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Retirement benefit risks loom over many governments' credit quality

July 2019

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Full market value funding would insulate pension sponsors from numerous risks

- Reduces reliance on future investment returns to cover current costs
  - Employer normal cost, CalPERS Highway Patrol:
    - 19.1% of payroll @ 7.0% discount rate
    - 40.0% of payroll @ 5.0% discount rate
- Asset-liability matching mitigates interest rate risk
  - Assets and accrued benefits with same duration impacted equivalently by changes in market interest rates
- Prevents higher costs at economically inopportune points in time (i.e., “generational equity”)
  - Mitigates risk that economy / tax base cannot concurrently pay for current government services, bonded debt and legacy employee retirement obligations

Pensions are "must-pay" obligations for most state and local governments

- Pension unaffordability = debt unaffordability
  - Risks are higher than ever for many, but vary significantly

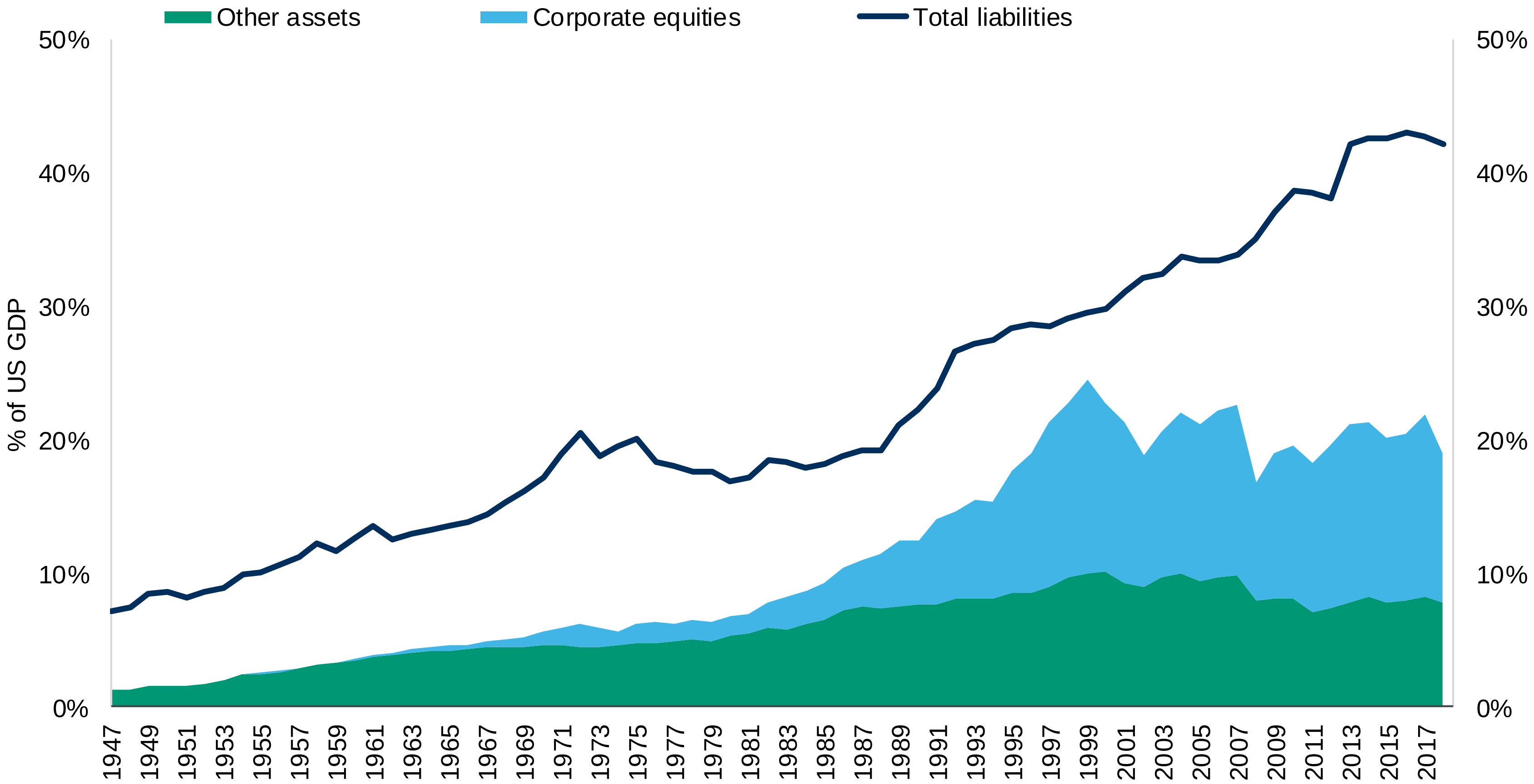
- Most state and local governments have high investment grade ratings

