

# Stochastic Simulation of Public Pension Risk Sharing Policies

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# Introduction

- ▶ Trend in adopting risk-sharing policies in public pension systems
  - ▶ Traditional defined-benefit plans: employer bears all or most risks, including investment returns, longevity, inflation, during members' working and retirement years.
  - ▶ Traditional defined-contribution plans: plan members bear most of these risks.
  - ▶ Some public pension plans incorporate risk-sharing mechanisms, under which the employer and plan members each bear some risks. More governments may seek risk sharing in the future as a way to reduce plan costs and risks.
- ▶ Risk-sharing mechanisms in public pension plans
  - ▶ Contingent COLA adjustments: share benefit risk in retirement years.
  - ▶ Contingent employee contribution adjustments: share the contribution risk in working years.
  - ▶ Hybrid DB-DC plans: introduce a supplemental DC plan to the DB plan.
  - ▶ Common triggers of risk-sharing: funded ratio and investment return performance

# Research goals

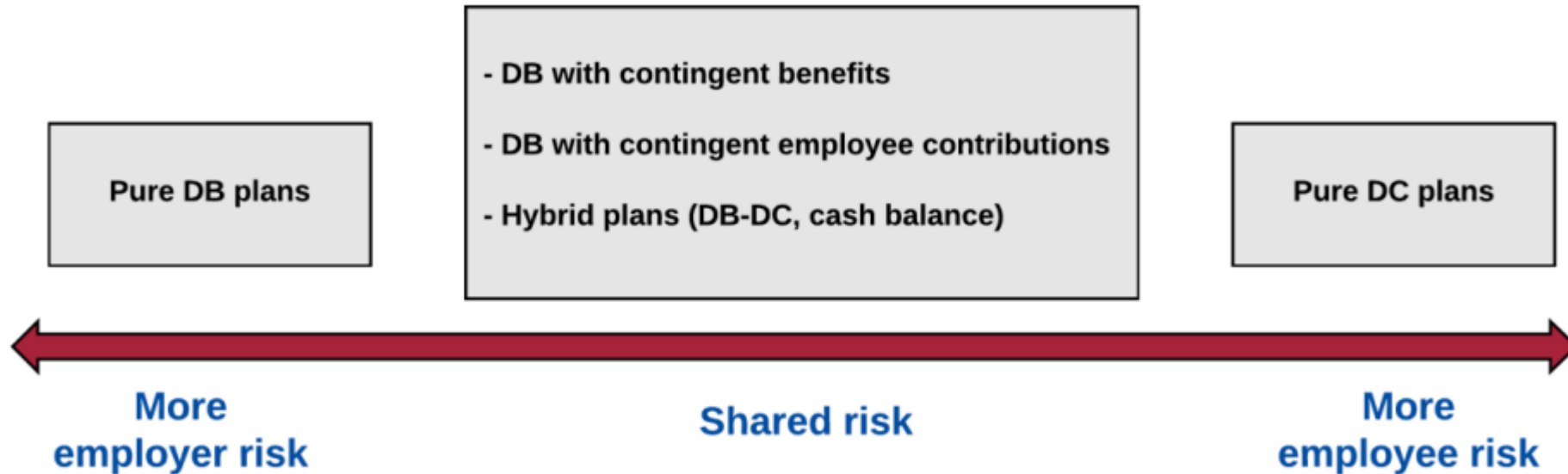
- ▶ Designing appropriate risk-sharing policies requires understanding how these policies affect costs and benefits and the volatility of each.
- ▶ The impacts of risk-sharing policies depend upon uncertain future events, particularly investment returns. These impacts are best understood with models that take investment-return volatility into account. Very little existing research has examined risk-sharing policies in this way.
- ▶ We examine the impacts of selected risk-sharing policies on employers and plan members, using a stochastic simulation model. The impacts are measured by
  - ▶ Employer contributions over a long term
  - ▶ Employer contribution volatility
  - ▶ Employee benefits and contributions over a long term
  - ▶ Employee benefit volatility
- ▶ We develop a policy guideline for risk-sharing policies in public pension plans.

# Public Pension Risks

- ▶ Investment risk: Investment returns may not be great enough during working years to accumulate needed funds at retirement, or returns may not be great enough in retirement years to generate desired income or to avoid exhausting available assets.
- ▶ Longevity risk: The plan member may live longer than expected, with the risk that money will run out.
- ▶ Inflation risk: The cost of living may go up during retirement, with the risk that the value of retirement income will be eroded by inflation.
  
- ▶ Which groups are better able to deal with these risks: active employees, retired plan members, or the government and taxpayers who support them?
- ▶ Who should bear the risks?

# Mechanisms for Sharing Public Pension Risks

Figure 1 Continuum of risk-sharing arrangements



We base this figure in part on a similar figure in Keith Brainard and Alex Brown, "NASRA Issue Brief: Shared-Risk in Public Retirement Plans," June 2014, <https://www.nasra.org/files/Issue%20Briefs/NASRASharedRiskBrief.pdf>.

# Risk-sharing mechanisms

- ▶ Sharing risks by adjusting pension benefits
  - ▶ Contingent Cost of Living Adjustments (COLAs)
    - ▶ The Arizona Public Safety Personnel plan provides no COLA if the funded ratio is less than 70 percent, a COLA of up to 2 percent if the plan is more than 90 percent funded.
  - ▶ Conditional indexation in plans in the Netherlands
    - ▶ In the Netherlands, benefit adjustments are based on the wage growth rate. The size of the adjustment depends upon the funded status of the plan.
- ▶ Sharing risks by adjusting employee contributions
  - ▶ The Connecticut State Employees' Retirement System requires some employee contributions to reflect a portion of increases in normal cost, depending upon investment performance.
- ▶ Sharing risks through hybrid plans
  - ▶ A DB-DC hybrid plan consists of a traditional DB plan (usually with a lower benefit level than in a DB-only arrangement) and a supplemental DC plan.

