

How Much Do Public Employees Value Defined Benefit versus Defined Contribution Retirement Benefits?

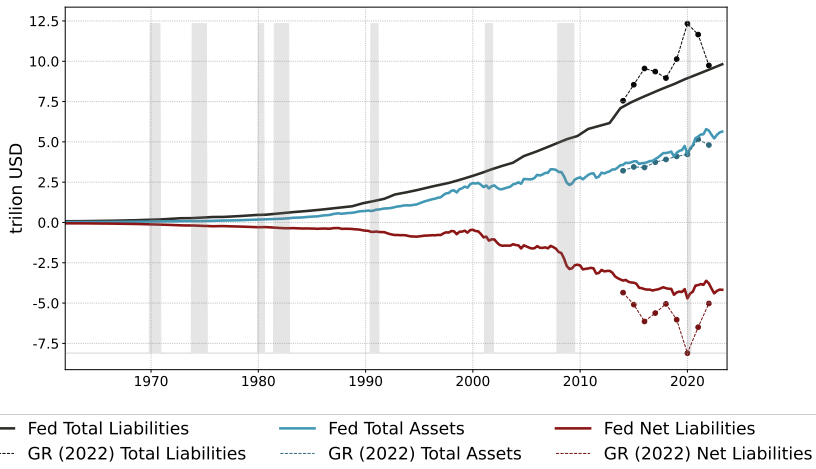
Oliver Giesecke, Hoover Institution
Joshua Rauh, Stanford GSB and Hoover Institution

October 6, 2023

Motivation

- U.S. private sector has moved away from defined benefit (DB) plans and toward defined contribution (DC)
 - Only 16 percent of workers in the private sector have access to DB plans ([Bureau of Labor Statistics, 2020](#)).
- U.S. public sector still mostly defined benefit (DB)
 - 86 percent of state and local government workers have access to DB plans ([Bureau of Labor Statistics, 2020](#); [NASRA, 2021](#)).
- Actuarial valuation of public pension liabilities underestimate economic liability ([Novy-Marx and Rauh, 2011](#)).
- Unfunded liability using market valuation around \$5 - \$6 trillion ([Giesecke and Rauh, 2022](#)).

Motivation



This Study

Scope:

- Survey public employees of school districts, local and state governments in the United States.
- We have e-mailed approximately 357,253 public employees (from 16 states) and received 7,674 responses, a response rate of 2.1%.

Main Objective:

- ① Assess public employees' perceived relative valuation of DB and DC plans.
 - ② Specifically, what is the lowest level of employer contribution in a new DC plan that would make employees indifferent between that new DC plan and a continuation of their DB plan?
 - ③ How does that cost compare to the cost of continuing their current DB plan?
- ⇒ Insights in the design of economically sustainable retirement options.

Results Preview

- Ask many questions about their current employment, income, current and expected job tenure, existing pension plan, financial literacy, and demographics
- Assess willingness to forgo future DB accruals in favor of a DC plan, with ascending offers
 - Not a lump-sum buyout of accrued benefits, which we specify will remain unchanged
- About **89.2%** accept DC plan in lieu of a DB plan for future accruals at some % contribution level
- Median respondent willing to forgo future DB accruals in exchange for DC plan with contribution rate of **10.0%** of payroll.
- **78.2%** of respondents willing to accept DC with contribution rate lower than individual DB service cost we calculate using an actuarial model

Heterogeneity in Results

- **Seniority of employee** (years of service, age) makes acceptance less likely and, if so, at higher contribution rates.
 - For required contributions there is an inverse U-relationship, consistent with employees understanding the impact of early retirement option on accruals ([Stock and Wise, 1990](#)).
- **Perceived financial stability** and **perceived and actual financial generosity** of the pension plan relate negatively to the acceptance rate
- **Educational attainment** and **financial literacy** show no strong relationship with DC contribution rate \Rightarrow responses are less a matter of understanding.

Roadmap

① Economic Motivation

② Survey Design

③ Summary Statistics

④ Results

⑤ Economic Cost

Employer Cost of Retirement Benefits: DC

- The cost to the employer of a DC plan is straightforward.
 - Basic (unconditional) percent of payroll (may be 0%), plus
 - Employer match as % of payroll
- Example: Stanford Contributory Retirement Plan
 - Basic contribution equals $\min\{5, \text{your years of service}\}\%$ of earnings up to limit
 - Matching contribution is 5% of earnings, for employee contribution of 4% of earnings (less if you contribute less), up to limit
 - Total employer cost: Up to 10% of earnings as contribution, up to limit

⇒ Employer cost is the contribution in the *current* year.

Employer Cost of Retirement Benefits: DB

- Economics of DB cost has two components
 - ① Service (“normal”) cost = PV(newly accrued benefits during the year), at some risk-appropriate discount rate
 - ② Interest on unfunded liability at risk-appropriate discount rate
- Typical DB cost concept in public budgeting is different
 - ① Service (“normal”) cost = PV(newly accrued benefits during the year), at some expected-return discount rate, usually 7%
 - ② Amortization of Unfunded Liabilities = Amortization payment on difference between assets and liabilities, at same discount rate

Note

- These costs may be offset by employee member contributions
- Employer could eliminate (1) by hard-freezing the plan, would replace it with a DC plan. Many companies have done this ([Rauh et al. \(2020\)](#))

Employer Cost of Retirement Benefits: DB Example

- Example: California State Teachers Retirement System (CalSTRS) benefit is $2\% \times \text{Years of Service} \times \text{Final Average Pay}$, full retirement eligibility at 60 (or 62)
 - 2021 Normal cost: 19.6% of pay (calculated at 7.1% discount rate)
 - Plus their 2021 calculated amortization rate of 15.1% to get to full funding by 2046 (at same discount rate)
 - Minus member contribution rate of 10.2%
 - Total employer “cost” = 24.5%
- But the true cost of continuing to run the DB plan is really the normal cost at a correct discount rate
- CalSTRS true normal cost using Treasury yield curve as was 44.3% in 2021.
- On average in sample of 647 pension plans, the median of stated service cost is 13.3% of payroll, and true actual is 26.7% (2021 data).

Literature

Valuation and Funding of Pension Obligations:

Lucas and Zeldes (2006); Brown and Wilcox (2009); Novy-Marx and Rauh (2009, 2011); Novy-Marx (2013); Brown and Pennacchi (2016); Giesecke and Rauh (2022)

DB vs. DC Choice:

Bodie et al. (1988), Beshears et al. (2010), Cocco and Lopes (2011), Brown and Weisbenner (2014), Brown et al. (2015), Fuchsman et al. (2023)

Conversion of Pension Benefits:

Chalmers et al. (2014), Rauh et al. (2020)

Surveys in Economics:

Beshears et al. (2014), Cole and Taska (2022), Stantcheva (2022)

Roadmap

① Economic Motivation

② Survey Design

③ Summary Statistics

④ Results

⑤ Economic Cost

Status and Response Rate

- Collected public e-mail addresses from **16 states** (AR, CA, CO, CT, DE, IA, ID, KS, MD, MN, MT, NC, NE, PA, VA and VT).
- Approximately **357,253** public employees contacted.
- Predominantly **public state employees; teachers and administrators in education.**
- A total of **7,674 responses**, that is, a **~2.1% response rate.**
- Approximately **2/3 completed the full survey**; remainder provided partial responses.

Response Rate by State

Avg. Completion Rate

Survey Design

- Survey contained **46 questions**
- Questions cover topics:
 - Employment status (employer, age, years of service, years until retirement, income)
 - Pension status (type of plan, current and expected benefits)
 - Perceptions about the DB and DC plan equivalence
 - Financial literacy assessment
 - Demographic / socio - economic characteristics
- **Key questions:**
 - *If your employer offered to contribute an amount equal to X% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?*
 - Began X at 2.5% and then went to 5% and progressively up by 5% up to 60%
 - Last question ask for write in as % of pay or no acceptance “under any conditions”.

