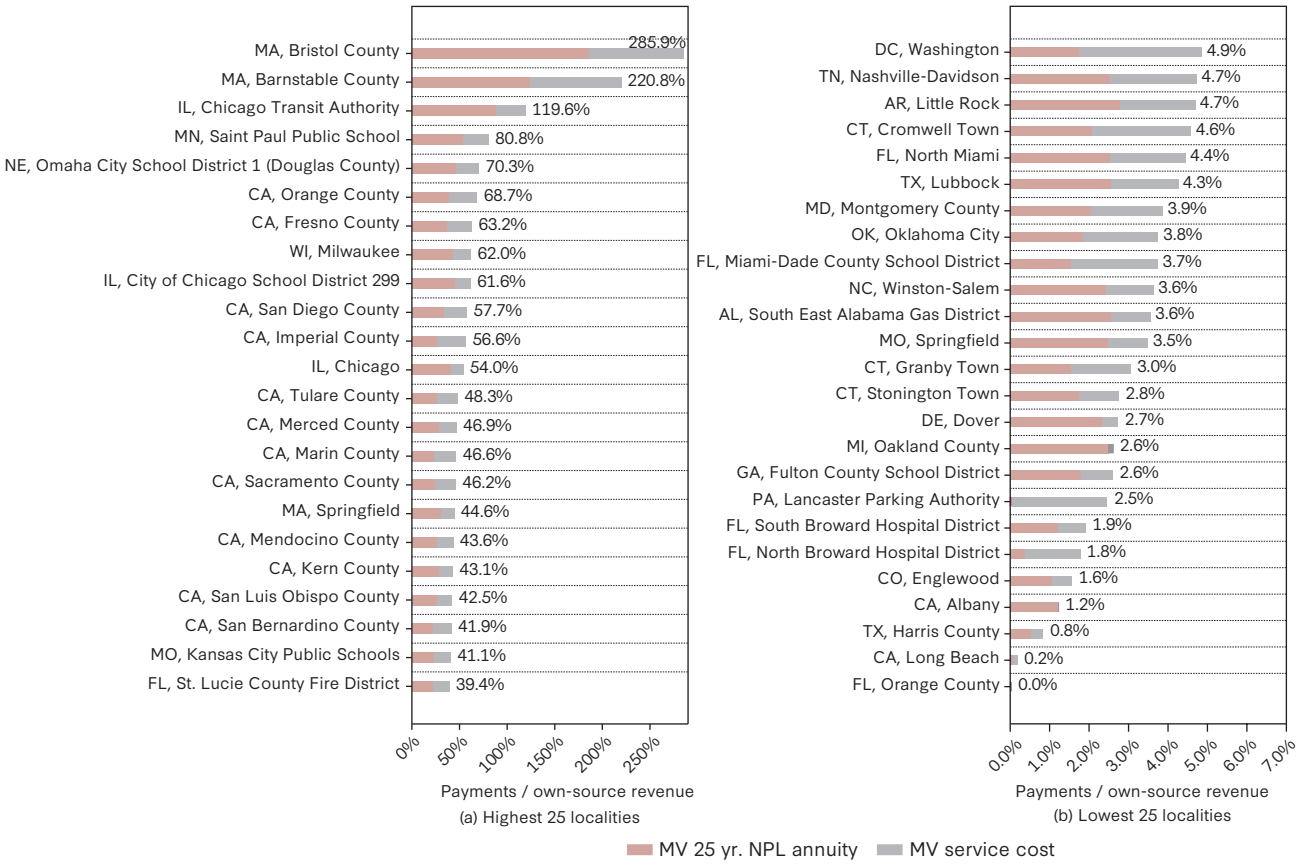
Notes: *Panel (a) displays the states with the lowest combined required payment for service cost and amortization of the unfunded pension obligation under market values in fiscal year 2023. Panel (b) displays the states with the largest combined required payment for service cost and amortization of the unfunded pension obligation under market values in fiscal year 2023. Market values are computed under the duration-matched Treasury yield instead of the assumed discount rate.*

FIGURE 19 *Change in Local Funding Ratio, 2022–2023*



Notes: *Panel (a) displays the local governments with the largest change in the funding ratio based on market values between 2022 and 2023. Panel (b) displays the local governments with the smallest change in the funding ratio based on market values between 2022 and 2023. The funding ratio based on market values is computed using a zero-coupon Treasury yield curve instead of the assumed discount rate.*

FIGURE 20 *Annuitization of Local NPL, Service Cost as Percentage of Payroll*



Notes: *Panel (a) displays the local governments with the largest combined required payment for service cost and amortization of the unfunded pension obligation under market values in fiscal year 2023. Panel (b) displays the local governments with the lowest combined required payment for service cost and amortization of the unfunded pension obligation under market values in fiscal year 2023. Market values are computed under the duration-matched Treasury yield instead of the assumed discount rate.*

