



DEFINED- CONTRIBUTION PENSIONS ARE COST-EFFECTIVE

Josh B. McGee
Senior Fellow, Manhattan Institute



CENTER FOR STATE AND LOCAL LEADERSHIP
AT THE MANHATTAN INSTITUTE

EXECUTIVE SUMMARY

In recent decades, U.S. private-sector employers have increasingly offered retirement benefits through defined-contribution retirement (DC) plans. The share of workers who are offered a retirement plan through their employer and who participate only in a DC plan has increased—from 16 percent in 1979 to 69 percent in 2011. Yet the vast majority of American public-sector workers (75 percent) still earn retirement benefits under a defined-benefit retirement (DB) plan.

The relative merits of DC plans and DB plans have long been debated. Many public-sector employers have recently considered placing new employees in a DC plan; but only two states, Michigan and Alaska, as well as a handful of cities, currently use a DC plan as the primary retirement savings vehicle for new employees. When state and local governments have considered adopting a DC plan for new employees, they have encountered significant opposition from organized labor, managers of current public-retirement systems, and the cottage industry of consultants that supports public DB plans.

Critics of DC plans argue that DB plans are more cost-effective because the latter deliver higher investment returns and convert retirement savings into annuities. This paper investigates whether such assertions hold up to empirical scrutiny. Key findings include:

- 1. DB plans are not structurally more cost-effective than DC plans.** Claims of the superior efficiency of DB plans—underpinned by false assumptions and a neglect of pension debt as a significant cost driver—are not supported by empirical evidence.
- 2. DC plans achieve similar investment returns.** Between 1995 and 2012, average estimated ten-year performance differences between DB and DC plans—at the mean, median, 25th, and 75th percentiles—were less than half a percentage point and were generally not statistically significant. Bottom-performing DB plans outperformed bottom-performing DC plans; top-performing DC plans outperformed top-performing DB plans. Since 2000, performance differences have further narrowed.
- 3. DC plans can—and do—offer annuities.** The limited availability of annuities among private-sector DC plans is largely the result of misguided federal regulation discouraging their provision. Nevertheless, a number of private-sector firms provide annuities under their DC plans. And most public-sector employers—which do not face regulation hostile to annuities—provide annuities at favorable prices under their DC plans.
- 4. Pension debt is a significant cost driver for DB plans.** DC plan critics generally ignore the cost of carrying pension debt—one of DB plans’ largest cost drivers—in their DC-DB plan comparisons. For example, carrying a pension debt equal to 10 percent of liabilities would increase annual cost as a percentage of payroll by around 70 percent; carrying a debt equal to 20 percent of liabilities would increase annual cost by around 140 percent.
- 5. DC plans are a good option for providing retirement security.** Most current DC plans include a number of plan features—including well-designed, diversified, professionally managed investment products—that automatically place participants on a secure retirement path. DC plans can also solve many of the political-economy and benefit-design problems associated with DB plans.

CONTENTS

1	Introduction
2	I. Investment Returns
13	II. Annuitization
13	III. The High Cost of Pension Debt
16	Conclusion
19	References
22	Appendix
27	Endnotes

ABOUT THE AUTHOR

JOSH B. MCGEE is a senior fellow at the Manhattan Institute and vice president of public accountability at the Laura and John Arnold Foundation. McGee's research on retirement policy, K–12 education, and economic development has been published in various scholarly journals, including *Education Finance and Policy*, *Journal of Development Economics*, and *Education Next*. His popular writing has appeared in *National Affairs*, *Dallas Morning News*, *Philadelphia Inquirer*, *Atlanta Journal Constitution*, and *Houston Chronicle*. McGee has provided expert testimony and technical assistance in more than 50 jurisdictions and routinely speaks to the media on retirement issues and K–12 policy. He holds a B.S. and an M.S. in industrial engineering and a Ph.D. in economics, all from the University of Arkansas.

ACKNOWLEDGMENTS

The author gratefully acknowledges Chad Aldeman, Andrew Biggs, Robert Costrell, William Gale, Liaw Huang, Cory Koedel, Greg Mennis, Brian Septon, Daniel Shoag, Michelle Welch, and the Reason Foundation for their insights.

DEFINED- CONTRIBUTION PENSIONS ARE COST-EFFECTIVE

Josh B. McGee INTRODUCTION

Retirement benefits are an important and valued component of compensation, and promoting retirement security is a worthy policy goal. Recognizing this, the vast majority of employers offer full-time workers some form of retirement benefits.¹ Two broad categories of retirement savings vehicles have evolved over the years: defined-benefit (DB) and defined-contribution (DC) plans. In a typical DB plan, workers are promised a monthly retirement benefit based on salary, age, and years of service. In a typical DC plan, workers are promised a certain level of annual employer contributions to individual accounts.²

The relative merits of DB and DC retirement plans have long been debated.³ This debate has occurred as the use of DC plans has increased significantly in the private sector, from 16 percent of primary-plan participation in 1979 to 69 percent in 2011.⁴ The vast majority—in 2014, 75 percent—of public-sector employees continue to earn retirement benefits under a DB system.⁵