- Service solvency a key credit consideration & proxy for "sustainability"
  - Unfunded liabilities are debt-like obligations, a claim on future resources
  - Bondholder risk rises as pensions + other fixed costs "crowd-out" essential services

- Bond default and/or bankruptcy usually precedes pension benefit defaults
  - Puerto Rico
  - Detroit, MI
  - California cities of Vallejo, Stockton & San Bernardino
  - Harvey, IL

Public pension liabilities and assets at historically elevated levels relative to US economic base

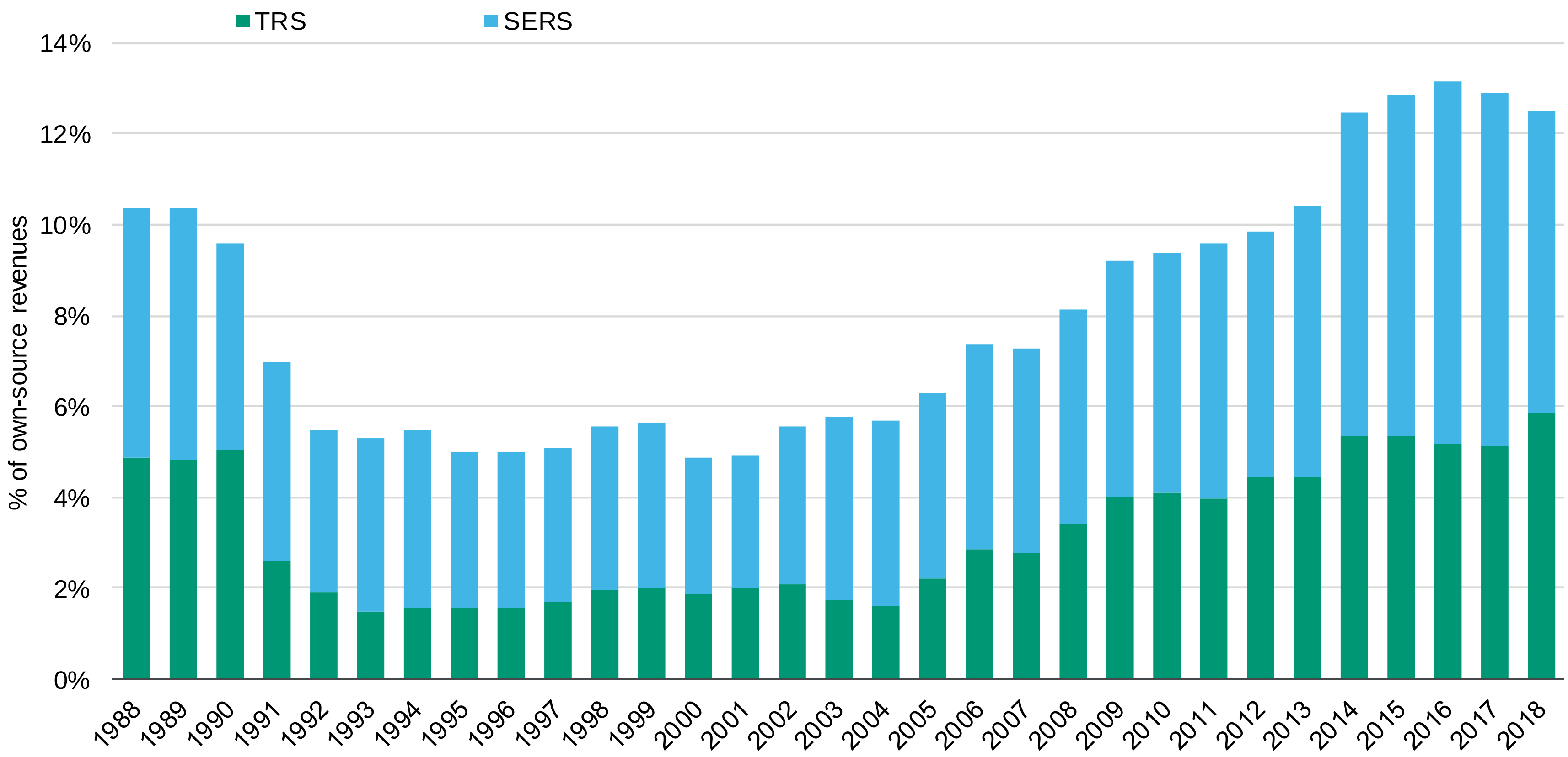
Unfunded liabilities soar when discount rate adjusted: $4.7 trillion reported by Federal Reserve as of year-end 2018