# Simulating and comparing risk-sharing policies

Table 2 Modeled risk-sharing policies for DB plans

Policy	Mechanism
<b>Baseline non-risk-sharing policy</b>	<ul style="list-style-type: none"> <li>• 1.5% COLA every year</li> <li>• 5% of payroll employee contribution rate every year</li> </ul>
<b>Contingent COLA</b>	
COLA with investment-return trigger	<ul style="list-style-type: none"> <li>• 0.5% COLA if 5-year average return is less than 7.5%</li> <li>• 2.5% COLA if 5-year average return is at least 7.5%</li> </ul>
COLA with funded-ratio trigger	<ul style="list-style-type: none"> <li>• 0.5% COLA if funded ratio is less than 100%</li> <li>• 2.5% COLA if funded ratio is at least 100%</li> </ul>
<b>Contingent employee contributions</b>	
Employee contribution with investment-return trigger	<ul style="list-style-type: none"> <li>• 3% of payroll if 5-year average return is 11% or higher <i>phasing up to</i></li> <li>• 7% of payroll if average return is 4% or lower</li> </ul>
Employee contribution with funded-ratio trigger	<ul style="list-style-type: none"> <li>• 3% of payroll if funded ratio is 115% or higher <i>phasing up to</i></li> <li>• 7% of payroll if funded ratio is 85% or lower</li> </ul>

# More-complex and more-radical risk-sharing policies

- ▶ Shared Actuarially Determined Contribution (shared-ADC) policies
  - ▶ Share the ADC evenly between employer and employee with no cap.
  - ▶ Share the ADC evenly but with a maximum cap of 10 percent of payroll.
- ▶ Hybrid DB plus DC plan
  - ▶ The defined benefit component is one-half of the baseline DB plan.
  - ▶ Half of the contributions go to the defined contribution component.
- ▶ South Dakota Retirement System (SDRS)-like policy:
  - ▶ Stable employer contributions with a COLA designed to achieve full funding.
  - ▶ Corrective actions might include benefit reductions, contribution increases, or other actions.
- ▶ Conditional indexation similar to policies used in the Netherlands
  - ▶ Pension benefits for retirees and the salary base for workers may be adjusted between 0.5% and 2% each year, depending on funded ratio.