Survey Conduct

- Every public employee of a school district, local or state government, with publicly available e-mail address, is a candidate for our pension survey.
- We collected 396,948 publicly available e-mail addresses, consisting of 325,473 public state employees, 65,493 in state higher education institutions, and 5,982 K-12 teachers and administrators.
- We invite candidates via Stanford University e-mail address, pensionstudy@stanford.edu, to our survey.
- We send a follow-up e-mail with a reminder about 10-14 days after the initial invitation.
- We have setup a website, <https://pensionsurvey.stanford.edu>, with additional information on the survey and context.

Roadmap

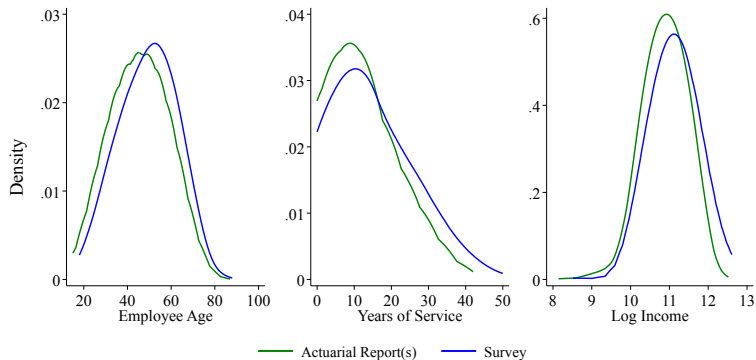
- ① Economic Motivation
- ② Survey Design
- ③ Summary Statistics**
- ④ Results
- ⑤ Economic Cost

Summary Statistics

	Mean	p25	p50	p75	Count
I. Survey Responses:					
Public Sector Income (USD)	75,375	45,000	65,000	85,000	7,458
Household Income (USD)	118,205	65,000	112,500	162,500	7,243
Financial Literacy (% Correct)	65.7	50.0	66.7	83.3	6,735
Age	49.2	40.0	50.0	59.0	7,674
Retirement Age	63.6	60.0	65.0	67.0	7,660
Years of Service	13.5	4.0	11.0	21.0	7,674
Remaining Years of Service	11.4	4.0	9.0	17.0	7,309
Hours Worked	40.5	40.0	40.0	40.0	7,674
Current DB Annuity (USD)	34,279	15,000	25,000	45,000	3,441
Expected DB Annuity (USD)	50,803	25,000	45,000	65,000	3,526
Current DC Balance (USD)	220,498	28,000	80,000	236,250	1,532
Acceptance of DC Plan (%)	89.2	100.0	100.0	100.0	5,524
Minimum Required DC Rate (%)	18.2	5.0	10.0	25.0	4,930
II. Matched Pension Plans:					
GASB Service Cost as % of Payroll	12.6	9.5	11.9	14.5	5,127
Market Value Service Cost as % of Payroll	24.1	20.4	24.3	24.7	4,819
Reported Service + Interest Cost as % of Payroll	58.2	47.9	52.5	70.8	5,127
MV Service + Interest Cost as % of Payroll	68.4	56.8	63.9	81.0	4,819
Contributions as % of Payroll	22.9	12.3	14.8	45.0	5,113

[More](#)

Sample Representativeness



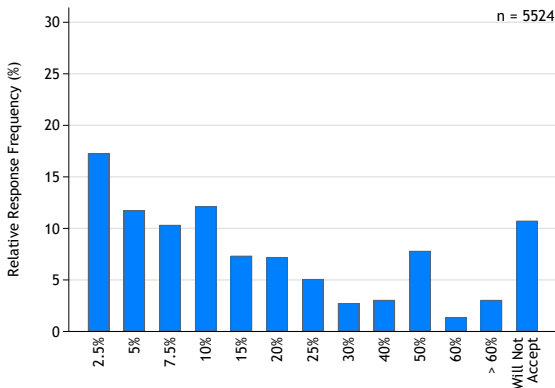
Variable	Mean	p25	p50	p75	Count
Actuarial Age	45.3	37.0	47.0	57.0	2,149,303
Survey Age	49.2	40.0	50.0	59.0	7,671
Actuarial Years of Service	10.6	2.0	7.0	17.0	2,149,356
Survey Years of Service	13.5	4.0	11.0	21.0	7,671
Actuarial Income (in USD)	57,004	45,073	57,065	65,756	2,120,481
Survey Income (in USD)	75,384	45,000	65,000	85,000	7,456

Income does not include KS because of missing data in the actuarial reports.

Roadmap

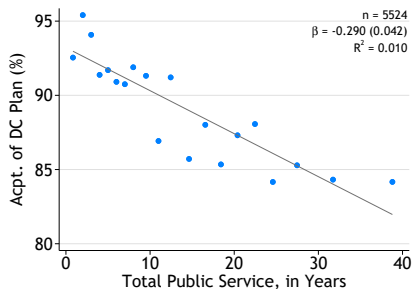
- ① Economic Motivation
- ② Survey Design
- ③ Summary Statistics
- ④ Results
- ⑤ Economic Cost

Acceptance & Minimum Required Contribution Rate

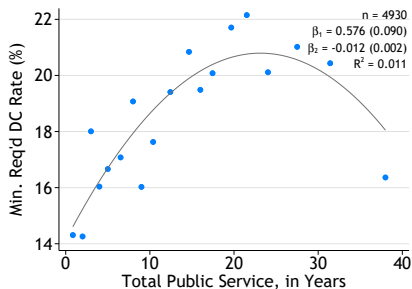


- ⇒ Acceptance of a DC in lieu of a DB plan of **89.2%**.
- ⇒ Median minimum required contribution rate of **10.0%** as of payroll (mean: 18.2%, 25th pct.: 5.0% and 75th pct.: 25.0%).

Heterogeneity by Years of Service



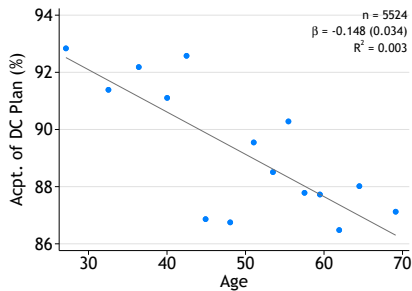
(a) Acceptance of DC Plan



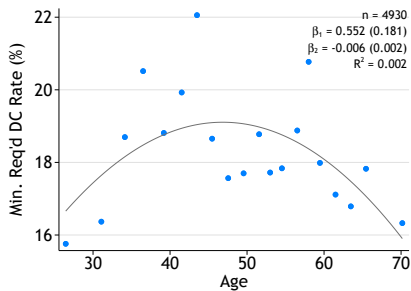
(b) Min. Required Contribution Rate

- ⇒ Seniority \uparrow ⇒ Acceptance Rate \downarrow
- ⇒ Acceptance Rate is still $> 80\%$ for employees with ≥ 30 years
- ⇒ Minimum rate consistent with accrual pattern (DB). Inverse U because of early retirement option

Heterogeneity by Age



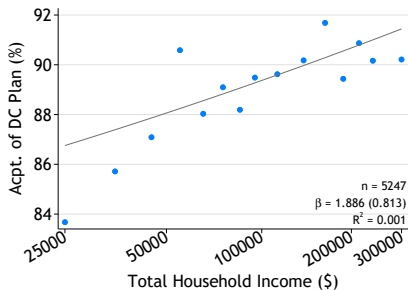
(c) Acceptance of DC Plan



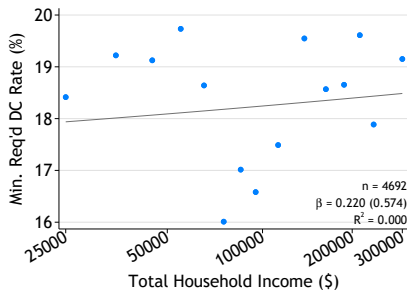
(d) Min. Required Contribution Rate

- ⇒ Respondents in their 40s require higher contribution rate than employees in their 20s and 30s
- ⇒ Employees in their 50s and 60s show similar required contribution rates to younger employees