Source: Board of Governors of the Federal Reserve System, "Financial Accounts of the United States"

Government pension contributions are higher than ever, for many

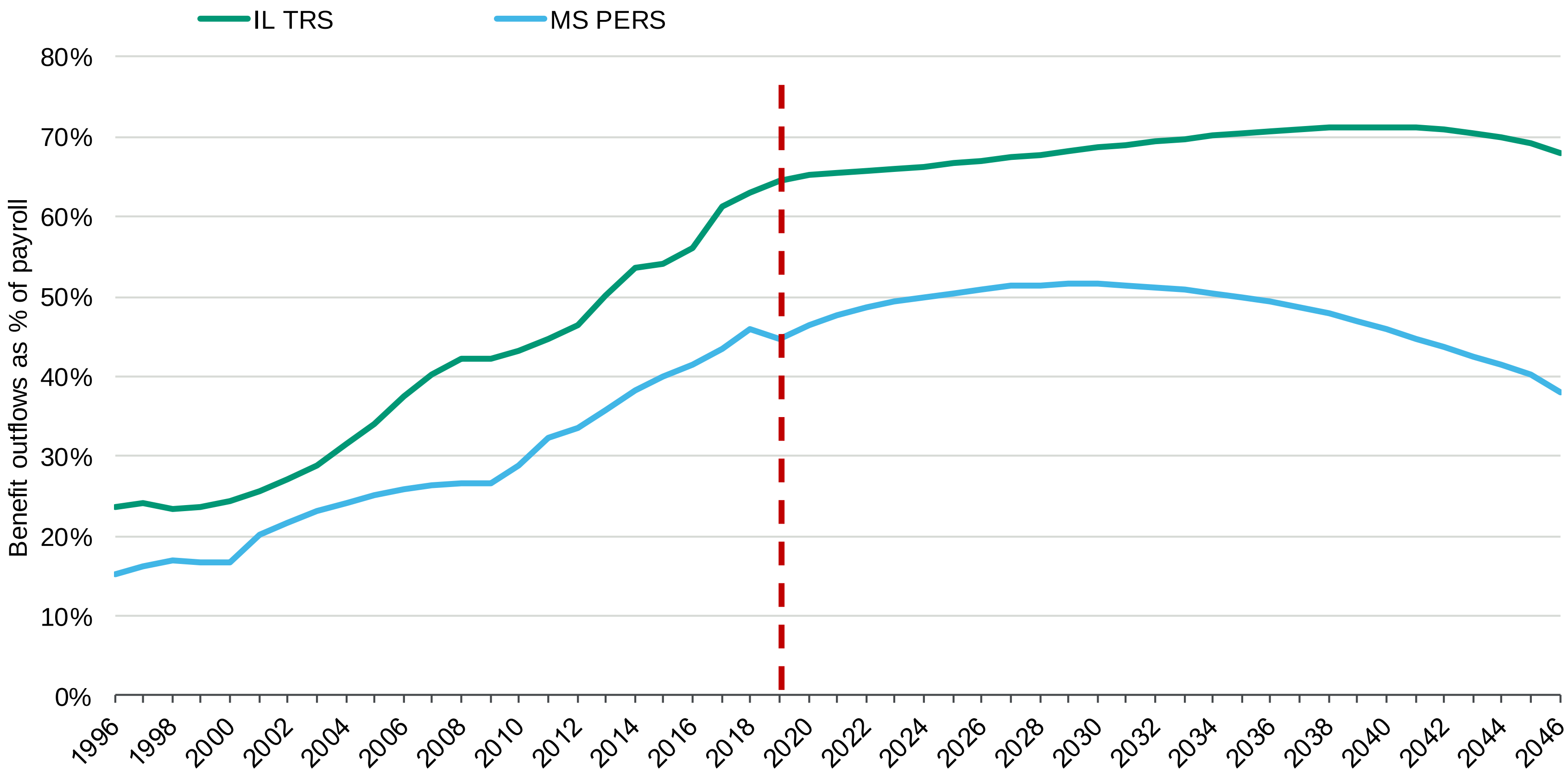
Contributions to Connecticut’s two largest pension systems, % of revenue