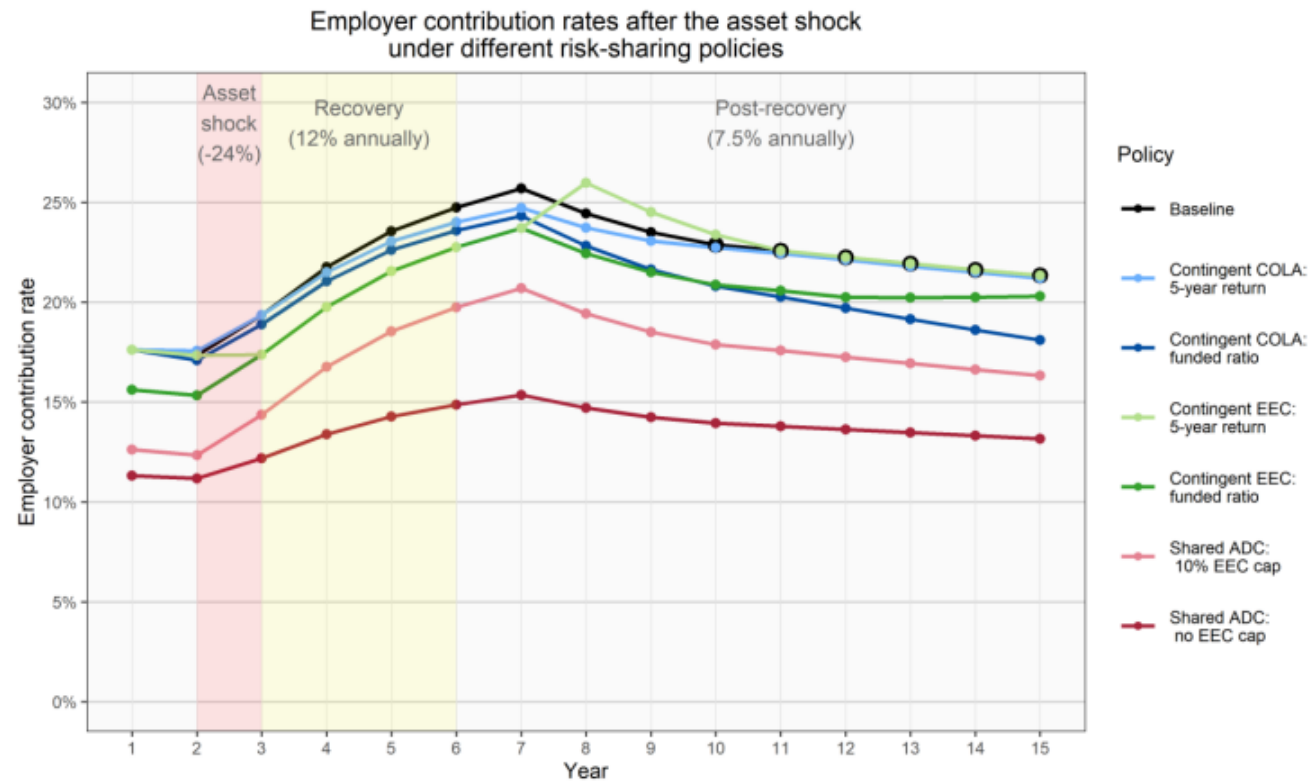


# Stress-testing in a severe market downturn

- ▶ We examine risk-sharing policies under a hypothetical asset-shock scenario like stress tests required of larger banks under the Dodd-Frank Act enacted in the wake of the Great Recession.
  - ▶ The plan achieves its investment return assumption of 7.5 percent in year 1.
  - ▶ Return is negative 24 percent in year 2,
  - ▶ Followed by a recovery in years 3 through 5 with returns of 12 percent annually.
  - ▶ In year 6 and later, annual returns equal the plan's 7.5 percent assumption.

# Results: Impact on employer costs

Figure 2 Employer contribution rates in an asset-shock scenario

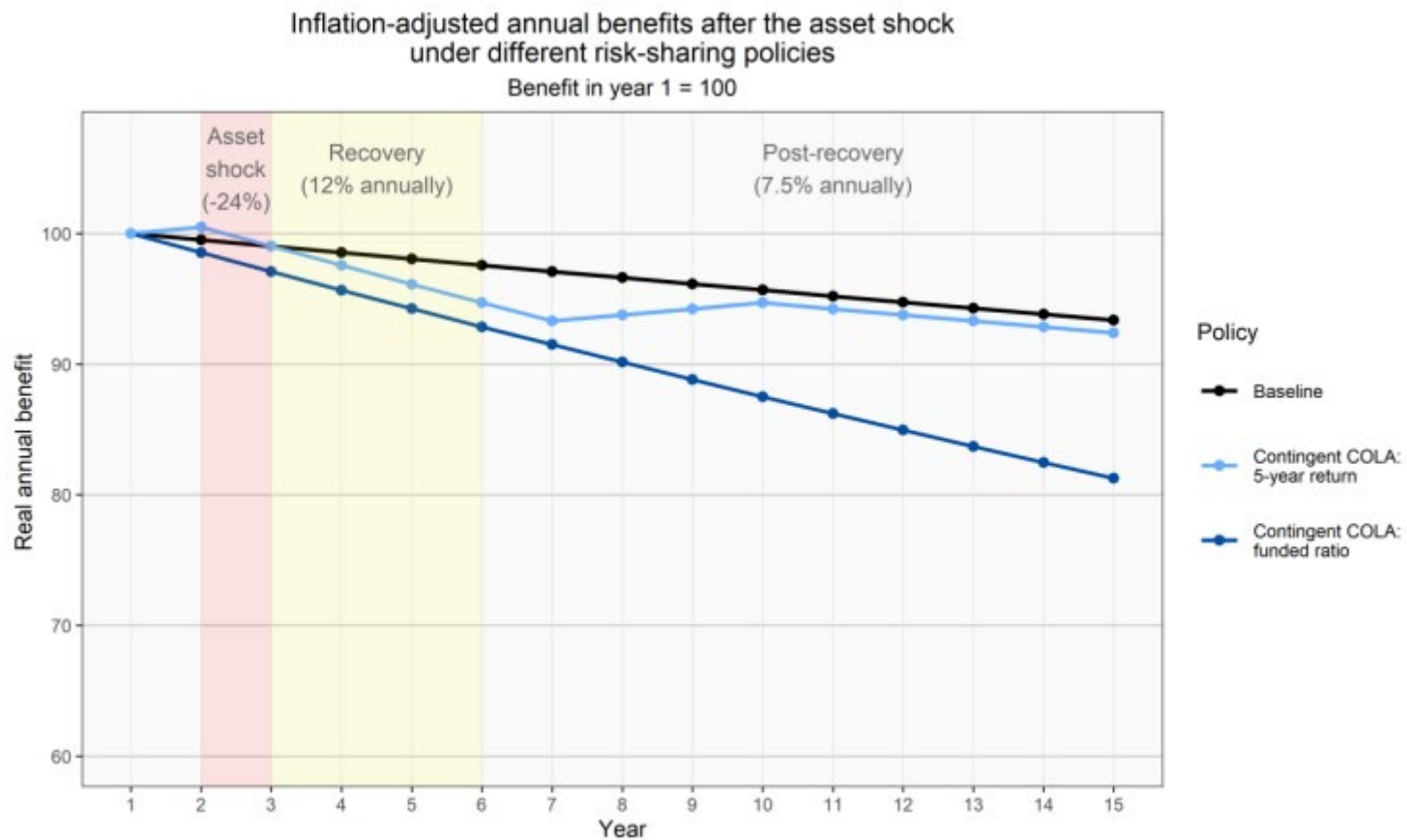


Note: The line for Baseline scenario almost overlaps with the line for investment-return-based COLA policy (the light blue line) in years 1 to 7 and overlaps with the line for return-based employee contribution policy (the light green line) in year 8 to year 15.