APPENDIX

DETAILS ON REVALUATION AND ADDITIONAL CONTRIBUTIONS

$$TPL_t = TPL_{t-1} + Service\ Cost_t + Interest\ Cost_t - Benefits\ Paid_t + All\ Other\ Adjustments$$

$$Assets\ (FNP)_t = Assets\ (FNP)_{t-1} + Employer\ Contribution_t + Member\ Contribution_t + Other\ Contribution_t + Net\ Investment\ Income_t - Benefits\ Paid_t - Administrative\ Expenses_t + Transfers\ Among\ Employers\ and\ All\ Other\ Adjustments$$

$$NPL_t = TPL_t - Assets_t$$

$$Required\ Additional\ Contribution\ Under\ Assumed\ Return_t = (Service\ Cost_t + Interest\ Cost_t) - (Employer\ Contribution_t + Member\ Contribution_t + Other\ Contribution_t) - Assumed\ Return\% * FNP_{t-1}$$

$$Required\ Additional\ Contribution\ Under\ MVL_t = (Service\ Cost^*_t + Interest\ Cost^*_t) - (Employer\ Contribution_t + Member\ Contribution_t + Other\ Contribution_t) - R' * FNP_{t-1}$$

where R' is the duration-matched Treasury yield and $Service\ Cost^*_t$ and $Interest\ Cost^*_t$ is the service cost and interest cost under market valuation, respectively.

$$Annuitization\ Cost^*_{t,\ 25\ years} = Service\ Cost^*_t + Annuitization\ Payment^*_{t,\ 25\ years}$$

$$Annuitization\ Payment^*_{t,\ 25\ years} = \frac{NPL^*_t * R'}{1 - (1+R')^{-25}}$$

$$Duration = \frac{TPL_{R+1\%} - TPL_{R-1\%}}{2 * TPL_R}$$

$$Convexity = \frac{TPL_{R+1\%} + TPL_{R-1\%} - 2 * TPL_R}{TPL_R * (0.01)^2}$$

$$TPL_{R'} = -Duration * \Delta R + 0.5 * Convexity * (\Delta R)^2$$

where $\Delta R = (R' - R)$

PENSION PLAN

TABLE A PENSION PLAN LIST

Pension plan	Pension plan
AK, State of Alaska Judicial Retirement System	AZ, Corrections Officer Retirement Plan
AK, State of Alaska National Guard and Naval Militia Retirement System	AZ, Elected Officials' Retirement Plan
AK, State of Alaska Public Employees' Retirement System	AZ, Tucson Supplemental Retirement System
AK, State of Alaska Teachers' Retirement System	CA, Alameda County Employees' Retirement Association
AL, Birmingham Firemen's and Police Supplemental Pension System	CA, Albany Police and Fire Relief Fund
AL, Birmingham Retirement and Relief Plan	CA, CalPERS: Public Employees' Retirement Fund B (schools)
AL, Employees' Retirement System of Alabama	CA, CalPERS: Public Employees' Retirement Fund C (small agencies)
AL, Judicial Retirement Fund	CA, California State Teachers' Retirement System (CalSTRS)
AL, Southeast Alabama Gas District Pension Plan	CA, City of Concord Retirement System Plan
AL, Teachers' Retirement System of Alabama	CA, City of Fresno Employees Retirement System
AR, Arkansas Judicial Retirement System	CA, City of Fresno Fire and Police Retirement System
AR, Arkansas Local Police and Fire Retirement System	CA, City of Oakland Police and Fire Retirement System
AR, Arkansas Public Employees' Retirement System	CA, City of Pasadena Fire and Police Retirement System
AR, Arkansas State Highway Employees' Retirement System	CA, City of San José Federated City Employees' Retirement System
AR, Arkansas State Police Retirement System	CA, City of San José Police and Fire Department Retirement Plan
AR, Arkansas Teacher Retirement System	CA, Contra Costa County Employees' Retirement Association
AR, Fayetteville Policemen's Retirement System	CA, East Bay Municipal Utility District Employees' Retirement Plan
AR, Little Rock 2014 Defined Benefit	CA, Fresno County Employees' Retirement Association
AR, Little Rock City Firemen's Relief and Pension Fund	CA, Imperial County Employees' Retirement System
AR, Little Rock City Police Pension and Relief Fund	CA, Judges' Retirement Fund
AR, Little Rock Non-Uniform Employees Defined Benefit Plan	CA, Judges' Retirement Fund II
AZ, Arizona State Retirement System	
AZ, City of Phoenix Employees' Retirement System	

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
CA, Kern County Employees' Retirement Association	CA, San Bernardino County Employees' Retirement Association
CA, Legislators' Retirement Fund	CA, San Diego City Employees' Retirement System—City of San Diego
CA, Long Beach Public Transportation Company Employees' Retirement System	CA, San Diego City Employees' Retirement System—Regional Airport Authority
CA, Los Angeles City Employees' Retirement System	CA, San Diego City Employees' Retirement System—Unified Port District
CA, Los Angeles City Fire and Police Pension System	CA, San Diego County Employees Retirement Association
CA, Los Angeles City Water and Power Employees' Retirement Plan	CA, San Francisco Employees' Retirement System
CA, Los Angeles County Employees Retirement Association	CA, San Joaquin County Employees' Retirement Association
CA, Marin County Employees' Retirement Association	CA, San Luis Obispo County Pension Trust
CA, Mendocino County Employees' Retirement Association	CA, San Mateo County Employees' Retirement Association
CA, Merced County Employees' Retirement Association	CA, Santa Barbara County Employees' Retirement System
CA, Orange County Employees Retirement System	CA, Santa Clara Amalgamated Transit Union Pension Plan
CA, Public Employees' Retirement Fund Plans (California Highway Patrol)	CA, Santa Clara County Central Fire Safety Plan
CA, Public Employees' Retirement Fund Plans (State Industrial)	CA, Santa Clara County Housing Authority Miscellaneous Plan
CA, Public Employees' Retirement Fund Plans (State Miscellaneous)	CA, Santa Clara County Miscellaneous Plan
CA, Public Employees' Retirement Fund Plans (State Peace Officers and Firefighters)	CA, Santa Clara County Safety Plan
CA, Public Employees' Retirement Fund Plans (State Safety)	CA, Sonoma County Employees' Retirement Association
CA, Richmond Garfield Pension Plan	CA, Stanislaus County Employees' Retirement Association
CA, Richmond General Pension Plan	CA, Tulare County Employees' Retirement Association
CA, Richmond Police and Firemen's Pension Plan	CA, University of California Retirement Plan
CA, Sacramento City Employees' Retirement System	CA, Ventura County Employees' Retirement Association
CA, Sacramento County Employees' Retirement System	CO, Adams County Retirement Plan
	CO, Board of Water Commissioners Retirement Plan Trust Fund