Sources: System actuarial valuations and state comprehensive annual financial reports

Benefit outflows to remain near peak levels of economic significance for ~next 20 years

Benefit outflows as % of active employee payroll



Source: Teachers' Retirement System of Illinois, Public Employees' Retirement System of Mississippi

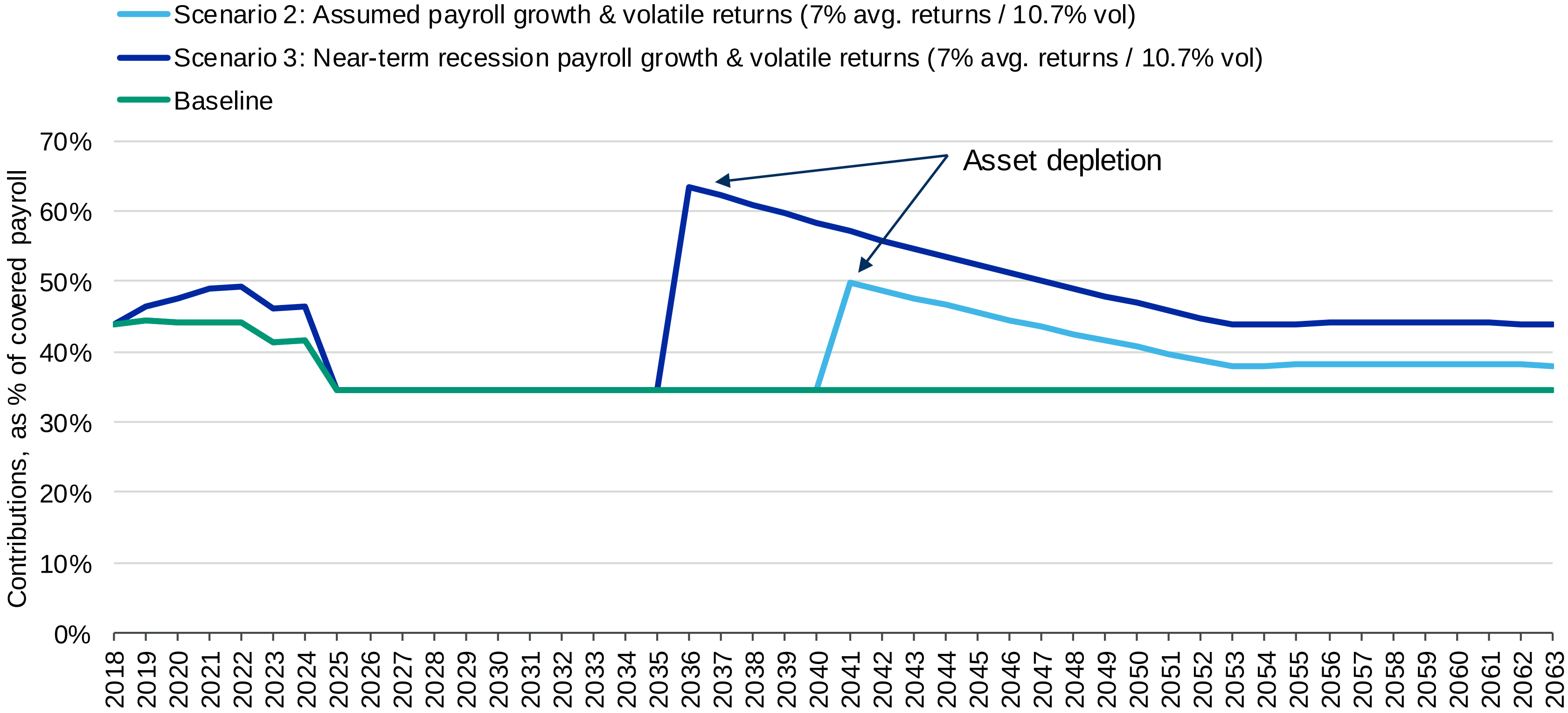
Pay-as-you-go *can* be affordable

…but not always

- **City of Portland, OR**
  - Closed public safety system funded with dedicated levy
- **State of Indiana**
  - Largest system by total liability has some assets, but is close to PAYGO