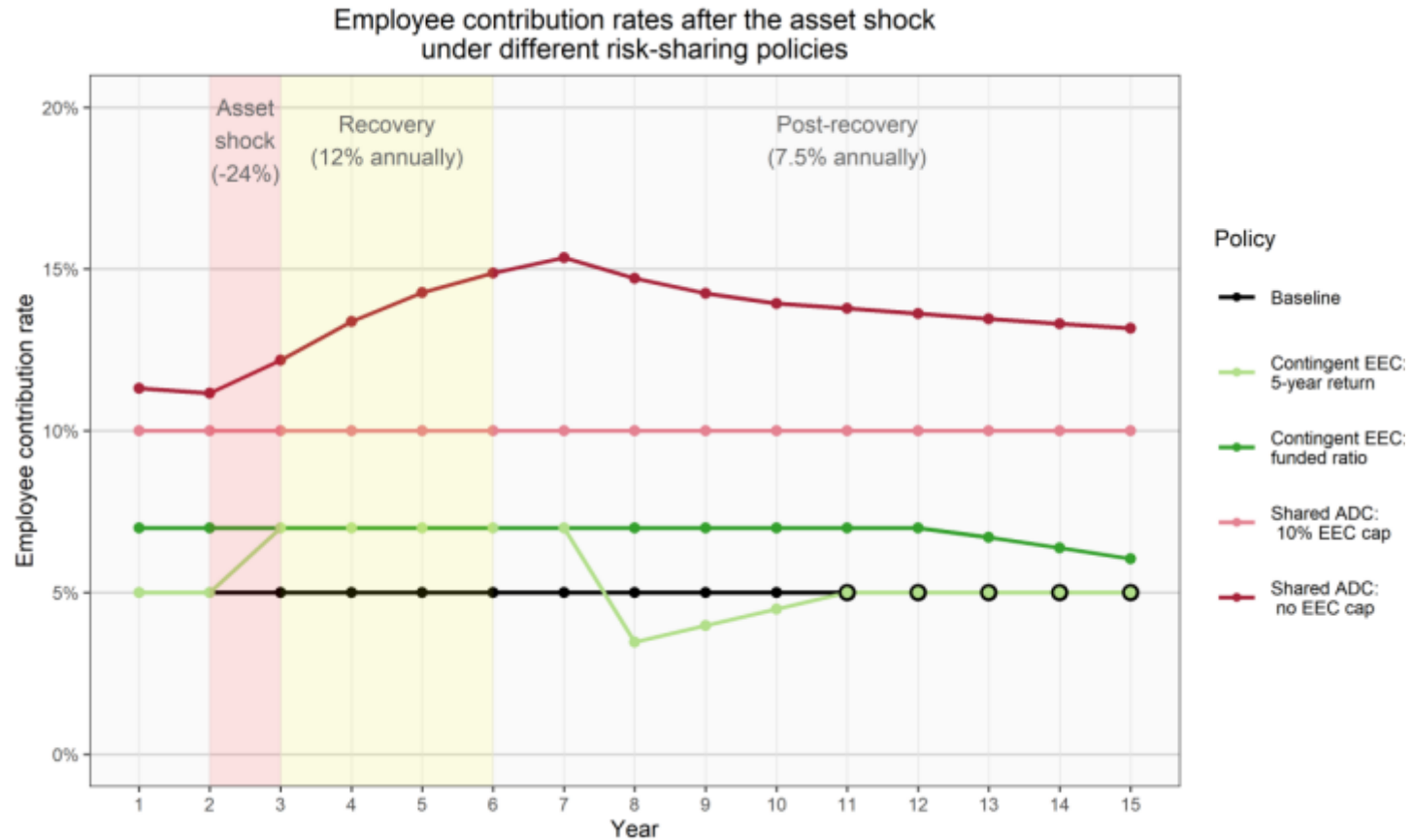
# Results: risk reduction and cost reduction

	% difference from baseline policy under the asset shock		
	Total effect	= Cost effect	+ Risk effect
<b>Modest-adjustment policies</b>			
Contingent COLA: 5-year return	-1.2%	0.0%	-1.2%
Contingent COLA: Funded ratio	-6.4%	-6.3%	-0.1%
Contingent EEC: 5-year return	-2.6%	0.0%	-2.6%
Contingent EEC: Funded ratio	-8.8%	-7.5%	-1.3%
<b>More-complex and more-radical policies</b>			
Evenly shared ADC: 10% EEC cap	-22.9%	-22.9%	0.0%
Evenly shared ADC: No EEC cap	-38.5%	-25.8%	-12.8%
Hybrid DB-DC	-37.2%	-24.4%	-12.8%
Netherlands-like conditional indexation*	-16.5%	-11.2%	-5.3%