Household Income



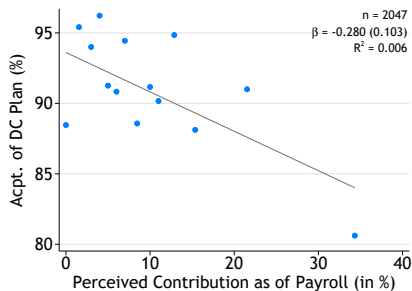
(a) Acceptance of DC Plan



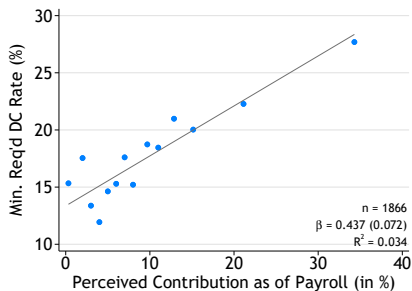
(b) Min. Required Contribution Rate

- ⇒ Weak positive relationship between household income and acceptance rate
- ⇒ Essentially no relationship between household income and required contribution rate

Perceived Pension Plan Generosity



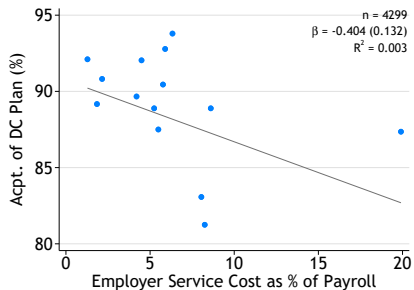
(a) Acceptance of DC Plan



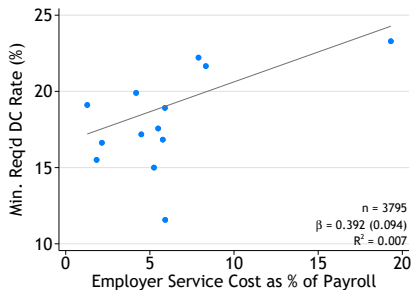
(b) Min. Required Contribution Rate

- ⇒ Perceived plan generosity serves as subjective reference point
- ⇒ Perceived Financial generosity \uparrow ⇒ acceptance rate \downarrow & required contribution \uparrow

Actual Pension Plan Generosity



(a) Acceptance of DC Plan



(b) Min. Required Contribution Rate

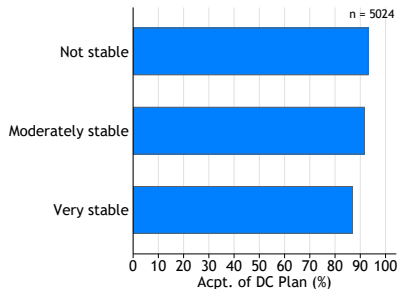
- ⇒ Actual financial generosity \uparrow ⇒ acceptance rate \downarrow
& required contribution \uparrow
- ⇒ Alternative measures of plan generosity show similar relationships

Plan Generosity Regression Results

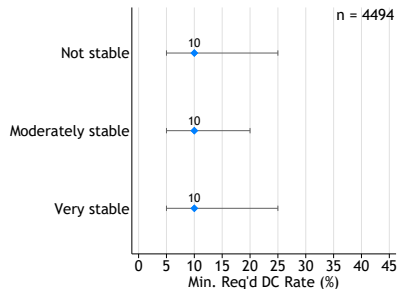
	Acceptance DC		Minimum Required Contribution DC	
	(1)	(2)	(3)	(4)
Perceived Employer Contr. as % of Payroll	-0.270*** (0.0888)		0.449*** (0.0580)	
Employer Service Cost. as % of Payroll		-0.317*** (0.112)		0.347*** (0.0773)
R^2	0.030	0.026	0.060	0.034
Ind. Characteristic	✓	✓	✓	✓
Race/Ethnicity	✓	✓	✓	✓
Marital Status	✓	✓	✓	✓
Education	✓	✓	✓	✓
Sex	✓	✓	✓	✓
Observations	1816	3683	1657	3271

- ⇒ An \$0.01 increase in reported service cost per \$1 of payroll is associated with a **\$0.35** increase in the contribution rate required for acceptance
- ⇒ Effect is **\$0.45** for perceived contribution
- ⇒ Average acceptance rate >**80%** even for most generous plans

Financial Stability



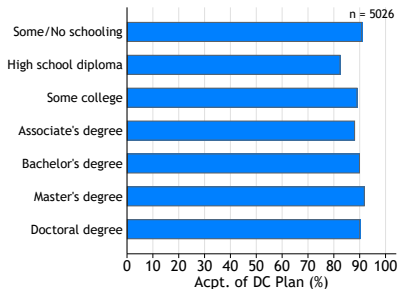
(a) Acceptance of DC Plan



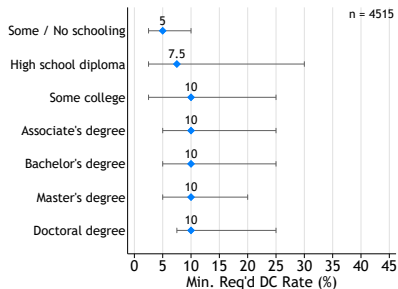
(b) Min. Required Contribution Rate

- ⇒ Payment of benefits under a DB plan depend on the solvency of the sponsor upon retirement.
- ⇒ Worries about financial stability affect willingness to switch to DC

Educational Attainment



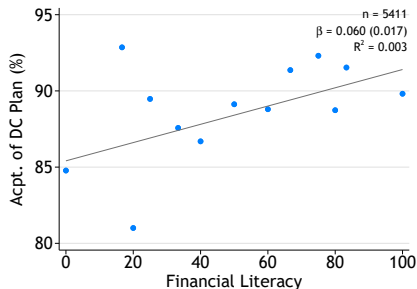
(a) Acceptance of DC Plan



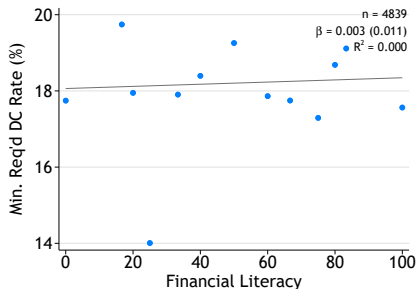
(b) Min. Required Contribution Rate

⇒ Educational attainment shows limited relationship with outcomes

Financial Literacy



(a) Acceptance of DC Plan



(b) Min. Required Contribution Rate

- ⇒ Financial literacy shows weak positive relationship with acceptance → financially savvy employees select into DC plan
- ⇒ But essentially no relationship with min required contribution rates

Acceptance of Defined Contribution Plan

	Acceptance (dummy)			
	(1)	(2)	(3)	(4)
Log HH Income	0.893 (0.842)	1.589* (0.869)	2.101** (1.034)	2.266** (1.063)
Age	0.00689 (0.0406)	0.00149 (0.0410)	-0.00271 (0.0496)	-0.0169 (0.0503)
Years of Service	-0.289*** (0.0508)	-0.277*** (0.0523)	-0.295*** (0.0603)	-0.296*** (0.0624)
Financial Literacy	4.947** (1.947)	5.064*** (1.955)	6.799*** (2.389)	7.230*** (2.409)
Education	0.648* (0.376)	0.330 (0.379)	0.557 (0.445)	0.201 (0.450)
Employer Service Cost % Payroll			-0.342** (0.137)	-0.0123 (0.154)
R^2	0.013	0.030	0.018	0.032
State-FE		✓		✓
Observations	4826	4826	3813	3813