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
CO, City of Aurora General Employees' Retirement Plan	CT, City of Middletown Employees' Pension Plan
CO, City of Boulder Fire Pension Fund	CT, City of Norwich Retirement System—City Employees
CO, City of Boulder Police Pension Fund	CT, City of Norwich Retirement System—Volunteer Fire
CO, City of Longmont Employee Pension Plan	CT, City of Torrington Employee Retirement Plan—Municipal Employees
CO, City of Longmont Fire Pension Plan	CT, City of Torrington Employee Retirement Plan—Police and Fire
CO, City of Longmont Police Pension Plan	CT, Cromwell Town Retirement Plan
CO, Colorado Public Employees' Retirement Association—Denver Public Schools Division	CT, East Hartford Town Retirement System
CO, Colorado Public Employees' Retirement Association—Judicial Division	CT, Granby Town Pension Plan
CO, Colorado Public Employees' Retirement Association—Local Government Division	CT, Greenwich Town Employee Retirement Plan
CO, Colorado Public Employees' Retirement Association—School Division	CT, Judicial Retirement System
CO, Colorado Public Employees' Retirement Association—State Division	CT, Milford Retirement System
CO, Denver Employees Retirement Plan	CT, Municipal Employees' Retirement System
CO, El Paso County Retirement Plan	CT, New Britain Fire Pension Fund
CO, Englewood City Employees Pension System—Non-Emergency Pension Plan	CT, New Britain Police Pension Fund
CO, Fire and Police Pension Association of Colorado—Colorado Springs New Hire Plan (Fire)	CT, New Haven City Employees' Retirement Plan
CO, Fire and Police Pension Association of Colorado—Colorado Springs New Hire Plan (Police)	CT, New Haven Police and Firemen Retirement Plan
CO, Fire and Police Pension Association of Colorado—Statewide Defined Benefit Plan	CT, Norwalk Employees' Pension Plan
CT, Cheshire Fire Department Retirement Plan	CT, Norwalk Fire Benefit Fund
CT, Cheshire Police Department Retirement Plan	CT, Norwalk Food Service Employees' Fund
CT, Cheshire Town Retirement Plan	CT, Norwalk Police Benefit Fund
CT, City of Bristol Retirement System	CT, Stamford Classified Employees' Retirement Fund
CT, City of Hartford Municipal Employees' Retirement Fund	CT, Stamford Custodians' and Mechanics' Retirement Fund
CT, City of Hartford RAF/PBF/FRF Plan	CT, Stamford Firefighters' Pension Trust
	CT, Stamford Policemen's Pension Trust
	CT, State Employees' Retirement System
	CT, Teachers' Retirement System
	CT, Town of Darien Police Pension Fund

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
CT, Town of Darien Town Pension Plan	DE, Delaware Public Employees' Retirement System—County and Municipal Other Employees' Plan
CT, Town of Fairfield Employees' Retirement Plan	DE, Delaware Public Employees' Retirement System—Delaware Volunteer Firemen's Fund
CT, Town of Fairfield Police and Firemen's Retirement Plan	DE, Delaware Public Employees' Retirement System—Diamond State Port Corporation Plan
CT, Town of Farmington Town Pension Plan	DE, Delaware Public Employees' Retirement System—Judiciary Pension Plans
CT, Town of Groton Retirement Fund—Town and Board of Education	DE, Delaware Public Employees' Retirement System—New State Police Plan
CT, Town of Hamden Retirement Pension Trust	DE, Delaware Public Employees' Retirement System—Special Fund
CT, Town of Stonington Employees' Pension Plan	DE, Delaware Public Employees' Retirement System—State Employees' Plan
CT, Town of West Hartford Retirement System	FL, City of Cape Coral Municipal Firefighters' Pension Plan
CT, Waterbury Retirement System	FL, City of Cape Coral Municipal General Employees' Pension Plan
CT, Fire Pension Fund of the Town of Westport	FL, City of Cape Coral Municipal Police Officers' Pension Plan
CT, Police Pension Fund of the Town of Westport	FL, City of Hialeah Elected Officials' Retirement System
CT, Westport Town Pension Fund	FL, City of Hialeah Employees' Retirement System
CT, Westport Town Public Works Employees' Pension Fund	FL, City of Jacksonville Corrections Officers Pension Plan
CT, Westport Non-Union and Non-Supervisor Employees' Pension Fund	FL, City of Jacksonville General Employees Retirement Plan
DC, Washington DC Police Officers' and Firefighters' Retirement Fund	FL, City of Jacksonville Police and Fire Pension Fund
DC, Washington DC Teachers' Retirement Fund	FL, City of Miami Elected Officers' Retirement Trust
DE, City of Dover General Employee Pension Plan	FL, City of Miami Firefighters' and Police Officers' Retirement Fund
DE, City of Dover Police Pension Plan	FL, City of Miami General Employees' and Sanitation Employee's Excess Benefit Plan
DE, City of Wilmington Firefighters' Pension Fund	FL, City of Miami General Employees' and Sanitation Employees' Retirement Fund
DE, City of Wilmington Plan I Non-Uniformed	
DE, City of Wilmington Plan II Non-Uniformed	
DE, City of Wilmington Plan III Non-Uniformed	
DE, City of Wilmington Police Pension Fund	
DE, Delaware Public Employees' Retirement System—County and Municipal Police and Firefighters' Plans	
DE, Delaware Public Employees' Retirement System—Closed State Police Plan	