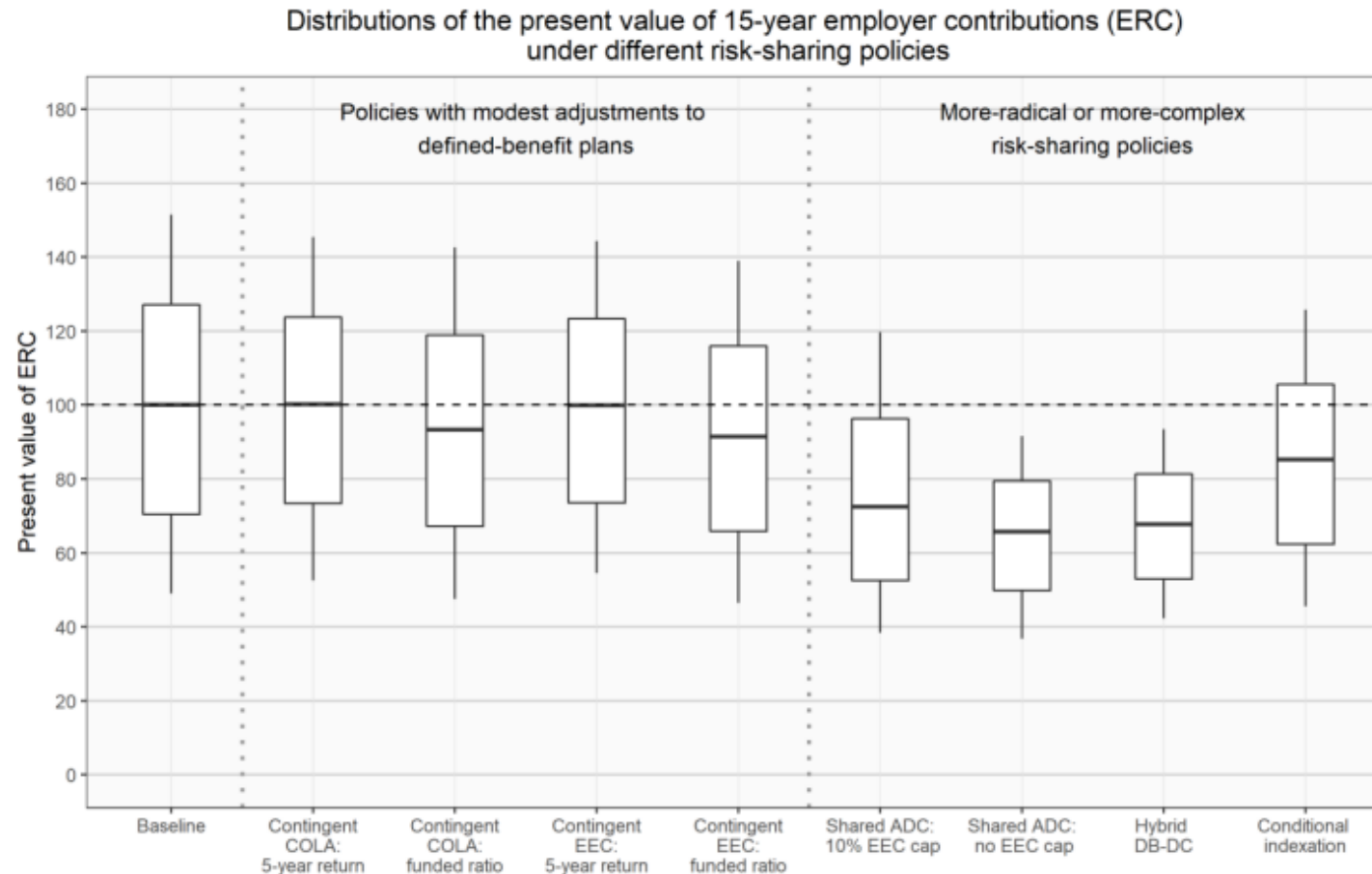
# Results: Impact on plan member benefits