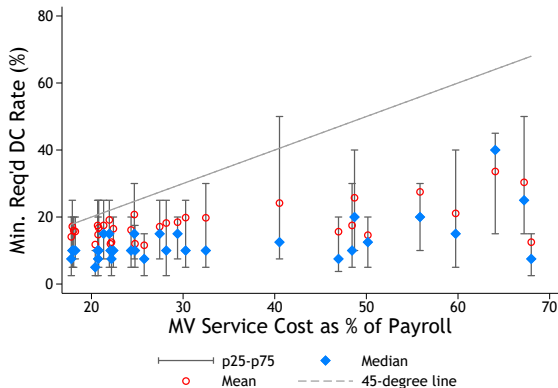
Minimum Required Contribution Rate

	Minimum Required Contribution Rate (in %)			
	(1)	(2)	(3)	(4)
Log HH Income	0.239 (0.623)	-0.0230 (0.627)	0.147 (0.730)	-0.0759 (0.740)
Age	-0.110*** (0.0289)	-0.110*** (0.0290)	-0.131*** (0.0341)	-0.126*** (0.0345)
Years of Service	0.192*** (0.0342)	0.203*** (0.0350)	0.163*** (0.0379)	0.188*** (0.0386)
Financial Literacy	0.407 (1.314)	0.292 (1.318)	0.789 (1.529)	0.481 (1.541)
Education	-0.486* (0.263)	-0.188 (0.266)	-0.519* (0.295)	-0.206 (0.300)
Employer Service Cost % Payroll			0.354*** (0.0966)	0.210* (0.110)
R^2	0.009	0.027	0.014	0.030
State-FE		✓		✓
Observations	4339	4339	3380	3380

Roadmap

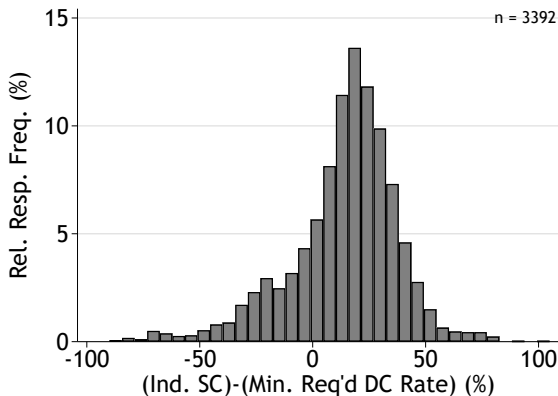
- ① Economic Motivation
- ② Survey Design
- ③ Summary Statistics
- ④ Results
- ⑤ Economic Cost

Plan-Level Analysis



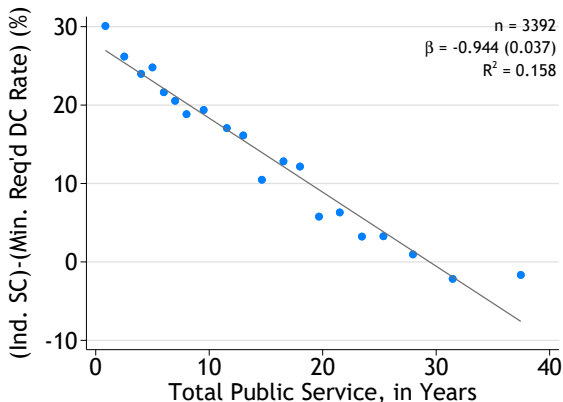
- ⇒ Both mean and median required contribution rate lie below current pension cost
- ⇒ Even the 75th percentile is below the current pension cost for predominant share of pension plans

Individual Analysis



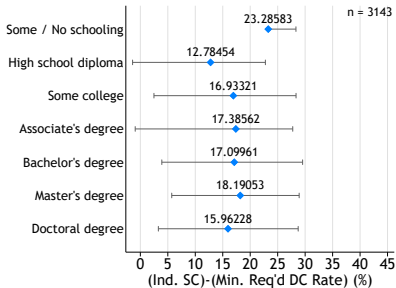
- ⇒ **78.2%** of respondents willing to accept contribution rate lower than individual service cost we calculate using actuarial model
- ⇒ That is, at a DC cost that is lower than the employer's DB cost for that individual

Individual Analysis (cont.)

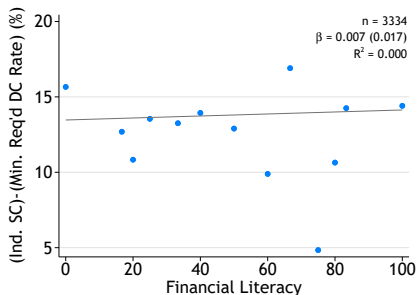


- ⇒ Savings are most pronounced among younger workers, who can benefit from mobility of DC plan
- ⇒ DC plans do not necessarily reduce employer competitiveness in the labor market

Individual Analysis (cont.)



(a) Educational Attainment



(b) Financial Literacy

⇒ Educational attainment and financial literacy shows little relationship with savings from DC plan, except possibly for those with less-than HS

Conclusion

- Many US public employees in DB plans would accept a DC plan that would both preserve satisfaction with the retirement plan option and be less costly than DB service cost.
- More senior employees are generally less likely to accept the DC option and generally at higher contribution rates until close to retirement age.
- Lower acceptance rate and, conditionally on acceptance, higher minimum required contribution rates for more generous plans.
- No significant heterogeneity with respect to educational attainment or financial literacy

References I

- Beshears, J., J. J. Choi, D. Laibson, and B. C. Madrian (2010). Defined contribution savings plans in the public sector: Lessons from behavioral economics. NBER State and Local Pensions Conference.
- Beshears, J., J. J. Choi, D. Laibson, B. C. Madrian, and S. P. Zeldes (2014). What makes annuitization more appealing? *Journal of public economics* 116, 2–16.
- Bodie, Z., J. B. Shoven, and D. A. Wise (1988). *Pensions in the US Economy*. University of Chicago Press.
- Brown, J. R., Z. Ivković, and S. Weisbenner (2015). Empirical determinants of intertemporal choice. *Journal of Financial Economics* 116(3), 473–486.
- Brown, J. R. and G. G. Pennacchi (2016). Discounting state and local pension liabilities: funding versus value. *Journal of Pension Economics and Finance* 15(3), 254–84.

References II

- Brown, J. R. and S. J. Weisbenner (2014). Why do individuals choose defined contribution plans? evidence from participants in a large public plan. *Journal of Public Economics* 116, 35–46.
- Brown, J. R. and D. W. Wilcox (2009). Discounting state and local pension liabilities. *American Economic Review* 99(2), 538–42.
- Bureau of Labor Statistics (2020). Employee benefits survey. <https://www.bls.gov/ncs/ebs/factsheet/defined-benefit-frozen-plans.htm>. [Online; accessed 05/15/2022].
- Chalmers, J., W. T. Johnson, and J. Reuter (2014). The effect of pension design on employer costs and employee retirement choices: Evidence from oregon. *Journal of Public Economics* 116, 17–34.
- Cocco, J. F. and P. Lopes (2011). Defined benefit or defined contribution? a study of pension choices. *Journal of Risk and Insurance* 78(4), 931–960.

References III

- Cole, A. and B. Taska (2022). Worker valuation of retirement benefits.
- Fuchsman, D., J. McGee, and G. Zamarro (2023). Teachers' willingness to pay for retirement benefits: A national stated preferences experiment. *Economics of Education Review* 102349.
- Giesecke, O. and J. D. Rauh (2022). Trends in state and local pension funds. *Annual Review of Financial Economics* 15.
- Lucas, D. and S. P. Zeldes (2006). Valuing and hedging defined benefit pension obligations—the role of stocks revisited. *Northwestern University and Columbia University, working paper, September*.
- NASRA (2021). Defined contribution plans administered by state retirement systems or available to state employees.
<https://www.nasra.org/files/Topical%20Reports/DC%20plans/statewidedcplans.pdf>. [Online; accessed 05/15/2022].

References IV

- Novy-Marx, R. (2013). Logical implications of the gasb's methodology for valuing pension liabilities. *Financial Analysts Journal* 69(1), 26–32.
- Novy-Marx, R. and J. Rauh (2011). Public pension promises: how big are they and what are they worth? *The Journal of Finance* 66(4), 1211–1249.
- Novy-Marx, R. and J. D. Rauh (2009). The liabilities and risks of state-sponsored pension plans. *Journal of Economic Perspectives* 23(4), 191–210.
- Rauh, J. D., I. Stefanescu, and S. P. Zeldes (2020). Cost saving and the freezing of corporate pension plans. *Journal of Public Economics* 188, 104211.
- Stantcheva, S. (2022). How to run surveys: A guide to creating your own identifying variation and revealing the invisible. Technical report, National Bureau of Economic Research.