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
FL, City of Miami General Employees' and Sanitation Employees' Staff Trust Plan	FL, Miami-Dade County Public Health Trust Defined Benefit Retirement Plan
FL, City of Miami Springs General Employees' Retirement System	FL, North Broward Hospital District Defined Benefit Pension Plan
FL, City of Miami Springs Police and Firefighters' Retirement System	FL, North Miami Clair T. Singerman Employees' Retirement System
FL, City of St. Petersburg Employees' Retirement System	FL, North Miami Police Pension Plan
FL, City of St. Petersburg Firefighters' Retirement System	FL, Orange County Library District General Retirement System
FL, City of St. Petersburg Police Officers' Retirement System	FL, Orlando Firefighter Pension Fund
FL, City of Tallahassee Pension Plan for Firefighters	FL, Orlando General Employees' Pension Fund
FL, City of Tallahassee Pension Plan for General Employees	FL, Orlando Police Pension Fund
FL, City of Tallahassee Pension Plan for Police Officers	FL, Pembroke Pines City Pension Fund for Firefighters and Police Officers
FL, City of Tampa General Employees' Pension Plan	FL, Pembroke Pines General Employees Pension Plan
FL, City of Tampa Pension Fund for Firemen and Policemen	FL, Retirement Plan for General Employees of the City of North Miami Beach
FL, Florida Retirement System Pension Plan	FL, Retirement System for General Employees of the St. Lucie County Fire District
FL, Fort Lauderdale General Employees' Retirement System	FL, South Broward Hospital District General Employee Pension Plan
FL, Fort Lauderdale Police and Firefighters' Retirement System	FL, St. Lucie County Fire District Firefighters' Pension Trust Fund
FL, City of Hollywood Firefighters' Pension System	GA, Atlanta Firefighters' Pension Fund
FL, City of Hollywood General Employees' Pension Plan	GA, Atlanta General Employees' Pension Fund
FL, City of Hollywood Police Officers' Retirement System	GA, Atlanta Policemen's Pension Fund
FL, Miami Beach Employees' Retirement System	GA, Augusta City 1945 Pension Plan
FL, Miami Beach Retirement System for Firefighters and Police Officers	GA, Augusta City General Retirement Plan
FL, Miami Department of Off-Street Parking Retirement Plan	GA, DeKalb County Pension Plan
	GA, Employees' Retirement System of Georgia
	GA, Fulton County Employees' Retirement System
	GA, Fulton County School Employees' Pension Fund

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
GA, Georgia Firefighters' Pension Fund	IL, City of Rockford Police Pension Fund
GA, Georgia Judicial Retirement System	IL, City of Springfield Firefighters' Pension Plan
GA, Georgia Military Pension Fund	IL, City of Springfield Police Pension Plan
GA, Legislative Retirement System	IL, Cook County Employees' and Officers' Annuity and Benefit Fund
GA, Macon County General Employees' Pension Plan (Closed to new entrants from 2014)	IL, Des Plaines Firefighters' Pension Fund
GA, Macon-Bibb County Employee Pension Plan	IL, Des Plaines Police Pension Fund
GA, Macon-Bibb County Fire and Police Pension Plan	IL, General Assembly Retirement System
GA, Peace Officers' Annuity and Benefit Fund of Georgia	IL, Hoffman Estates Firefighters' Pension Plan
GA, Public School Employees' Retirement System	IL, Hoffman Estates Police Pension Fund
GA, Teachers' Retirement System of Georgia	IL, Illinois Municipal Retirement Fund
HI, Employees' Retirement System of the State of Hawaii	IL, Illinois Teachers' Retirement System
IA, Iowa Judicial Retirement System	IL, Judges' Retirement System of Illinois
IA, Iowa Public Employees' Retirement System	IL, Metropolitan Water Reclamation District Retirement Fund
IA, Municipal Fire and Police Retirement System of Iowa	IL, Public School Teachers' Pension and Retirement Fund of Chicago
IA, Peace Officers' Retirement, Accident and Disability System	IL, Retirement Plan for Chicago Transit Authority Employees
ID, Firefighters' Retirement Fund	IL, State Employees' Retirement System of Illinois
ID, Judges' Retirement Fund	IL, State Universities Retirement System
ID, Public Employee Retirement System of Idaho	IL, The Firemen's Annuity and Benefit Fund of Chicago
IL, City of Aurora Firefighters' Pension Fund	IL, The Laborers' and Retirement Board Employees' Annuity and Benefit Fund of Chicago
IL, City of Aurora Police Pension Fund	IL, The Municipal Employees' Annuity and Benefit Fund of Chicago
IL, City of Evanston Fire Pension Fund	IL, The Policemen's Annuity and Benefit Fund of Chicago
IL, City of Evanston Police Pension Fund	IL, Tinley Park Police Pension System
IL, City of Joliet Firefighters' Pension Plan	IL, Town of Normal Firefighter's Pension Plan
IL, City of Joliet Police Pension Plan	IL, Town of Normal Police Pension Plan
IL, City of Naperville Firefighters' Pension Fund	IL, Village of Arlington Firefighters' Pension Plan
IL, City of Naperville Police Pension Fund	IL, Village of Arlington Police Pension Plan
IL, City of Rockford Firefighters' Pension Fund	