# Results: Impact on employee contributions

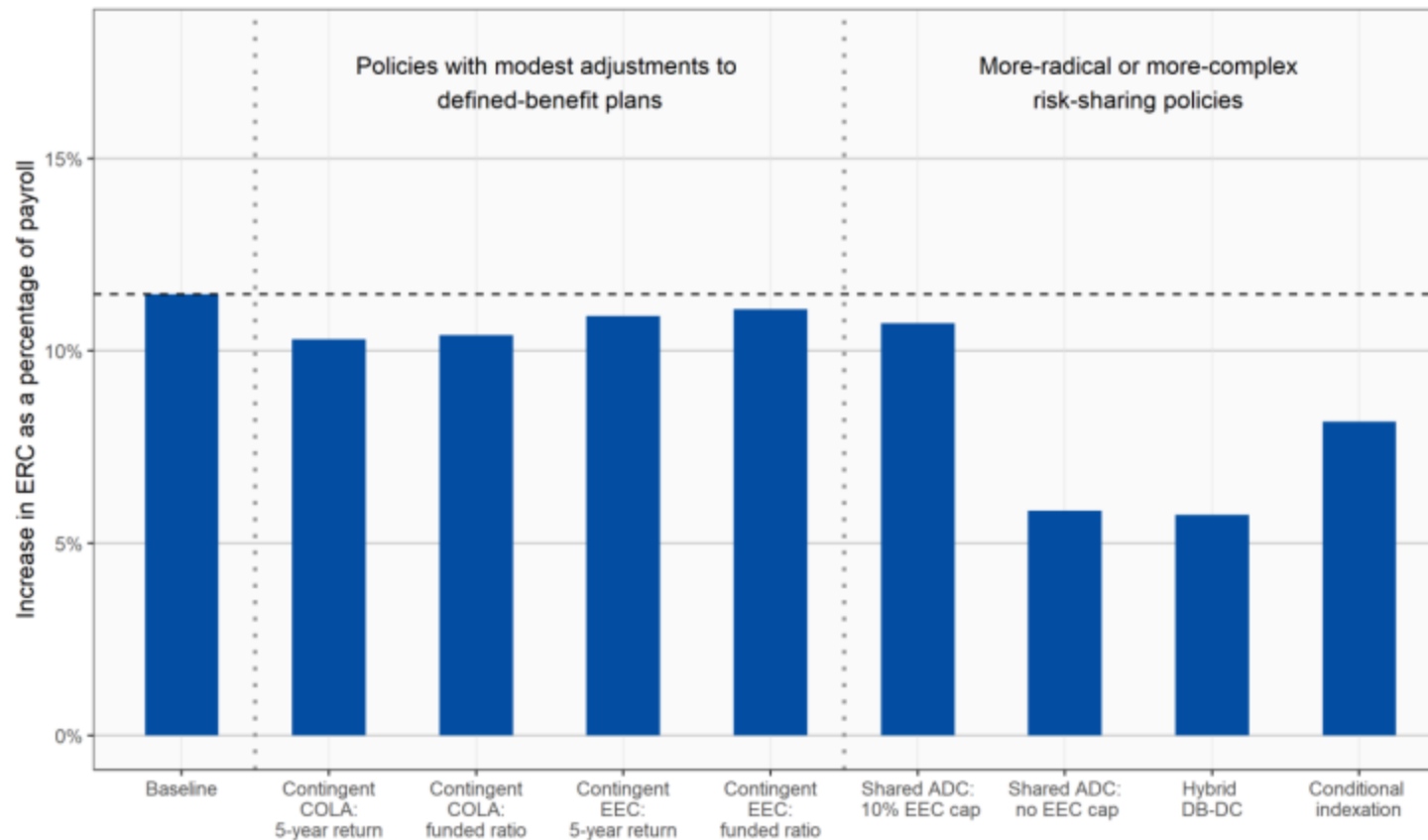


# Stochastic simulations: the impact on employer contributions

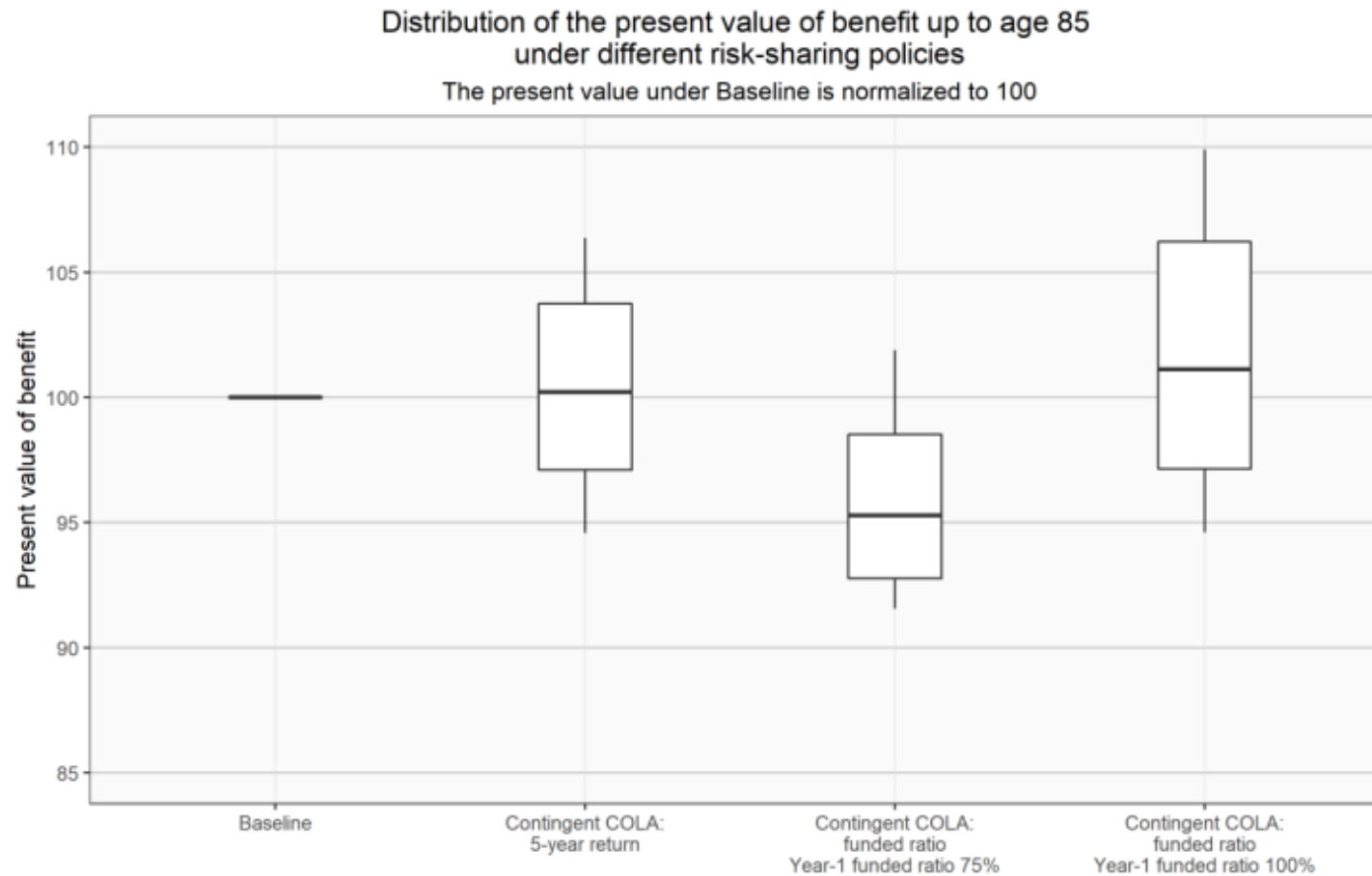


# Stochastic simulations: Employer contribution risk

Maximum 5-year increase in employer contribution (ERC) rate over 15 years  
(75th percentile)