  - Balance sheet burden of unfunded liabilities is essentially at median for state governments
- **State of Kentucky**
  - Contributions to “non-hazardous” state employees system now very close to PAYGO
  - Higher pension costs have driven one participating employer into bankruptcy
- **Commonwealth of Puerto Rico**
  - Bond defaults have enabled government services and PAYGO pension benefit payments to continue

Negative cash flow raises importance of investment return path

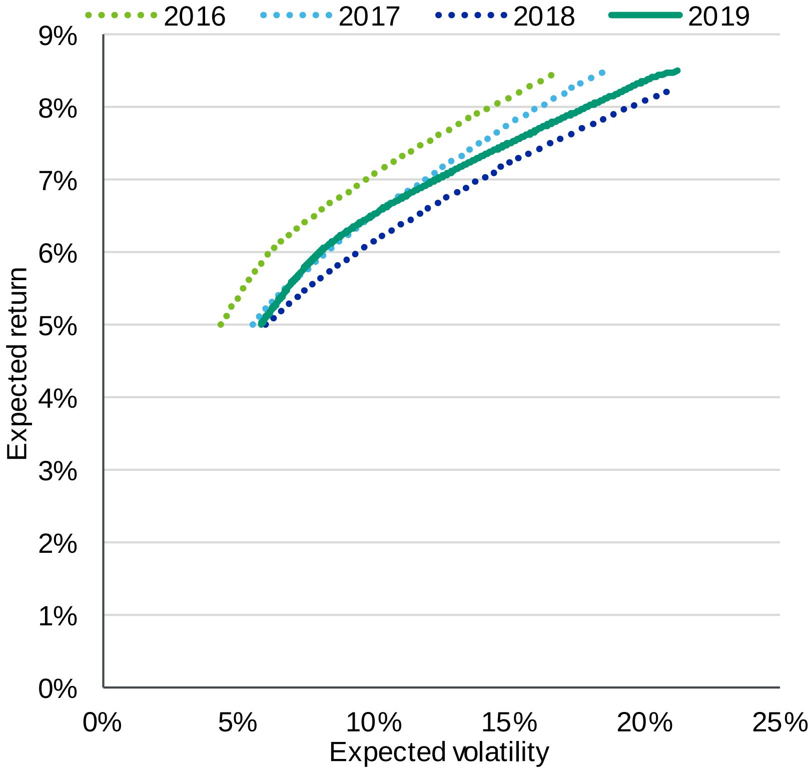
Near-term recession stands to cause more credit damage than last, due to funding position and heavy benefit outflows