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
IL, Village of Mount Prospect Firefighters' Pension Fund	KY, Kentucky State Police Retirement System
IL, Village of Mount Prospect Police Pension Fund	KY, Kentucky Teachers' Retirement System
IL, Village of Orland Park Police Pension Fund	KY, Legislators' Retirement Plan
IL, Village of Schaumburg Firefighters' Pension Fund	LA, City of New Orleans Employees' Retirement System
IL, Village of Schaumburg Police Pension Fund	LA, Employees' Retirement System of the City of Baton Rouge and Parish of East Baton Rouge—CPERS
IN, 1977 Police Officers' and Firefighters' Pension and Disability Fund	LA, Employees' Retirement System of the City of Baton Rouge and Parish of East Baton Rouge—Police Guarantee Trust
IN, City of Indianapolis Firefighters' Pre-1977 Plan	LA, Firefighters' Pension and Relief Fund of the City of New Orleans—New System
IN, City of Indianapolis Police Pre-1977 Plan	LA, Firefighters' Pension and Relief Fund of the City of New Orleans—Old System
IN, Judges' Retirement System	LA, Firefighters' Retirement System of Louisiana
IN, Legislators' Defined Benefit Plan	LA, Louisiana Assessors' Retirement Fund
IN, Prosecuting Attorneys' Retirement Fund	LA, Louisiana Clerks' of Court Retirement and Relief Fund
IN, Public Employees' Retirement Fund	LA, Louisiana District Attorneys' Retirement System
IN, State Excise Police, Gaming Agent, Gaming Control Officer and Conservation Enforcement Officers' Retirement Plan	LA, Louisiana School Employees' Retirement System
IN, State Police Retirement Fund	LA, Louisiana Sheriffs Pension and Relief Fund
IN, Teachers' Retirement Fund 1996 Account	LA, Louisiana State Employees' Retirement System
IN, Teachers' Retirement Fund Pre-1996 Account	LA, Louisiana State Police Retirement System
KS, Kansas Public Employees Retirement System	LA, Municipal Employees' Retirement System of Louisiana—Plan A
KS, Wichita Employees' Retirement System	LA, Municipal Employees' Retirement System of Louisiana—Plan B
KS, Wichita Police and Fire Retirement System	LA, Municipal Police Employees' Retirement System
KY, Judicial Retirement Plan	LA, Parochial Employees' Retirement System of Louisiana—Plan A
KY, Kentucky County Employees Retirement System—Hazardous	LA, Parochial Employees' Retirement System of Louisiana—Plan B
KY, Kentucky County Employees Retirement System—Nonhazardous	
KY, Kentucky Employees Retirement System—Hazardous	
KY, Kentucky Employees Retirement System—Nonhazardous	

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
LA, Registrar of Voters Employees' Retirement System for the State of Louisiana	MD, Anne Arundel County Employees' Retirement Plan
LA, City of Shreveport Employees' Retirement System	MD, Anne Arundel County Fire Service Retirement Plan
LA, City of Shreveport Firemen's Pension Relief Fund	MD, Anne Arundel County Police Service Retirement Plan
LA, City of Shreveport Police Pension Relief Fund	MD, City of Baltimore Elected Officials' Retirement System
LA, Teachers' Retirement System of Louisiana	MD, City of Baltimore Employees' Retirement System
MA, Barnstable County Retirement Association	MD, City of Baltimore Fire and Police Employees' Retirement System
MA, Boston Retirement System	MD, Employees Retirement System of Baltimore County
MA, Bristol County Retirement Association	MD, Maryland State Retirement and Pension System—Employees
MA, Brookline Town Contributory Retirement System	MD, Maryland State Retirement and Pension System—Judges
MA, City of Cambridge Retirement System	MD, Maryland State Retirement and Pension System—Law Enforcement Officers
MA, City of Lynn Contributory Retirement System	MD, Maryland State Retirement and Pension System—State Police
MA, City of New Bedford Contributory Retirement System	MD, Maryland State Retirement and Pension System—Teachers
MA, City of Newton Retirement System	MD, Maryland Transit Administration Pension Plan
MA, City of Worcester Retirement Plan	MD, Montgomery County Employees' Retirement System
MA, Essex Regional Retirement System	MD, Prince Georges County AFSCME Pension Plan
MA, Framingham Town Retirement System	MD, Prince Georges County Correctional Officers' Comprehensive Pension Plan
MA, Franklin Regional Retirement System	MD, Prince Georges County Correctional Officers' Supplementary Pension Plan
MA, Lowell Contributory Retirement System	MD, Prince Georges County Crossing Guards Pension Plan
MA, Massachusetts Teachers' Retirement System	MD, Prince Georges County Deputy Sheriff's Comprehensive Pension Plan
MA, Middlesex County Retirement System	
MA, Norfolk County Retirement System	
MA, Plymouth (Town of) Contributory Retirement	
MA, Plymouth County Retirement Association	
MA, Springfield Contributory Retirement System	
MA, State Employees' Retirement System	
MA, Worcester Regional Retirement System	
MD, Anne Arundel County Detention Officers' and Deputy Sheriffs' Plan	