References V

Stock, J. H. and D. H. Wise (1990, September). Pensions, the option value of work, and retirement. *Econometrica* 58(5), 1151–1180.

Summary Statistics (continued)

	N	Rel. Resp. Freq.
I. Plan Stability:		
Not stable	475	7.7%
Moderately stable	2,773	44.9%
Very stable	2,926	47.4%
II. Health Status:		
Poor	82	1.1%
Fair	2,766	36.9%
Excellent	4,653	62.0%

Summary Statistics (continued)

	N	Rel. Resp. Freq.
I. Race:		
Asian	131	2.1%
Black	458	7.2%
Native	27	0.4%
Other	466	7.4%
Pacific Islander	21	0.3%
Two or More	90	1.4%
White	5,141	81.2%
II. Educational Attainment:		
Some/No Schooling	17	0.3%
High School Diploma	345	5.5%
Some College	655	10.5%
Associate's Degree / Credential	631	10.1%
Bachelor's Degree	2,090	33.6%
Master's Degree	1,520	24.4%
Doctoral Degree	971	15.6%

Summary Statistics (continued)

	N	Rel. Resp. Freq.
I. Marital Status:		
Divorced	795	12.6%
Living with a partner	91	1.4%
Married	3,995	63.1%
Never married	1,017	16.1%
Prefer not to say	224	3.5%
Separated	80	1.3%
Widowed	132	2.1%
II. Sex:		
Female	3,078	49.9%
Male	3,042	49.3%
Non-binary / Other	47	0.8%

Survey Questions

ID	Question
Q1	Which of the following best describes your current employer?
Q2	Who is your current primary employer?
Q3	Which of the following best describes your current job?
Q4	How many years have you worked for your employer?
Q5	How many hours per week do you work in your job on average?
Q6	What was the estimated income from your job in the past 12 months?
Q7	Considering your entire household (which includes you, your spouse / partner) now, what was your estimated total household income (including income from all jobs as well as rent, dividends, interest, and other money received) in the past 12 months?
Q8	What is your age?
Q9	At what age do you plan to retire?
Q10	How would you describe your current health?
Q11	Which of the following, if any, best describes the retirement plans in which you are enrolled through your employer?
Q12	What is the name of the hybrid plan in which you are enrolled?
Q13	What is the name of the defined benefit pension plan in which you are enrolled?
Q14	(To the best of your knowledge,) how much do you expect to receive per year from your defined benefit pension plan after your retirement if you were to leave your job today?

Survey Questions (continued)

ID	Question
Q15	For about how many more years do you expect to continue to work for your current employer?
Q16	(To the best of your knowledge,) how much do you expect to receive per year from your defined benefit pension plan after your retirement if you continued to work for the number of years specified in the previous question?
Q17	To the nearest \$10,000, what is the estimated balance of your current defined contribution plan (e.g. 401(k), 403(b), etc.)?
Q18	How much do you think your employer pays into your defined benefit pension plan, defined contribution plan, guaranteed return plan and/or hybrid plan combined, as a percentage of your income (before taxes)?
Q19	How much does your household expect to receive annually in retirement benefits after retirement (including all defined benefit plans, 401(k), 403(b), social security benefits, military retired pay and veteran's pensions)?
Q20	If your employer offered to contribute an amount equal to 2.5% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q21	If your employer offered to contribute an amount equal to 5% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?

Survey Questions (continued)

ID	Question
Q22	If your employer offered to contribute an amount equal to 7.5% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q23	If your employer offered to contribute an amount equal to 10% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q24	If your employer offered to contribute an amount equal to 15% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q25	If your employer offered to contribute an amount equal to 20% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q26	If your employer offered to contribute an amount equal to 25% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q27	If your employer offered to contribute an amount equal to 30% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?

Survey Questions (continued)

ID	Question
Q28	If your employer offered to contribute an amount equal to 40% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q29	If your employer offered to contribute an amount equal to 50% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q30	If your employer offered to contribute an amount equal to 60% of your income each year into an investment account, would you enroll in this hypothetical plan if it meant you would stop earning additional benefits under your current plan?
Q31	Ok, if your employer offered to contribute an amount equal to any percentage of your income each year into an investment account, what is the smallest percentage you would accept to enroll in this hypothetical plan?
Q32	What healthcare benefits do you expect to receive upon retirement?
Q33	How would you describe the stability of your current retirement plan?
Q34	Suppose you have \$100 in an account with an interest rate of 2% per year. If you left your money in the account for 5 years, how much money do you think would be in the account?
Q35	Again, suppose you have \$100 in an account with an interest rate of 2% per year. If you left your money in the account for 5 years, how much money do you think would be in the account?

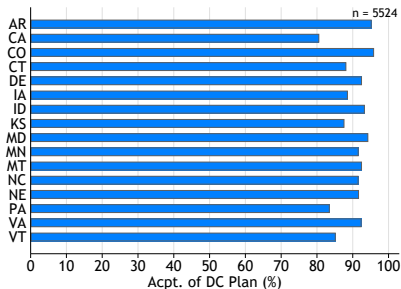
Survey Questions (continued)

ID	Question
Q36	Suppose you have some money in an account with an interest rate of 2% per year. If inflation is 3%, after one year, will you be able to buy less, more, or exactly the same with the money in your account than you could today?
Q37	What typically happens to the value of investment in bonds if interest rates rise?
Q38	Buying a single company's stock usually provides a safer return than a stock mutual fund
Q39	Suppose you have the option between a secure, guaranteed one-time payment of \$10,000 cash in ten years, or a one-time immediate cash payment today. What is the minimum amount that the immediate cash payment would have to be for you to choose it instead of the payment of \$10,000 in ten years?
Q40	Given your answer to the previous question, please specify the minimum amount that the immediate cash payment would have to be for you to choose it instead of the payment of \$10,000 in ten years.
Q41	What is your sex?
Q42	Are you of Hispanic, Latino, or Spanish origin?
Q43	What is your race?
Q44	What is the highest degree or level of school you have completed?
Q45	What is your marital status?
Q46	We thank you for your time spent taking this survey. Is there anything else you'd like to tell us?

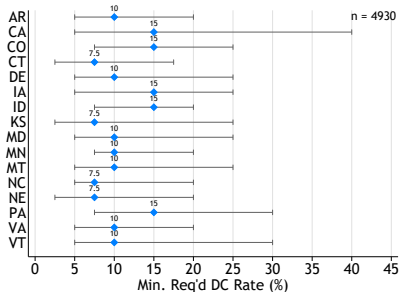
Financial Literacy Questions

ID	Question
Q34	Suppose you have \$100 in an account with an interest rate of 2% per year. If you left your money in the account for 5 years, how much money do you think would be in the account?
Q35	Again, suppose you have \$100 in an account with an interest rate of 2% per year. If you left your money in the account for 5 years, how much money do you think would be in the account?
Q36	Suppose you have some money in an account with an interest rate of 2% per year. If inflation is 3%, after one year, will you be able to buy less, more, or exactly the same with the money in your account than you could today?
Q37	What typically happens to the value of investment in bonds if interest rates rise?
Q38	Buying a single company's stock usually provides a safer return than a stock mutual fund
Q39	Suppose you have the option between a secure, guaranteed one-time payment of \$10,000 cash in ten years, or a one-time immediate cash payment today. What is the minimum amount that the immediate cash payment would have to be for you to choose it instead of the payment of \$10,000 in ten years?
Q40	Given your answer to the previous question, please specify the minimum amount that the immediate cash payment would have to be for you to choose it instead of the payment of \$10,000 in ten years.