The private-sector shift to DC plans has been driven by a number of factors widely discussed in the academic literature.⁶ While some of the causes are unique to the private sector, public-sector plans have experienced their own challenges that have precipitated retirement-plan changes in nearly every jurisdiction in the United States. State and local governments now shoulder a public pension debt of \$1.3–\$6 trillion for benefits that workers have already earned.⁷ Since 2001, taxpayer contributions to public-retirement plans have nearly tripled.⁸ In 49 of 50 states, benefits have changed substantially for at least some public workers as well.⁹

Changes to public-sector plans have largely reduced the value of final-average-salary DB plans but have not resulted in comprehensive reforms similar to the private-sector shift to DC plans.¹⁰ Governments that have considered switching to DC plans have encountered significant resistance from organized labor, managers of current public-retirement systems, and the cottage industry of consultants that supports public DB plans.

Perhaps the most vocal critic of DC plans is the National Institute for Retirement Security (NIRS), a Washington, D.C.-based nonprofit started by public DB plan administrators and associated interest groups. In 2008 and in 2014, NIRS published reports asserting that DB plans provide benefits at nearly half the cost of those provided by DC plans.¹¹ Such advantages are inherent in the DB model, NIRS asserts—any plan sponsor who selects a DC plan over a DB plan is thus choosing an inferior benefit at higher cost.

The NIRS papers are influential in the state and local retirement-policy community, with their arguments echoed by think tanks, public-retirement plans, and actuarial- and financial-consulting firms that work for public plans.¹² Actuarial firms, such as the Segal Group, Buck Consultants, and Gabriel, Roeder, Smith & Company, have produced reports repeating this claim in Colorado, Michigan, Nevada, New Mexico, and Texas.¹³

This paper investigates whether claims asserting the superior cost-effectiveness of DB plans hold up to empirical scrutiny. Building on the work of other recent papers that have addressed these claims, it provides new analysis of investment returns by plan type, the provision of annuities under DC plans, and the cost of carrying pension debt under DB plans.¹⁴

This paper finds that claims that DB plans are more cost-effective are not supported by empirical evidence, are driven by false assumptions, and ignore pension debt as a significant cost driver for DB plans. Both theory and practice suggest that well-designed DC plans can deliver benefits at least as efficiently as DB plans. Though not a panacea for

all retirement-policy problems and not the only viable option, well-designed DC plans address some of the most significant flaws of the predominant DB model. DC plans are less back-loaded than DB plans—allowing workers to earn a reasonable retirement benefit regardless of age and tenure—and they eliminate the prospect of pension debt.

Section I examines DB plans' alleged superior investment returns; **Section II** examines the availability of annuities under DB and DC plans;¹⁵ and **Section III** discusses the importance of pension debt in DB and DC plan comparisons.

I. INVESTMENT RETURNS

It is widely believed that individual investors underperform institutional investors and that the former are often poorly equipped to navigate market vagaries.¹⁶ Though there is empirical evidence to support this assertion, the extent to which it is a problem is unclear in the current retirement-plan context. Specifically, it is not clear that the common framework—under which DB administrators are considered institutional investors and DC participants are considered individual investors—captures the practical dynamics of DC plan investing, given the direction that DC plan design has taken during the past 15–20 years.

Unlike individual-investment accounts, DC plans limit the number and type of investment options: members are normally not allowed to pick individual equity or bond investments but must instead select among professionally constructed and managed funds. In recent years, DC plan policy has shifted further away from the pure individual-investor model. Increasingly, DC plans include auto-enrollment, well-designed default-investment options, and automatic allocation-investment vehicles, such as target-date funds.¹⁷ The proliferation of plan features that automatically place participants on a secure retirement path will likely have a significant positive impact on savings outcomes.¹⁸

The investment choices available to DC plan participants have improved dramatically as well. The vast

majority of DC plans now offer target-date funds (70 percent) and index funds (84 percent).¹⁹ According to the Employee Benefit Research Institute (EBRI), two-thirds of recently hired private-sector workers participating in a retirement plan hold balanced funds, a category that includes target-date funds.²⁰ In 2013, 77 percent of newly hired workers who held balanced funds invested 90 percent of their account balances in target-date funds.²¹

In a 2014 paper on target-date funds in the DC plans that it administers, Vanguard found similar results: 88 percent of DC plans, covering 97 percent of plan participants, offered target-date funds; and 82 percent of DC plans used a target-date fund or balanced fund as a default investment.²² As a result, approximately 80 percent of new Vanguard plan entrants are invested only in target-date or balanced funds. The bottom line: most DC plan members now invest in well-designed, diversified, professionally managed investment products—thereby mitigating many advantages that institutional investors formerly enjoyed.