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
MD, Prince Georges County Deputy Sheriff's Supplemental Pension Plan	MN, Minnesota State Retirement System—Correctional Employees Retirement Fund
MD, Prince Georges County Fire Civilian Pension Plan	MN, Minnesota State Retirement System—Judges Retirement Fund
MD, Prince Georges County Fire Service Pension Plan	MN, Minnesota State Retirement System—Legislators Retirement Fund
MD, Prince Georges County General Schedule Pension Plan	MN, Minnesota State Retirement System—State Employees Retirement Fund
MD, Prince Georges County Police Civilian Pension Plan	MN, Minnesota State Retirement System—State Patrol Retirement Fund
MD, Prince Georges County Police Pension Plan	MN, Public Employees Retirement Association—General Employees Retirement Fund
ME, Maine Public Employees Retirement System—Judicial Plan	MN, Public Employees Retirement Association—Police and Fire Fund
ME, Maine Public Employees Retirement System—Legislative Plan	MN, St. Paul Teachers' Retirement Fund Association
ME, Maine Public Employees Retirement System—PLD Consolidated Plan	MN, Teachers Retirement Association
ME, Maine Public Employees Retirement System—State Employee and Teacher Plan	MO, City of Springfield Police Officers' and Fire Fighters' Retirement System
MI, City of Detroit General Retirement System	MO, City of St. Louis Employees Retirement System
MI, City of Detroit Police and Fire Retirement System	MO, Firemen's Retirement System of St. Louis
MI, City of Grand Rapids General Retirement System	MO, Kansas City Police Department Civilian Employees Retirement System
MI, City of Grand Rapids Police and Fire Retirement System	MO, Kansas City Police Retirement System
MI, Jackson County Employees' Retirement System	MO, Kansas City Public School Retirement System
MI, Judges' Retirement System	MO, Missouri Local Government Employees Retirement System
MI, Oakland County Employees' Retirement System	MO, Missouri State Employees' Retirement System—Judicial Plan
MI, Public School Employees' Retirement System	MO, Missouri State Employees' Retirement System—State Employees' Plan
MI, State Employees' Retirement System	MO, MoDOT and Patrol Employees' Retirement System
MI, State Police Retirement System	MO, Public Education Employee Retirement System of Missouri
MI, Township of Macomb County Employees' Retirement System	MO, Public School Retirement System of Missouri
MI, Wayne County Employees' Retirement System	

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
MO, Public School Retirement System of the City of St. Louis	NC, Teachers' and State Employees' Retirement System
MO, St. Louis County Missouri Employee's Retirement Plan	NC, Winston-Salem Police Officers' Retirement System
MS, Mississippi Highway Safety Patrol Retirement System	NC, Winston-Salem Police Officers' Separation Allowance
MS, Public Employees' Retirement System of Mississippi	ND, Highway Patrolmen's Retirement System
MS, Supplemental Legislative Retirement Plan	ND, North Dakota Teachers' Fund for Retirement
MT, Montana Teachers' Retirement System	ND, Public Employees Retirement System
MT, Public Employees' Retirement System—Defined Benefit Retirement Plan	ND, Retirement Plan for Employees of Job Service North Dakota
MT, Public Employees' Retirement System—Firefighters' Unified Retirement System	NE, City of Lincoln Police and Fire Pension Plan
MT, Public Employees' Retirement System—Game Wardens' and Peace Officers' Retirement System	NE, City of Omaha Employees' Retirement System (the Civilian Plan)
MT, Public Employees' Retirement System—Highway Patrol Officers' Retirement System	NE, City of Omaha Police and Fire Retirement System (the Uniformed Plan)
MT, Public Employees' Retirement System—Judges' Retirement System	NE, County Employee Retirement System
MT, Public Employees' Retirement System—Municipal Police Officers' Retirement System	NE, Judges Retirement System
MT, Public Employees' Retirement System—Sheriffs' Retirement System	NE, Omaha School Employees' Retirement System
MT, Public Employees' Retirement System—Volunteer Firefighters' Compensation Act	NE, School Retirement System
NC, City of Charlotte Firefighters' Retirement System	NE, State Employee Retirement System
NC, Consolidated Judicial Retirement System	NE, State Patrol Retirement System
NC, Firefighters' and Rescue Squad Workers' Pension Fund	NH, New Hampshire Retirement System
NC, Legislative Retirement System	NJ, Consolidated Police and Fire Pension Fund
NC, Local Governmental Employees' Retirement System	NJ, Judicial Retirement System
NC, North Carolina National Guard Pension Fund	NJ, Police and Fireman's Retirement System
NC, Registers of Deeds Supplemental Pension Fund	NJ, Prison Officers' Pension Fund
	NJ, Public Employees' Retirement System
	NJ, State Police Retirement System
	NJ, Teachers' Pension and Annuity Fund
	NM, New Mexico Judicial Retirement Fund
	NM, New Mexico Magistrate Retirement Fund