Heterogeneity by State

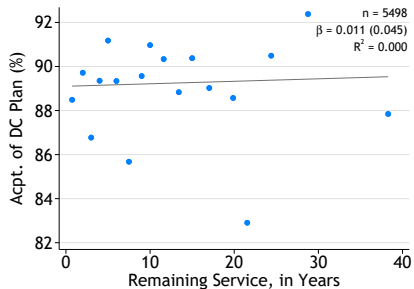


(a) Acceptance of DC Plan

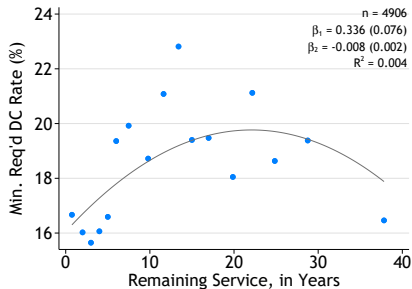


(b) Min. Required Contribution Rate

Heterogeneity by Remaining Years

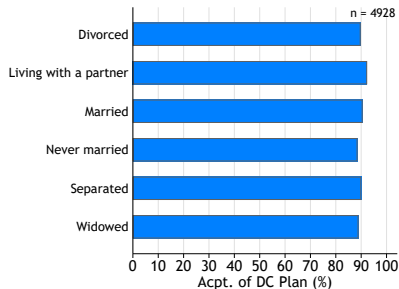


(a) Acceptance of DC Plan

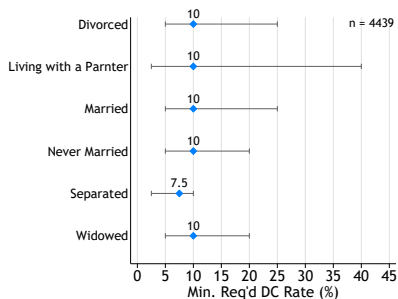


(b) Min. Required Contribution Rate

Heterogeneity by Marital Status

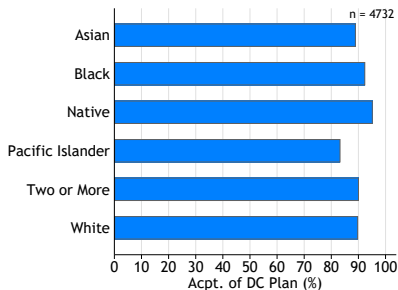


(a) Acceptance of DC Plan

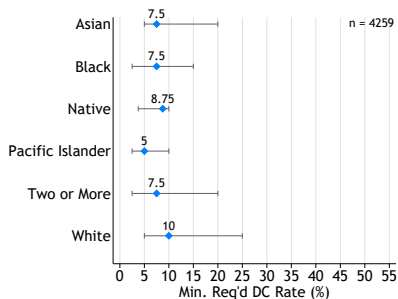


(b) Min. Required Contribution Rate

Heterogeneity by Race

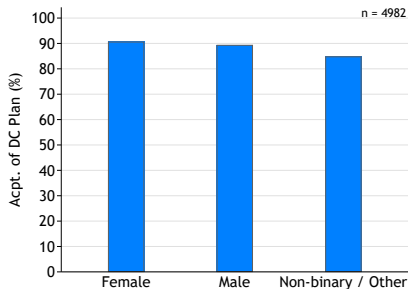


(a) Acceptance of DC Plan

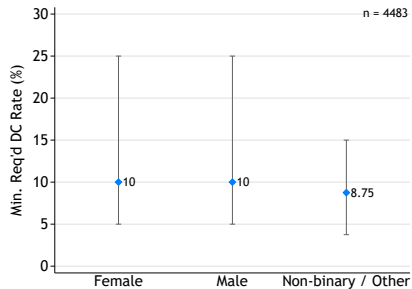


(b) Min. Required Contribution Rate

Heterogeneity by Sex

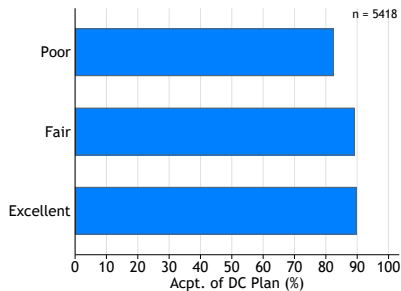


(a) Acceptance of DC Plan

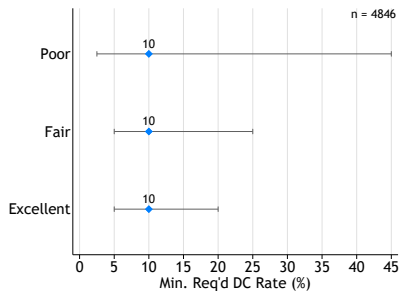


(b) Min. Required Contribution Rate

Heterogeneity by Health Status

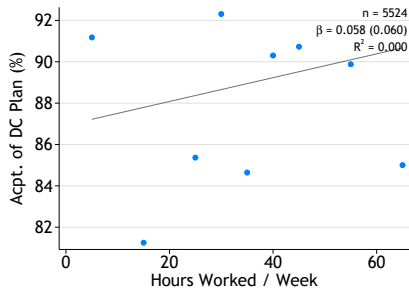


(a) Acceptance of DC Plan

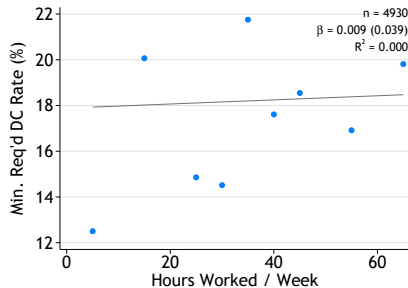


(b) Min. Required Contribution Rate

Heterogeneity by Hours Worked

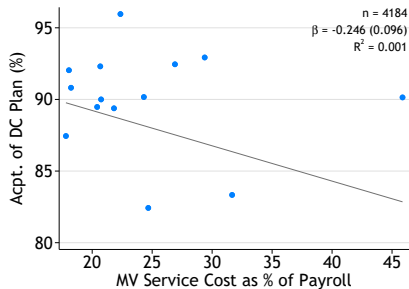


(a) Acceptance of DC Plan

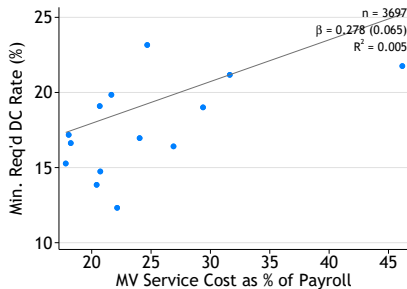


(b) Min. Required Contribution Rate

MV of Service Cost as of Payroll

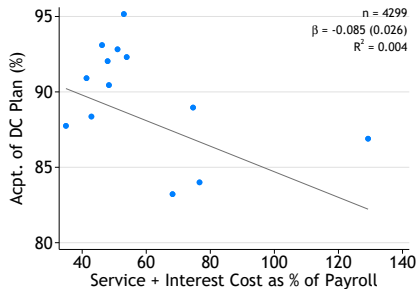


(a) Acceptance of DC Plan

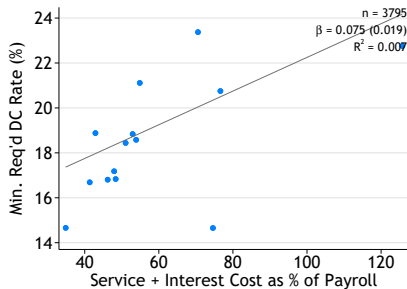


(b) Min. Required Contribution Rate

Service and Interest Cost as of Payroll

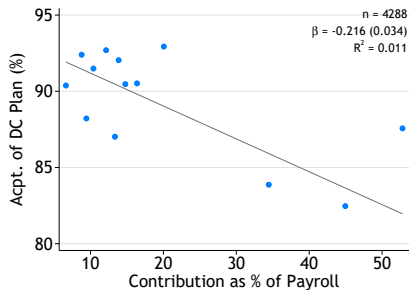


(a) Acceptance of DC Plan

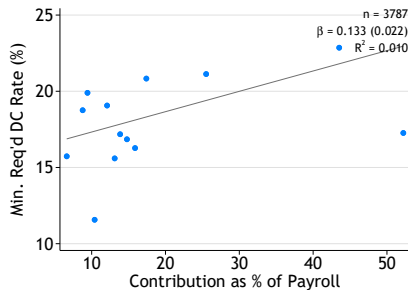


(b) Min. Required Contribution Rate

Contributions as of Payroll



(a) Acceptance of DC Plan



(b) Min. Required Contribution Rate

Back

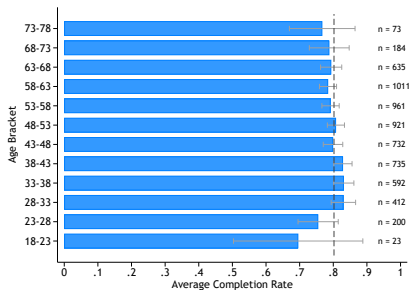
Plan Summary Statistics

State	Plan Name	N	Stability Score	Share Acceptance	p50 Req'd DC Rate	Mean Req'd DC Rate	p25 Req'd DC Rate	p75 Req'd DC Rate
AR	Arkansas Public Employees Retirement System (APERS)	84	1.43	96.4%	10.0%	17.5%	5.0%	20.0%
CA	California Public Employee Retirement System (CalPERS) - Judges I	10	1.80	70.0%	25.0%	32.9%	11.2%	50.0%
CA	California Public Employee Retirement System (CalPERS) - Judges II	19	1.44	84.2%	40.0%	33.6%	17.5%	42.5%
CA	California Public Employee Retirement System (CalPERS) - State Miscellaneous	208	1.70	81.2%	10.0%	21.7%	5.0%	30.0%