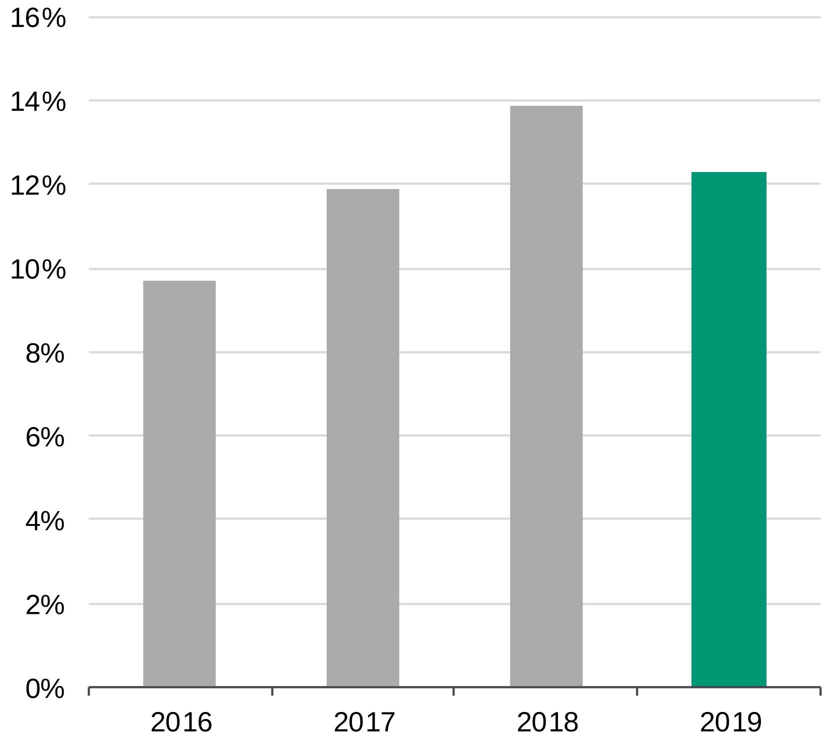
Source: Moody's Investors Service, based on Dallas Police & Fire Pension Fund actuarial valuation

Reach for yield means high expected volatility for US public pension portfolios

Macro-investment risk-return map



Expected volatility required for 7.0% expected returns



Source: Moody's Investors Service, based on JP Morgan 10-year capital markets assumptions

Many governments face limited ability to change benefits for current employees

Diverse answers emerging from state courts on key legal questions concerning pension reforms