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
NM, New Mexico State Educational Retirement Board	OK, Oklahoma Public Employees Retirement Plan
NM, New Mexico Volunteer Firefighter Fund	OK, Oklahoma Teachers Retirement System
NM, Public Employees Retirement Association of New Mexico	OK, Uniform Retirement System for Justices and Judges
NV, Judicial Retirement System	OR, City of Portland Fire and Police Disability, Retirement, and Death Benefit Plan
NV, Legislators' Retirement System	OR, Oregon Public Employees Retirement System
NV, Public Employees' Retirement System	PA, Abington Township Non-Uniformed Pension Fund
NY, Employees Retirement System	PA, Abington Township Police Pension Fund
NY, New York City Board of Education Retirement System	PA, Allegheny County Non-Uniformed Retirement Plan
NY, New York City Employees Retirement System	PA, Bensalem Non-Uniformed Pension Plan
NY, New York City Fire Department Pension Fund	PA, Bensalem Township Police Pension Plan
NY, New York City Police Pension Fund	PA, Bethlehem City Redevelopment Authority Non-Uniform Pension
NY, New York State Teachers' Retirement System	PA, Bethlehem Parking Authority Pension Plan
NY, Police and Fire Retirement System	PA, Butler Area Public Library Non-Uniform Pension Plan
NY, Teachers' Retirement System of the City of New York	PA, City of Allentown Firemen's Pension Plan
OH, City of Cincinnati Retirement System	PA, City of Allentown Officers' and Employees' Plan
OH, Highway Patrol Retirement System	PA, City of Allentown Police Pension Plan
OH, Ohio Police and Fire Pension Fund	PA, City of Bethlehem Firemen's Pension Plan
OH, Ohio Public Employees Retirement System	PA, City of Bethlehem Police Pension Plan
OH, School Employees Retirement System of Ohio	PA, City of Erie Firefighter's Pension Trust Fund
OH, State Teachers Retirement System of Ohio	PA, City of Erie Officer's and Employee's Pension Trust Fund
OK, City of Tulsa Municipal Employees' Retirement Plan Defined Benefits Pension Plan	PA, City of Erie Police Pension Trust Fund
OK, Oklahoma City Employee Retirement System	PA, City of Lancaster Fire Pension Fund
OK, Oklahoma Firefighters Pension and Retirement System	PA, City of Lancaster Police Pension Fund
OK, Oklahoma Law Enforcement Retirement System	PA, City of Pittsburgh Policemen's Relief and Pension Fund
OK, Oklahoma Police Pension and Retirement System	

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
PA, City of Reading Officers' and Employees' Pension Fund	RI, Employees' Retirement System Plan—Teachers
PA, City of Reading Paid Firemen's Pension Fund	RI, Judicial Retirement Benefits Trust Plan
PA, City of Reading Police Pension Fund	RI, Municipal Employees' Retirement System Plan—General Employees
PA, City of Scranton Firemen's Relief and Pension Plan	RI, Municipal Employees' Retirement System Plan—Police and Fire
PA, City of Scranton Non-Uniformed Pension Plan	RI, Rhode Island Judicial Retirement Fund Trust Plan
PA, City of Scranton Police Pension Plan	RI, State Police Retirement Benefits Trust
PA, Cumberland County Retirement Fund	RI, Teachers' Survivors Benefits Plan
PA, Dauphin County Employees' Retirement Plan	SC, General Assembly Retirement System
PA, Delaware County Employees' Retirement System	SC, Judges and Solicitors Retirement System
PA, Lancaster City Parking Authority General Pension	SC, Police Officers Retirement System
PA, Lower Merion Township Employees' Pension Fund	SC, South Carolina National Guard Supplemental Retirement Plan
PA, Lower Merion Township Municipal Police Pension Fund	SC, South Carolina Retirement System
PA, Lycoming County Employees' Retirement System	SD, Sioux Falls City Employee's Retirement System
PA, Pennsylvania Public School Employees' Retirement System	SD, Sioux Falls City Firefighters' Pension Fund
PA, Pennsylvania State Employees' Retirement System	SD, South Dakota Retirement System
PA, Philadelphia Gas Works Non-Uniform Pension System	TN, City of Chattanooga Fire and Police Pension Trust Fund
PA, Philadelphia Municipal Retirement System	TN, City of Chattanooga General Pension Trust Fund
PA, Upper Darby Township Firemen's Pension Plan	TN, Knoxville City Employees' Pension Fund
PA, Upper Darby Township Municipal Employees Pension Plan	TN, Memphis Employees Retirement System—City
PA, Upper Darby Township Police Pension Plan	TN, Memphis Employees Retirement System—Library
PA, Washington County Employees' Retirement Plan	TN, Nashville-Davidson City Education Retirement Plan
RI, Employees' Retirement System Plan—State Employees	TN, Nashville-Davidson City Retirement Plan
	TN, Nashville-Davidson County Education Retirement Plan