CA	California Public Employee Retirement System (CalPERS) - State Peace Officers and Firefighters	31	1.63	77.4%	17.5%	24.4%	6.9%	40.0%
CO	Public Employees' Retirement Association of Colorado (PERA) - State Division	41	1.10	97.6%	15.0%	17.1%	7.5%	25.0%
CT	Connecticut State Employee Retirement System (SERS)	149	1.46	89.3%	7.5%	14.8%	2.5%	20.0%
DE	Delaware Public Employee Retirement System (DPERS) - State Employees	58	1.59	93.1%	10.0%	16.8%	5.0%	23.8%
IA	Iowa Judicial Retirement System (JRS)	30	1.54	90.0%	20.0%	25.7%	12.5%	40.0%
IA	Iowa Public Employees' Retirement System (IPERS) - Regular Membership	267	1.50	88.0%	15.0%	20.2%	5.0%	25.0%
IA	Peace Officers' Retirement, Accident and Disability System (PORS)	7	1.86	100.0%	25.0%	30.4%	15.0%	50.0%
ID	Public Employee Retirement System of Idaho (PERSI)	193	1.69	92.7%	15.0%	19.0%	8.8%	20.0%
KS	Kansas Public Employees Retirement System (KPERs)	207	1.37	87.0%	7.5%	15.0%	2.5%	20.0%

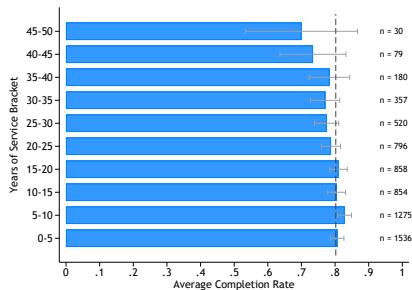
Plan Summary Statistics (continued)

State	Plan Name	N	Stability Score	Share Acceptance	p50 Req'd DC Rate	Mean Req'd DC Rate	p25 Req'd DC Rate	p75 Req'd DC Rate
MD	Maryland Teachers' Retirement and Pension Systems (TCS)	17	1.53	94.1%	10.0%	12.0%	5.0%	16.2%
MN	Public Employees Retirement Association (PERA) - General Employees Fund	23	1.38	91.3%	10.0%	17.6%	5.0%	25.0%
MN	State Retirement System (SRS) - Correctional Employees Retirement Fund	7	1.57	85.7%	12.5%	24.2%	8.1%	41.2%
MN	State Retirement System (SRS) - General Employees Retirement Fund	195	1.57	90.8%	10.0%	16.7%	7.5%	20.0%
MN	State Retirement System (SRS) - State Patrol Retirement Fund	7	1.83	85.7%	20.0%	27.5%	10.0%	30.0%
MT	Public Employees' Retirement System (PERA) - Game Wardens' and Peace Officers' Retirement System	13	1.38	92.3%	12.5%	14.6%	5.0%	20.0%
MT	Public Employees' Retirement System (PERA) - Public Employees Retirement System	221	1.41	92.3%	10.0%	19.1%	7.5%	25.0%
NC	North Carolina Consolidated Judicial Retirement System (CJRS)	17	1.35	94.1%	7.5%	15.6%	4.4%	20.0%
NC	North Carolina Local Governmental Employees' Retirement System (LGERs)	47	1.42	91.5%	7.5%	11.6%	2.5%	15.0%
NC	North Carolina Teachers and State Employees' Retirement System (TSERS)	534	1.54	90.4%	10.0%	16.8%	5.0%	20.0%
NE	Nebraska Public Employees Retirement System (NPERs) - State Employees	95	1.45	89.5%	5.0%	13.9%	2.5%	10.0%
NE	Nebraska Public Employees Retirement System (NPERs) - State Patrol	20	1.50	90.0%	7.5%	17.4%	2.5%	18.8%