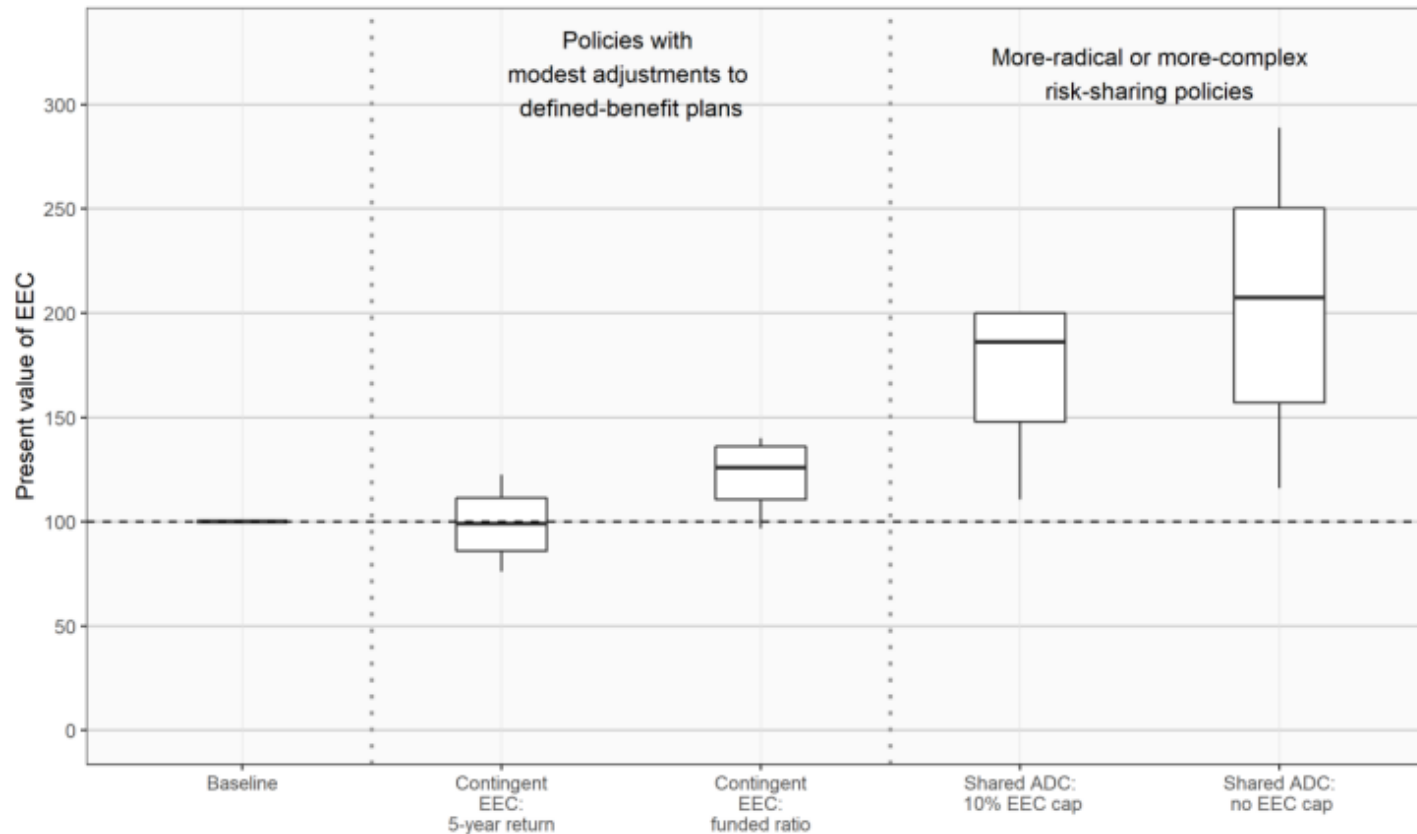
# Stochastic simulations: the impact on benefits





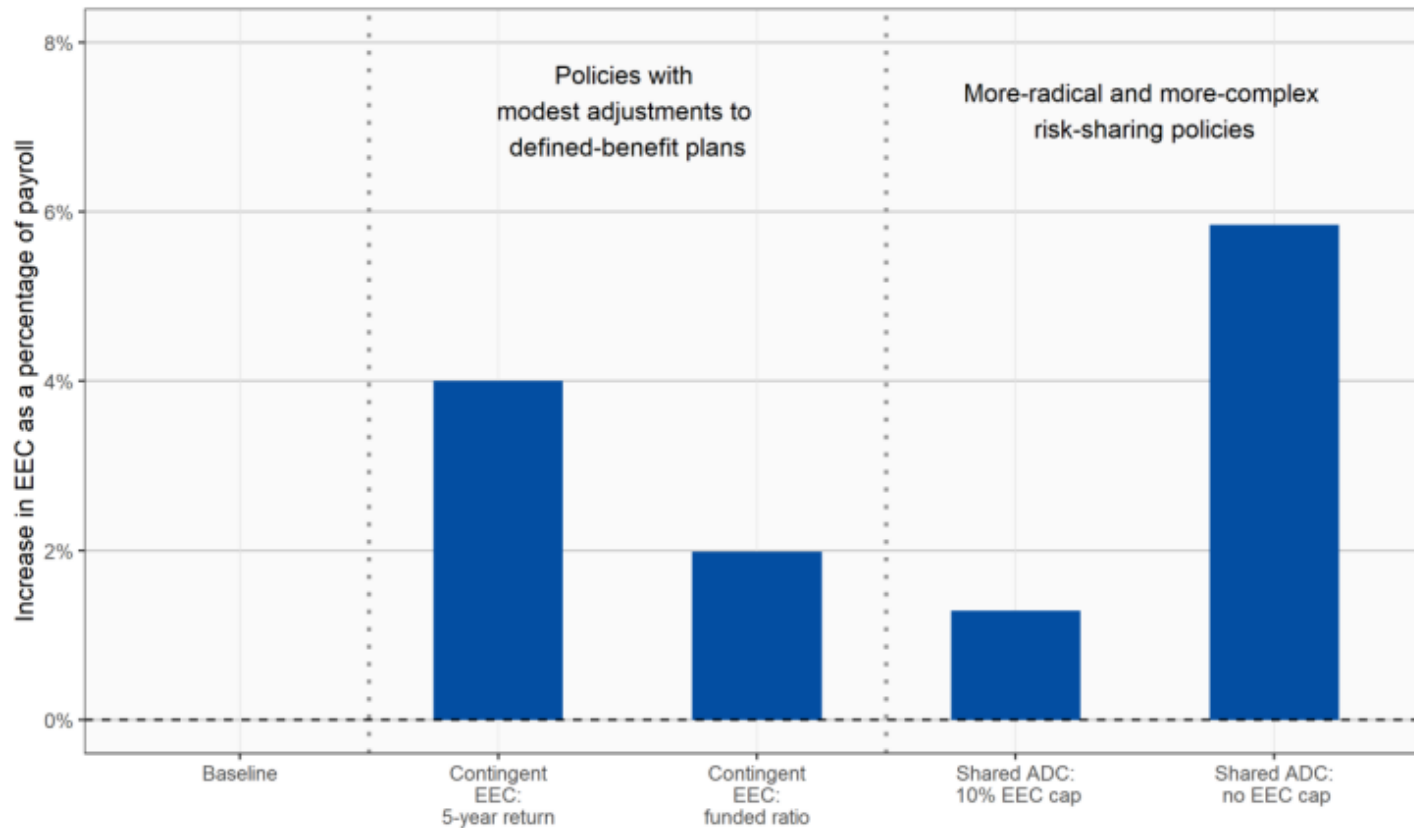
# Stochastic simulations: the impact on employee contributions