There is also evidence that institutional investors are susceptible to shortcomings of their own. Recent papers have found that state and local pension plans tend to overinvest in in-state equities and alternative investments.²³ Further, there is evidence that accounting rules for U.S. public pensions incentivize riskier investment behavior than do those of other countries.²⁴ Pension-plan investments have become politicized, too: activists have demanded that pension plans invest in or divest from various companies—from producers of green energy to fossil fuels to weapons—for reasons unrelated to shareholder value.

Do Investment Returns Differ Between DB and DC Plans?

U.S. Department of Labor (DOL) data on private-sector retirement plans allow comparisons of DB and DC returns over long periods.²⁵ Previous analyses of these data, by the DOL, Towers Watson (TW), and Boston College's Center for Retirement Research (CRR), found that annual DB plan investment returns have historically been higher than those of DC plans.²⁶ However, in each case, the authors' preferred metric heavily weighted their results based on

the performance of large plans—an approach that offers DB plans an artificial advantage because they tend to be larger than private-sector DC plans and because large DB plans tend to outperform relatively smaller DB plans. Such studies likely conflated the effects of plan size and plan design.

To determine the total aggregate investment return achieved across all plans of a particular type, the DOL calculated annual aggregate returns across plan types in the private sector, using aggregate asset levels and flow data.²⁷ This approach provides a good measure of aggregate performance but does not reveal much about plans' potential to deliver investment income—the aggregate numbers are heavily weighted toward a small number of large plans. This approach compares the investment performance of a few very large DB plans with the performance of more distributed DC assets.

TW and the CRR—using approaches that similarly emphasize the performance of a few large DB plans—present their results in the form of annual, asset-weighted median return. As with the DOL's approach, this metric is a good representation of the performance of the 50th-percentile dollar in each plan type but understates return variation across plans by weighting the result heavily on investment returns achieved by a few large plans. Likewise, TW's approach and the CRR's approach do not differentiate between the effect of plan size and the effect of plan design. Their approaches offer limited insight into the structural capacity of different plan designs to deliver investment returns.

Figure 1 reveals how private-sector DB plans' assets are far more skewed toward big plans than are private-sector DC plans' assets. The bottom two rows provide averages, across all years, for the percentage of assets and percentage of plans represented in each size category. While less than one-half of 1 percent of DB plans have \$5 billion or more in assets, these plans represent 33 percent of DB plan assets, on average. The pattern is still more pronounced at larger asset levels. Even though plans with more than \$20 billion in assets make up, on average, only 0.053 percent of plans in the DOL

sample, they hold an average of 12 percent of all DB assets. DC plans' assets demonstrate a similar skew toward large plans; but there are simply fewer large DC plans in the data.

Given significant differences between the size distribution of private-sector DB and DC plans in the DOL data, plan-weighted metrics, which better represent the full variation of investment returns across individual plans, are more appropriate.²⁹

While plan-weighted metrics can also be biased by differences in the distribution of plan size across plan types, such metrics are still likely better than dollar-weighted metrics, which are heavily skewed by the large DB plans in the private-sector plan data.³⁰

Fortunately, TW and the CRR provide annual plan-weighted median returns in their analyses: these show small differences between DB plan

Figure I. Percentage of Total Retirement-Plan Assets in Large Plans, by Plan Type²⁸

Year	\$5 Billion or More in Assets (%)		\$10 Billion or More in Assets (%)		\$20 Billion or More in Assets (%)	
	DB	DC	DB	DC	DB	DC
1990	22	6	12	0	6	0
1991	22	7	12	0	5	0
1992	24	9	17	0	5	0
1993	27	10	17	0	9	0
1994	27	9	15	0	9	0
1995	29	15	19	0	10	0
1996	32	11	20	4	13	0
1997	31	10	19	4	10	0
1998	31	13	19	5	9	0
1999	30	17	15	9	7	0
2000	37	18	25	9	18	2
2001	38	17	25	8	15	3
2002	37	17	22	9	12	3
2003	34	15	19	8	10	0
2004	36	17	22	9	11	4
2005	39	18	26	9	14	4
2006	37	19	25	9	14	3
2007	40	20	29	10	16	4
2008	40	19	30	10	17	5
2009	41	16	29	9	15	2
2010	37	17	27	9	15	2
2011	39	20	28	10	15	4
2012	39	20	28	10	14	5
Average % of Plan Assets	33	15	22	6	12	2
Average % of Plans	0.412	0.051	0.170	0.013	0.053	0.003

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

and DC plan returns. **Figure 2** combines data from TW and the CRR to create a time series for plan-weighted median returns, by plan design, from 1988 to 2011. To combine the data from the two analyses, this paper averages annual median returns, by plan type, for the years included in both analyses. Column 5 and column 6 provide the compound annual return (geometric mean), beginning in that row's year and running through the end of the sample.³¹ Column 7 provides the difference in geometric means between DB and DC plans.