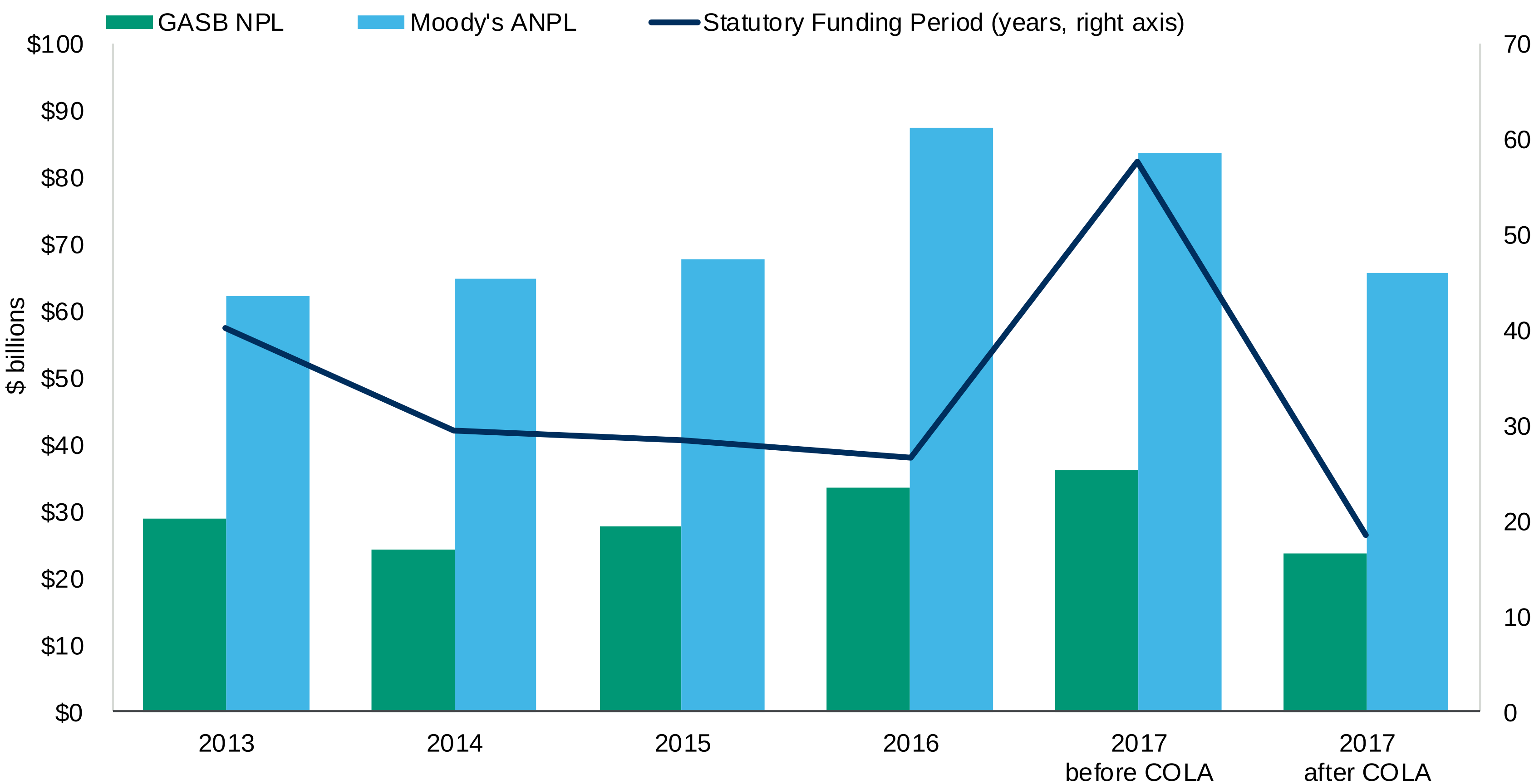
» Can benefits be changed prospectively for current employees' future work?
  - Examples: Yes in Florida, No in Illinois

» Can cost-of-living adjustments be changed prospectively for current employees?
  - Examples: Yes in Oregon, No in New York

» Can cost-of-living adjustments be changed for current retirees?
  - Examples: Yes in New Jersey, No in California