Distributions of the present value of 15-year employee contributions (EEC) under different risk-sharing policies



# Stochastic simulations: employee contribution risk

Maximum 5-year increase in employee contribution (EEC) rate over 15 years  
(75th percentile)



# Questions for policymakers to consider

- ▶ 1. What are the primary risks to share?
  - ▶ Before risk-sharing policies are designed, a thorough risk assessment should be conducted to identify the primary risks facing the plan, its members, and contributing governments. Policymakers can then design appropriate risk-sharing policies to target those risks.
  
- ▶ 2. What are the possible ways to share risks?
  - ▶ There are two main ways of sharing risks within the defined benefit structure: making pension benefits variable and making employee contributions variable—in either case, contingent on factors such as investment returns or plan-funded status. Other risk-sharing arrangements involve creating DB-DC hybrid plans, cash balance plans, and complex policies that combine multiple approaches.

# Questions for policymakers to consider

- ▶ 3. How will risk-sharing policy design choices determine who will be affected and how?
  - ▶ Contingent COLA policies share risks with plan members during their retirement years and contingent employee contribution policies share risks with plan members during their working years. Risk sharing policies with investment-return triggers target investment risk, while policies with funded-ratio triggers and policies that share the ADC target all risks.
  
- ▶ 4. What is the goal of risk sharing? Is it risk reduction, cost reduction, or both?
  - ▶ In some situations, risk sharing policies have been adopted to immediately transfer a portion of the existing cost of unfunded liability to plan members from employers even if the plan return assumption is met. Policymakers will want to pay close attention to the primary reason for the new policy: whether it is to reduce cost immediately, or to reduce future risks.

# Questions for policymakers to consider

- ▶ 5. How much can governments expect to save if risk-sharing policies are adopted?
  - ▶ In our simulations, the shared-ADC and hybrid DB-DC policies we modeled can reduce governments' long-term contribution by around 20 to 40 percent over 15 years under a severe asset-shock scenario or when the long-term average return is lower than expected, at the expense of lower member benefits or higher member contributions.
  - ▶ The impacts of contingent COLA and contingent employee contribution policies, as typically implemented in the United States, are much smaller.
- ▶ 6. How would pension benefits and member contributions be affected by risk-sharing policies?
  - ▶ In an asset-shock scenario, the funded-ratio-based COLA policy we modeled was reduced for 15 years, resulting in a retirement benefit after 15 years that was about 12 percent lower than the baseline benefit. Our stochastic simulations show that with contingent COLAs, pension benefits up to age 85 can be reduced by more than 5 percent in poor investment return scenarios and the maximum decrease could be 7 percent in real terms in a 5-year window. In the shared-ADC policies, we show that employee contributions could double over a 15-year period.

# Questions for policymakers to consider

- ▶ 7. What kinds of risk-sharing policies are allowed in your pension system?
  - ▶ States vary in their legal framework for public pension plans. Policymakers need to understand the institutional constraints, which include formal laws, processes, policies, and informal norms and practices, as well as influences from employees' unions, taxpayer groups, and others. Some risk-sharing policies may not be allowable under state constitutions or other laws.
  
- ▶ 8. Are there win-win possibilities?
  - ▶ Unfortunately, it doesn't seem so, at least in the sense that employer and plan member can both be financially better off. Pension plans take substantial investment risk, and that risk must be borne by someone. Policies that reduce contribution risk for employers come at the cost of greater contribution risk for employees and/or benefit risk for retirees.

# Thank you!

- ▶ Questions and comments are welcome.
- ▶ Available online:
  - ▶ [Public Pension Risk-Sharing Policies: A Policymaker's Guidebook;](#)
  - ▶ [Fact sheets: Public Pension Risk-Sharing Policies](#)

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