Because the starting year can be important, starting the analysis in different years is useful. The first five rows of the last column reveal that, since 1988, the difference between DB and DC plan median returns was only 0.19–0.28 percentage points—an order of magnitude smaller than the difference that DC plan critics typically use in their analyses. The NIRS papers used a 1 percentage-point difference, for example, while recent papers by the Center for American Progress (CAP) and the Teacher Retirement System of Texas (TRS) used 1.8 and 2.7 percentage-point differences, respectively.³²

Figure 2. Plan-Level DB and DC Investment Returns,
Based on Combined Data from TW and the CRR³³

	Combined (Avg.) DB Return (%)	Combined (Avg.) DC Return (%)	Years Included in Geometric Mean	DB Geometric Mean Return (%)	DC Geometric Mean Return (%)	Difference (percentage points)
1988	9.80	10.10	24	6.66	6.46	0.20
1989	12.00	11.30	23	6.53	6.30	0.22
1990	4.20	5.70	22	6.28	6.08	0.20
1991	15.40	13.10	21	6.38	6.10	0.28
1992	7.10	7.70	20	5.95	5.76	0.19
1993	8.00	8.20	19	5.89	5.66	0.23
1994	0.00	2.30	18	5.78	5.52	0.25
1995	19.48	17.60	17	6.13	5.72	0.41
1996	12.66	12.75	16	5.34	5.01	0.33
1997	16.30	17.33	15	4.87	4.52	0.36
1998	12.14	14.41	14	4.10	3.66	0.44
1999	10.76	14.24	13	3.51	2.87	0.63
2000	-0.27	-4.62	12	2.93	1.98	0.95
2001	-4.21	-7.21	11	3.22	2.60	0.62
2002	-8.42	-11.98	10	3.99	3.64	0.36
2003	17.00	19.53	9	5.47	5.54	-0.06
2004	9.09	9.50	8	4.12	3.91	0.21
2005	6.17	6.62	7	3.42	3.13	0.29
2006	11.19	11.39	6	2.97	2.56	0.41
2007	6.28	6.91	5	1.40	0.88	0.52
2008	-23.16	-27.13				
2009	17.65	21.42				
2010	11.20	11.74				
2011	0.36	-1.15				

Source: Towers Watson (2013), Munnell et al. (2006), and author's calculations

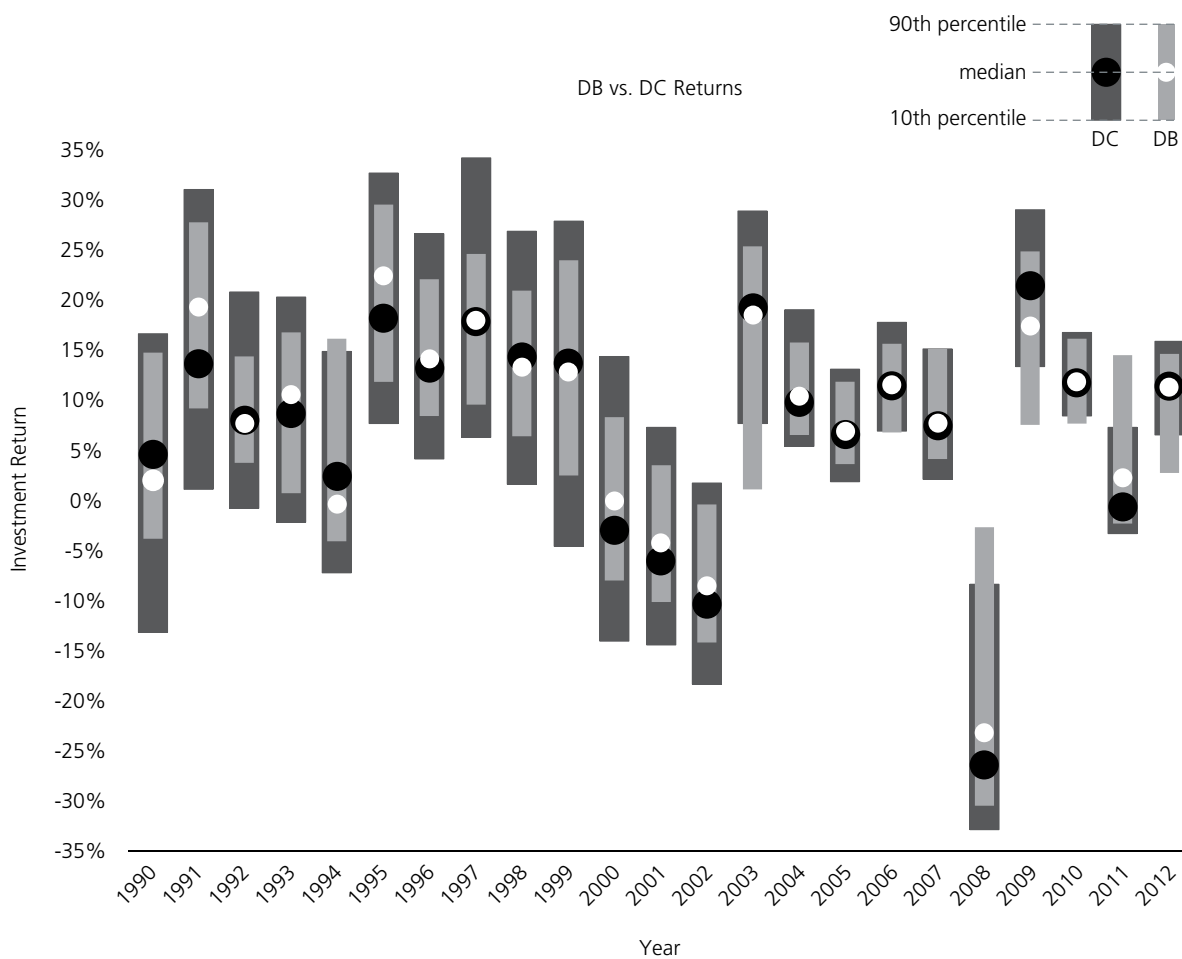
Figure 3. Regression (OLS) Results
Estimates for Difference Between DB and DC Investment Returns*