Ohio’s benefit flexibility is significant

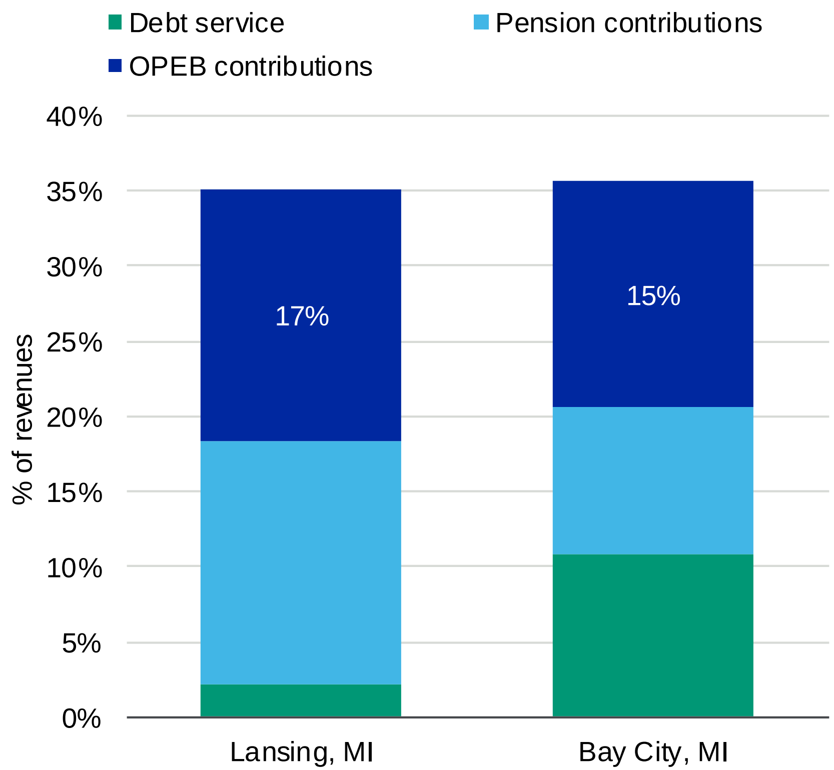
COLA suspension reduced STRS’ unfunded liabilities and statutory funding period

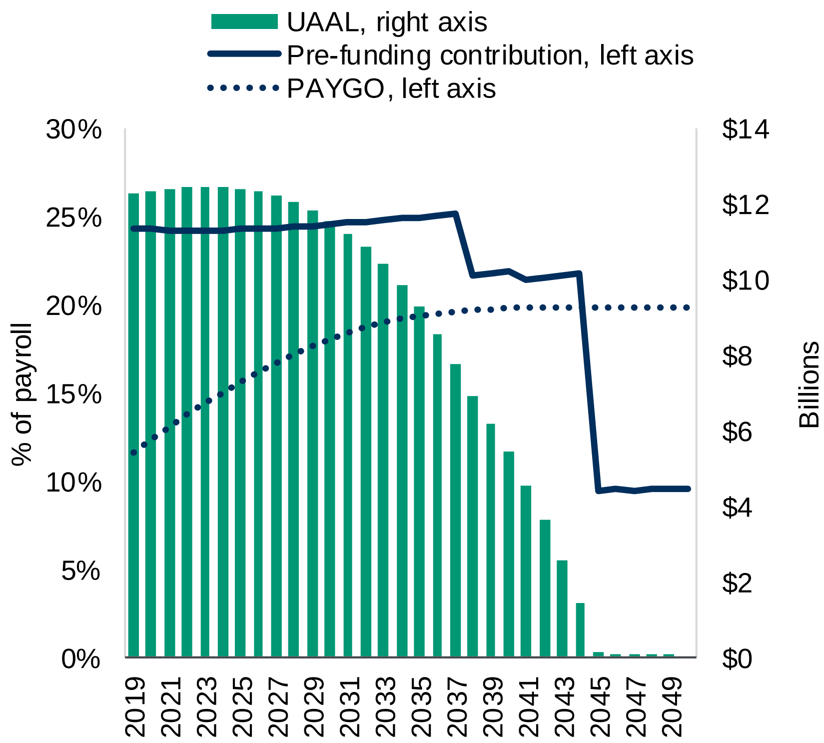


Sources: State Teachers Retirement System of Ohio, Moody’s Investors Service

OPEBs a primary “fixed cost” driver for some governments

Hawaii contributing “more and sooner” to retire unfunded OPEB liability and lower long-term OPEB costs (right-hand chart)





Source: Moody’s Investors Service, Hawaii EUTF actuarial valuation

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