Average Completion Rates



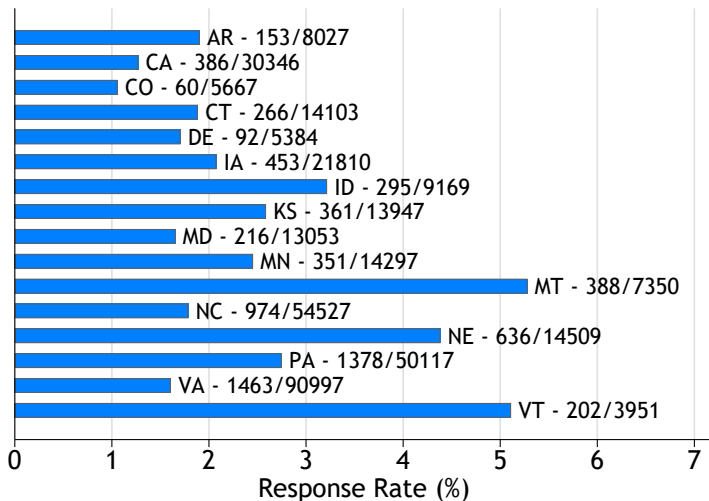
(a) Avg. Completion Rate by Age



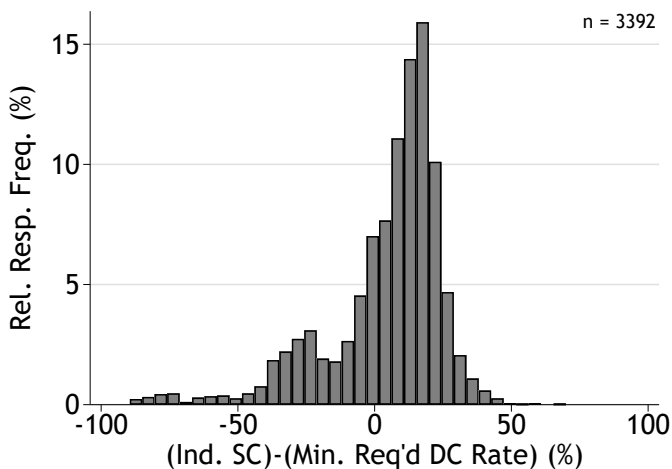
(b) Avg. Completion Rate by Service

Back

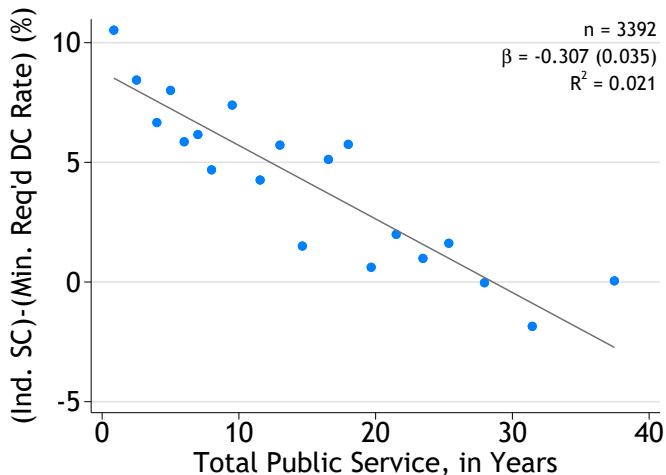
Response Rate by State



(Individual MV SC) - (Required Contribution Rate) Distribution



(Individual MV SC) - (Required Contribution Rate) vs. Years of Service

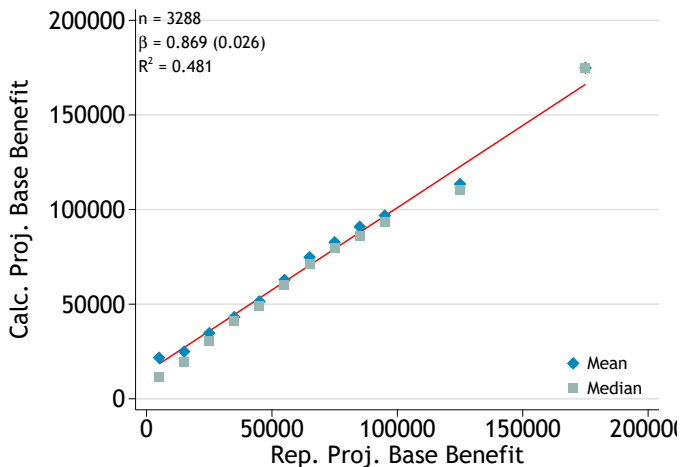


Service Cost Equation

$$SVC_{i,l,t} = Benefits_{i,l,r} * \ddot{a}_r * \frac{\frac{(1+d)}{(1+w)} - 1}{\frac{(1+d)^{r-k+1}}{(1+w)} - 1} * \frac{1}{(1+w)^{r-t}} \quad (1)$$

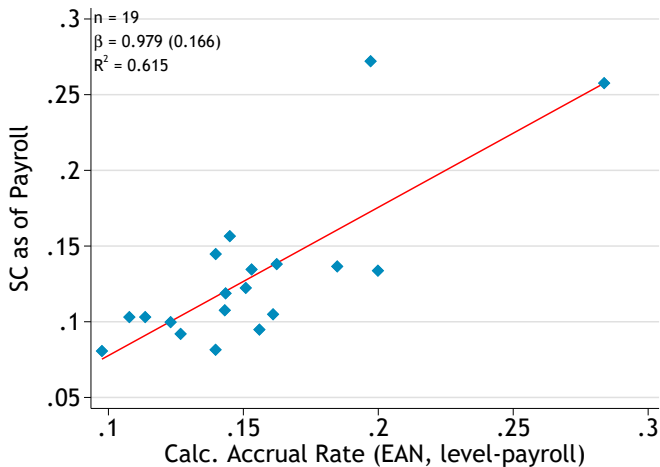
- ⇒ The first two terms are the annual value of benefits at retirement and the annuity factor
- ⇒ The second two terms smooth the value of this benefit out to equal the same percentage of payroll across the lifetime of an employee, the method used in Entry Age Normal, level-percent of payroll service cost calculation, the method used by most plans.

Reported vs. Calculated Base Benefit



⇒ Reported future base benefits predict **48%** of the variation in calculated future base benefits

Reported vs. Calculated SC



Invitation Email

Hello,

You are invited to participate in a survey that explores public sector employee retirement options and alternatives.

The survey is conducted by researchers at the **Stanford University** Graduate School of Business. Your participation may help ensure the long term stability and sustainability of public sector retirement benefits.

If you want to learn more about the pension survey please visit: <https://pensionsurvey.stanford.edu>

Your participation is **voluntary** and **anonymous**. If you choose to participate, please accept your invitation by clicking the link below and completing our brief survey.

[Go To Survey](#)

Thank you for your consideration and have a wonderful day.

Stanford Pension Study
Stanford Graduate School of Business



DESCRIPTION: You are invited to participate in a **research study** exploring public sector employee knowledge and preference regarding defined benefit and defined contribution retirement plans. This study will be used to develop solutions for maintaining the long-term stability of public sector retirement plans. You will be asked to complete a brief online survey.

TIME INVOLVEMENT: Your participation will take approximately 10 minutes.

RISKS AND BENEFITS: There are no risks associated with the study. The benefits which may reasonably be expected to result from this study are improvement of the long-term stability of public sector retirement plans. **We cannot and do not guarantee or promise that you will receive any benefits from this study.** Your decision whether or not to participate in this study will not affect your employment or retirement.

PAYMENTS: You will receive no payment for your participation.

PARTICIPANT'S RIGHTS: If you have read this form and have decided to participate in this project, please understand your **participation is voluntary** and you have the **right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. The alternative is not to participate.** You have the right to refuse to answer particular questions. The results of this research study may be presented at scientific or professional meetings or published in scientific journals. Your individual privacy will be maintained in all published and written data resulting from the study.

CONTACT INFORMATION:

Questions: If you have any questions, concerns or complaints about this research, its procedures, risks and benefits, email the survey team at pensionfeedback@stanford.edu or contact the the Protocol Director, **Tim Rosenberger** at

Independent Contact: If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the Stanford Institutional Review Board (IRB) to speak to someone independent of the research team at 650-723-2480 or email at irbnonmed@stanford.edu or toll free at 1-866-680-2906. You can also write to the Stanford IRB, Stanford University, 1705 El Camino Real, Palo Alto, CA 94306.

Please print a copy of this page for your records

If you agree to participate in this research, please complete the attached survey.

Follow-Up Email

Hello,

This is a follow-up to our previous invitation to participate in the pension survey conducted by researchers at the **Stanford University** Graduate School of Business. We would appreciate your input and time as this survey may help ensure the long term stability and sustainability of public sector retirement benefits.

Please ignore this invitation if you have already participated. This is the last invitation to participate and there will be no additional follow-up.

If you want to learn more about the pension survey please visit: <https://pensionsurvey.stanford.edu>.

Your participation is **voluntary** and **anonymous**. If you choose to participate, please accept your invitation by clicking the link below and completing our brief survey.

[Go To Survey](#).

Thank you for your consideration and have a wonderful day.

Stanford Pension Study
Stanford Graduate School of Business

DESCRIPTION: You are invited to participate in a **research study** exploring public sector employee knowledge and preference regarding defined benefit and defined contribution retirement plans. This study will be used to develop solutions for maintaining the long-term stability of public sector retirement plans. You will be asked to complete a brief online survey.

TIME INVOLVEMENT: Your participation will take approximately 10 minutes.

RISKS AND BENEFITS: There are no risks associated with the study. The benefits which may reasonably be expected to result from this study are improvement of the long-term stability of public sector retirement plans. **We cannot and do not guarantee or promise that you will receive any benefits from this study.** Your decision whether or not to participate in this study will not affect your employment or retirement.

PAYMENTS: You will receive no payment for your participation.

PARTICIPANT'S RIGHTS: If you have read this form and have decided to participate in this project, please understand your **participation is voluntary** and you have the **right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. The alternative is not to participate.** You have the right to refuse to answer particular questions. The results of this research study may be presented at scientific or professional meetings or published in scientific journals. Your individual privacy will be maintained in all published and written data resulting from the study.

CONTACT INFORMATION:

Questions: If you have any questions, concerns or complaints about this research, its procedures, risks and benefits, email the survey team at pensionfeedback@stanford.edu or contact the the Protocol Director, **Tim Rosenberger** at

Independent Contact: If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the Stanford Institutional Review Board (IRB) to speak to someone independent of the research team at 650-723-2480 or email at irbnonmed@stanford.edu or toll free at 1-866-680-2906. You can also write to the Stanford IRB, Stanford University, 1705 El Camino Real, Palo Alto, CA 94306.

Please print a copy of this page for your records

If you agree to participate in this research, please complete the attached survey.