	Observations—Plan-Years	Defined-Benefit Indicator— All DC Plans, %	Defined-Benefit Indicator— Only 401(k) Plans, %
1990–2012	All DC: 86,390; 401(k): 70,100	0.44 (0.07)	0.31 (0.07)
2003–2012	All DC: 49,675; 401(k): 40,478	0.17 (0.08)	0.17 (0.09)

*Table values are the estimated percentage point differences between DB and DC investment returns; positive numbers indicate DB plans performed better than DC plans; bolded point-estimates significant at 5 percent level; standard errors provided in parentheses

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Figure 4. Distribution of Annual Investment Returns, by Plan Type



Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Investment Returns by Plan Type—Further Analysis

This paper uses regression analysis and the same DOL data used by TW and the CRR to further investigate differences in investment returns between plan types and the persistence of any difference over time.³⁴ **Figure 3** presents the results of an analysis in which the dependent variable, annual investment returns, was regressed on a DB plan indicator and controls for plan size and year.³⁵ The third column presents results, including all DC plans in the sample. The fourth column limits the DC sample to plans with 401(k) features, thereby focusing results on the most common private-sector DC plan type.

Figure 3 indicates that the mean annual investment-return difference between DB and DC plans between 1990 and 2012 is 0.44 percentage points for all DC plans and 0.31 percentage points for 401(k) plans. Both estimates are statistically significant. Regression results suggest that the small mean difference observed between DB and DC plans returns over the full sample was much smaller in recent years. Regressions, using only the last ten years of data, yield point-estimates that are around half as large as point-estimates for the full sample, and are either marginally significant or statistically insignificant.

Though results presented in Figure 3 are informative, neither the median nor the mean is the only relevant metric for comparing returns between plans. The distribution of outcomes also matters—especially when attempting to draw general conclusions about structural efficiency. Investigating the distribution of outcomes, particularly when there is significant

heterogeneity, provides a fuller picture of overall performance and the potential of each plan design.

Figure 4 illustrates the distribution of returns for DB and DC plans. Bars represent the range of returns between the 10th and 90th percentiles. Dots represent medians. There is significant variation around the median return for both plan types. DC plans tend to exhibit wider variation in return experience than do DB plans—a pattern consistent with the former’s historically more heterogeneous plan design and investment allocation. The significant overlap of bars provides evidence that a sizable share of DC plans perform at least as well as their DB counterparts. The range of annual DC performance tends to extend above and below the range of performance exhibited by DB plans: on an annual basis, the best DC plans appear to outperform the best DB plans; but the bottom DC plans fare considerably worse than the bottom DB plans. Figure 4 also shows a significant reduction in the range of annual returns in later years, as well as a relatively larger reduction in annual return deviation for DC plans.

Figure 5 provides quantile regression results at the 10th, 25th, 50th, 75th, and 90th percentiles. Bolded point-estimates are statistically significant. Positive values indicate that DB plans performed better than DC plans at that point in the return distribution. Figure 5 further develops the story illustrated in Figure 4. Over the full sample, DB plans perform 0.45 percentage points better at the median. The best-performing DC plans outperform the best DB plans, while the worst-performing DB plans do better than the worst DC

Figure 5. Difference Between DB and DC Plan
Annual Investment Returns, at Different Points in the Investment-Return Distribution*

	Observations— plan-years	10th Pctl., %	25th Pctl., %	50th Pctl., %	75th Pctl., %	90th Pctl., %
1990–2012	86,390	1.40 (0.09)	0.61 (0.04)	0.45 (0.03)	0.22 (0.05)	-1.80 (0.13)
2003–2012	49,675	0.06 (0.09)	0.09 (0.05)	0.29 (0.04)	0.45 (0.06)	-0.80 (0.16)

*Table values are the estimated percentage point differences between DB and DC investment returns; positive numbers indicate DB plans performed better than DC plans; bolded point-estimates significant at 5 percent level; standard errors provided in parentheses

Source: Author’s calculations using DOL form 5500 data for private-sector retirement plans

plans. Examining only the last ten years, the differences in returns, by plan type, have decreased at nearly every point in the return distribution. At the median, the difference is only 0.29 percentage points.