(*Continued*)

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
TN, Nashville-Davidson County Retirement Plan (Closed)	TX, Employee Retirement System of Texas—Judicial Retirement System Plan II
TN, Nashville-Davidson Metropolitan Board of Education Teacher Retirement Trust Fund	TX, Employee Retirement System of Texas—Law Enforcement and Custodial Officer Supplemental Fund
TN, Nashville-Davidson Metropolitan Employee Benefit Trust Fund	TX, Employees' Retirement Fund of the City of Dallas
TN, Shelby County Retirement System	TX, Harris County Hospital District Pension Plan
TN, Tennessee Consolidated Retirement System—Closed State and Higher Education Employee Pension Plan—component units	TX, Harris County Non-Union Pension Plan
TN, Tennessee Consolidated Retirement System—Closed State and Higher Education Employee Pension Plan—primary government	TX, Harris County Transport Workers Union Pension Plan
TN, Tennessee Consolidated Retirement System—State and Higher Education Employee Pension Plan—component units	TX, Houston Firefighters' Relief and Retirement Fund
TN, Tennessee Consolidated Retirement System—State and Higher Education Employee Pension Plan—primary government	TX, Houston Municipal Employees' Pension System
TN, Tennessee Consolidated Retirement System—Teacher Legacy Pension Plan	TX, Houston Police Officers' Pension System
TN, Tennessee Consolidated Retirement System—Teacher Retirement Plan	TX, Lubbock Fire Pension Fund
TX, Austin Fire Fighters' Retirement Fund	TX, San Antonio Fire and Police Pension Fund
TX, Austin Police Officers' Retirement Fund	TX, San Antonio Water System Retirement Plan
TX, City of Austin Employees' Retirement System	TX, Teacher Retirement System of Texas
TX, City of Fort Worth Employees' Retirement Fund—City Plan	UT, Firefighters Retirement System
TX, City of Fort Worth Employees' Retirement Fund—Staff Plan	UT, Judges' Retirement System
TX, Dallas Police and Fire Pension System	UT, Public Employees' Contributory Retirement System
TX, Dallas Police and Fire Pension System—Supplemental Pension Plan	UT, Public Employees' Noncontributory Retirement System
TX, El Paso City Employees' Pension Fund	UT, Public Safety Retirement System
TX, El Paso Firemen's Pension Fund	UT, Tier 2 Public Employees' Contributory Retirement System
TX, El Paso Policemen's Pension Fund	UT, Tier 2 Public Safety and Firefighter Contributory Retirement System
TX, Employee Retirement System of Texas—Employees Retirement Fund	UT, Utah Governors' and Legislators' Retirement Plan
	VA, Fairfax County Education Employees' Supplemental Retirement System
	VA, Fairfax County Employees' Retirement System

TABLE A PENSION PLAN LIST (*continued*)

Pension plan	Pension plan
VA, Fairfax County Police Officers Retirement System	WA, Tacoma Employees' Retirement System
VA, Fairfax County Uniformed Retirement System	WA, Teachers' Retirement System Plan 1
VA, Judicial Retirement System	WA, Teachers' Retirement System Plan 2/3
VA, Newport News Employees' Retirement Fund	WA, Volunteer Fire Fighters' and Reserve Officers' Relief and Pension Fund
VA, Norfolk Employees' Retirement System	WA, Washington State Patrol Retirement System Plan 1/2
VA, Richmond Retirement System	WI, Employees' Retirement System of the City of Milwaukee
VA, State Police Officers' Retirement System	WI, Milwaukee County Employees Retirement System
VA, Virginia Law Officers' Retirement System	WI, Milwaukee County Transit Employee Pension Plan
VA, Virginia Retirement System—Political Subdivisions	WI, Wisconsin Retirement System
VA, Virginia Retirement System—State Employees	WV, Deputy Sheriff Retirement System
VA, Virginia Retirement System—Teachers	WV, Emergency Medical Services Retirement System
VT, City of Burlington Employees' Retirement System	WV, Judges' Retirement System
VT, Vermont Municipal Employees' Retirement System	WV, Municipal Police Officers and Firefighters Retirement System
VT, Vermont State Employees' Retirement System	WV, Public Employees' Retirement System
VT, Vermont State Teachers' Retirement System	WV, State Police Death, Disability and Retirement System
WA, Judges' Retirement Fund	WV, State Police Retirement System
WA, Judicial Retirement System	WV, Teachers' Retirement System
WA, Law Enforcement Officers' and Fire Fighters' Retirement System Plan 1	WY, Air Guard Firefighter Pension Plan
WA, Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2	WY, Judicial Pension Plan
WA, Public Employees' Retirement System Plan 1	WY, Law Enforcement Pension Plan
WA, Public Employees' Retirement System Plan 2/3	WY, Paid Firemen's Pension Plan A
WA, Public Safety Employees' Retirement System Plan 2	WY, Paid Firemen's Pension Plan B
WA, School Employees' Retirement System Plan 2/3	WY, Public Employee Pension Plan
WA, Seattle City Employees' Retirement System	WY, State Patrol, Game and Fish, Warden and Criminal Investigator Pension Plan
WA, Spokane Employees' Retirement System	WY, Wyoming Volunteer Firefighter, EMT, and Search and Rescue Pension Plan

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