Analyses presented thus far examine only annual returns, by plan type. But analyzing the data in this

manner does not match the reality of plan members' investment experience. Members do not earn a random draw from their plan type's return distribution each year. Instead, they earn their plan's specific return, compounded over several years. Examining only the annual return distribution may misstate plan members' compound annual

Figure 6. Difference Between DB and DC Plan Ten-Year Geometric Mean Investment Returns, at Different Points in the Investment-Return Distribution*

Starting Year	Observations—plans	Mean Difference (OLS), %	10th Pctl., %	25th Pctl., %	50th Pctl., %	75th Pctl., %	90th Pctl., %
1990	523	1.40 (0.30)	3.77 (0.79)	2.00 (0.27)	0.82 (0.28)	-0.80 (0.39)	-1.83 (0.87)
1991	496	1.47 (0.32)	2.79 (0.85)	1.59 (0.31)	0.93 (0.33)	0.13 (0.42)	-1.81 (0.82)
1992	529	0.94 (0.30)	1.70 (0.72)	1.15 (0.26)	0.22 (0.24)	-0.53 (0.44)	-2.59 (0.75)
1993	554	0.51 (0.26)	1.24 (0.67)	0.68 (0.26)	0.27 (0.26)	-0.58 (0.25)	-2.16 (0.87)
1994	574	0.58 (0.26)	1.77 (0.37)	0.72 (0.34)	0.28 (0.23)	-0.12 (0.35)	-1.97 (0.71)
1995	611	0.34 (0.26)	1.01 (0.52)	0.60 (0.39)	0.38 (0.26)	-0.30 (0.35)	-1.90 (0.64)
1996	708	0.24 (0.22)	1.12 (0.33)	0.20 (0.29)	0.27 (0.21)	-0.40 (0.28)	-2.42 (0.53)
1997	785	0.07 (0.23)	0.74 (0.41)	0.34 (0.28)	0.27 (0.21)	-0.28 (0.24)	-2.15 (0.57)
1998	912	0.27 (0.20)	0.76 (0.32)	0.31 (0.24)	0.19 (0.19)	-0.39 (0.25)	-2.06 (0.46)
1999	1,016	0.64 (0.21)	1.08 (0.36)	0.79 (0.17)	0.69 (0.20)	0.02 (0.29)	-0.61 (0.43)
2000	1,475	0.31 (0.16)	1.04 (0.25)	0.52 (0.11)	0.31 (0.14)	-0.29 (0.21)	-1.04 (0.41)
2001	1,616	0.09 (0.15)	0.52 (0.21)	0.31 (0.10)	0.12 (0.12)	-0.64 (0.18)	-1.08 (0.36)
2002	1,732	0.12 (0.13)	0.29 (0.18)	0.12 (0.11)	0.18 (0.11)	-0.24 (0.18)	-1.01 (0.29)
2003	1,803	-0.06 (0.13)	0.29 (0.22)	0.04 (0.12)	-0.07 (0.11)	-0.31 (0.15)	-1.22 (0.30)
Average Point-Estimate, 1990–2003		0.49	1.29	0.67	0.35	-0.34	-1.70
Average Point-Estimate, 2000–2003		0.12	0.54	0.25	0.14	-0.37	-1.09

*Table values are the estimated percentage point differences between DB and DC investment returns; positive numbers indicate DB plans performed better than DC plans; bolded point-estimates significant at 5 percent level; standard errors provided in parentheses

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

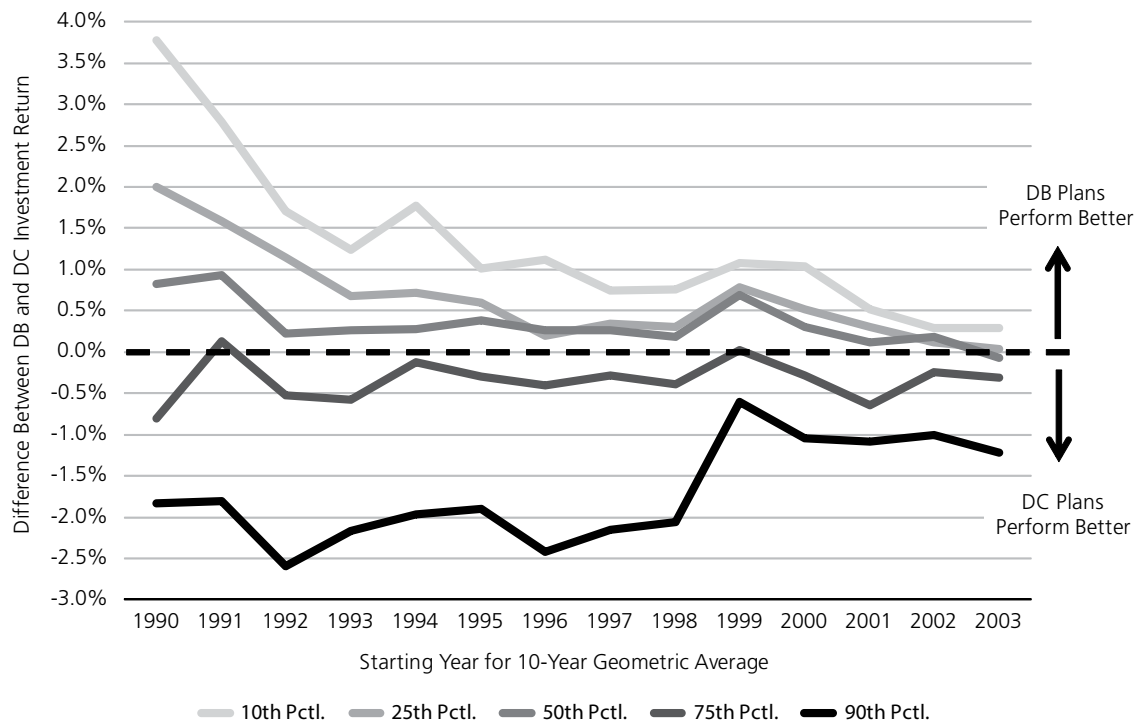
returns. To better capture plan members' investment experience, this paper calculates the ten-year compound annual return for each plan in the data set, beginning at each possible year.

Figure 6 presents quantile regression results at the 10th, 25th, 50th, 75th, and 90th percentiles. Bolded point-estimates are statistically significant. Positive values indicate that DB plans performed better than DC plans—at that point in the return distribution—over the ten years beginning in the year associated with the corresponding row. Between 2001 and 2010, the median DB plan performed (a statistically insignificant) 0.12 percentage points better than the median DC plan, while the DC plan at the 90th percentile performed a statistically significant 1.08 percentage points better than the corresponding DB plan. Across all years, a similar

pattern emerges: bottom-performing DB plans do better than bottom-performing DC plans; but top-performing DC plans do better than top-performing DB plans. Further, Figure 6 indicates that DC plan performance has improved over time relative to DB plan performance, especially since 2000.

Over the 14 potential starting years for the ten-year annual return calculation, Figure 6 reveals that there is a statistically significant mean difference between the performance of DB and DC plans in only six starting years; and between the median DB and DC plans in only four starting years. Since 2000 (the final four rows of Figure 6), the point-estimates representing the difference in DB and DC plan performance trend toward zero and are statistically insignificant—except at the 90th percentile, where DC plans outperform DB plans by roughly 1 percentage point.

Figure 7. Difference Between DB and DC Plan Ten-Year Geometric Mean Investment Returns, at Different Points in the Investment-Return Distribution



Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Figure 7 illustrates the increasing performance and reduced variability of DC returns, relative to DB returns, using the estimates presented in Figure 6. Through the 1990s, there was wide variation in the ten-year compound annual returns of DC plans relative to DB plans: DC plans at the 10th and 25th percentiles generally performed more than 1 percentage point worse; those at the 90th percentile performed more than 1 percentage point better. But over the entire period (and especially since 2000), DC plans at the 10th and 25th percentiles improved dramatically, relative to comparable DB plans—shrinking the difference between plans at the bottom of the return distribution toward zero. DC plans’ improved performance at the bottom of the return distribution helps explain why earlier regression results showed a much smaller mean difference between DB and DC plan returns during the past ten years.

Improved DC plan investment performance can likely be attributed to numerous factors, including better default investment options and the trend toward target-date and index funds that improve asset allocation and lower fees. Regardless, it is clear that differences in performance across the return distribution are now small except at the top, where the best DC plans continue to outperform the top DB plans by about 1 percentage point. These results suggest that plan design matters but that elements of good plan design are not confined only to DB plans.

The analysis presented in this section also suggests that while there may have been differences between DB and DC plan investment performance, empirical estimates of such differences are far smaller than those claimed by critics of DC plans. Papers by the NIRS, CAP, TRS, and others assume that the difference between DB and DC plan investment returns are 1 percentage point or larger. Since 1990, however, the average of point-estimates at the median is only 0.35 percentage points. Further, in ten of 14 potential starting years for the ten-year return calculation, such estimates are statistically insignificant. This paper also finds significant improvement of (relative) DC plan performance since 2000: point-estimates for investment-return differences between plan types are close to zero and

are generally statistically insignificant, except at the top of the distribution, where the best-performing DC plans still do better than the best DB plans.

NIRS’s 2014 paper acknowledges that DC plans can achieve investment-return results on par with DB plans but only, it asserts, in the rare case of the “ideal” DC plan. This paper finds that the results embodied in such a plan are far less rare than the NIRS assumes—in fact, for at least a decade, DC plans have delivered investment returns as good as those achieved by DB plans.

Unequal Distribution of Investment Returns

As Figure 7 reveals, annual returns of DB and DC plans exhibit significant heterogeneity. Since workers directly bear the investment risk under a DC plan, some observers rightly worry that lower-income workers—who are less financially literate and more susceptible to poor investment choices—will bear the brunt of performance differences. This potential problem can be mitigated by encouraging the adoption of sensible automatic features and well-designed investment options.³⁶ Where such features fail to provide sufficient protection, fully managed DC plans can be put into place to take investment decisions out of workers’ hands entirely.³⁷

The unequal distribution of investment returns—to the extent that it is a problem—is, perhaps, a larger concern for DB plans. The dominant DB plan model is based on a worker’s final average salary.³⁸ Typically, such plans are heavily back-loaded: workers earn little retirement savings until late in their careers, when they approach their plan’s retirement eligibility thresholds. Under such a system, workers who do not spend an entire career under a single retirement system earn far smaller benefits.³⁹ Indeed, back-loaded DB plan benefits can result in a majority of workers earning investment returns well below the realized returns of their retirement plan, with a select few earning outsize returns.

A 2014 Urban Institute paper highlighted the extent to which poorly designed defined-benefit systems harm young workers. In 86 percent of teachers’ pension plans, new teachers must work more than ten

years before earning retirement benefits more valuable than their contributions accumulated at their plan's assumed investment rate of return.⁴⁰ Workers who leave before reaching the ten-year threshold earn no employer contributions or earnings on their contributions. In nearly 40 percent of teachers' plans, new teachers must teach more than 25 years before the value of their benefits exceeds their contributions and assumed investment earnings.⁴¹

Teachers who stick around long enough to reach their plan's retirement thresholds, on the other hand, earn benefits that are far more valuable—often exceeding, by large amounts, the combination of their contributions, their employer's contributions, and investment returns on such contributions. Under New York City's teacher pension plan, a new 25-year-old teacher who teaches until age 63, the plan's normal retirement age, would earn benefits worth approximately 30 percent more than her and her employer's contributions accumulated at the plan's assumed investment rate of return.⁴²

Most workers, of course, do not spend an entire career in one job and are therefore unlikely to achieve results under a DB plan that match their plan's realized returns. According to the U.S. Bureau of Labor Statistics, median tenure for a private-sector worker is 4.1 years; for a public-sector worker, 7.8 years.⁴³ Even mid-career workers (aged 35–44) have relatively short tenures: 5.2 years for all workers and 5.7 years for college graduates.⁴⁴ For teachers, the largest group of college graduates in public employment, the story is similar. Using data from the Institute for Education Sciences, this paper calculates that 72 percent of public school teachers will leave the profession before reaching 20 years of service; under many current retirement systems, they will leave with savings that amount to little more than their contributions and interest.⁴⁵

Because most workers are not certain about the number of years they will spend working under a single retirement system, back-loaded benefits create significant retirement-savings risk that is generally not captured in DC plan critics' comparisons of cost-effectiveness. This is an important consideration.

Under a back-loaded benefit structure, the majority of workers who leave before reaching retirement eligibility may be left well below the savings path necessary to reach an adequate retirement benefit, especially under recently enacted benefit tiers that are much less generous. Two recent papers demonstrate that, under reasonable assumptions for risk aversion, workers would be better off under a smoother benefit-accrual pattern—one more likely to place all workers on a secure retirement-savings path.⁴⁶

What About Fees?

Fees are important to the economic-efficiency discussion only to the extent that there is a difference between net investment returns that needs to be explained. (As discussed, DB and DC investment returns are similar.) Because DC plan critics often offer higher fees as an explanation for lower returns under DC plans, the issue nonetheless merits discussion. The NIRS papers, for instance, claim that DB plan administrative expenses average around 25 basis points and that DC plans have “asset management fees that range from 60 to 170 basis points”⁴⁷—a fee difference, the NIRS asserts, that drags down DC returns.

In practice, however, the fee estimates used by the NIRS and other DC plan critics generally understate DB plan costs and/or dramatically overstate DC plan costs. Recent work has shown that DB plan fees, at least in the public sector, have increased significantly over the past decade, with average total cost roughly double the figure used in the NIRS papers. A Pew Charitable Trusts / Laura and John Arnold Foundation paper showed that public-sector DB plan investment practice has changed dramatically during the past 30 years: in 1952, only 4 percent of plan assets were invested in equities or alternatives; by 2012, more than 70 percent were.⁴⁸ Within this shift toward risky assets, alternatives have recently begun to make up a larger share of public DB plan portfolios—more than doubling during 2006–12, from 11 percent to 23 percent. Public DB plan money-management fees have also grown significantly for statewide public plans—from approximately 28 basis points in 2006 to 37 basis points in 2012.

A recent CRR paper estimated that, on average, total public DB plan cost, including administrative and investment fees, was approximately 43 basis points. Brown and Weisbenner (2014) produced similar estimates for private-sector DB plans, with total cost ranging from 40 basis points for all plans to 66 basis points for multiemployer plans (where data are likely more accurate).⁴⁹ There is significant variation in fees paid by individual DB plans, too. TRS recently reported that its administrative fees are approximately 47 basis points—relatively close to DB plan averages—while fees under Pennsylvania’s Public School Employees Retirement System are around 100 basis points, well above the average.⁵⁰

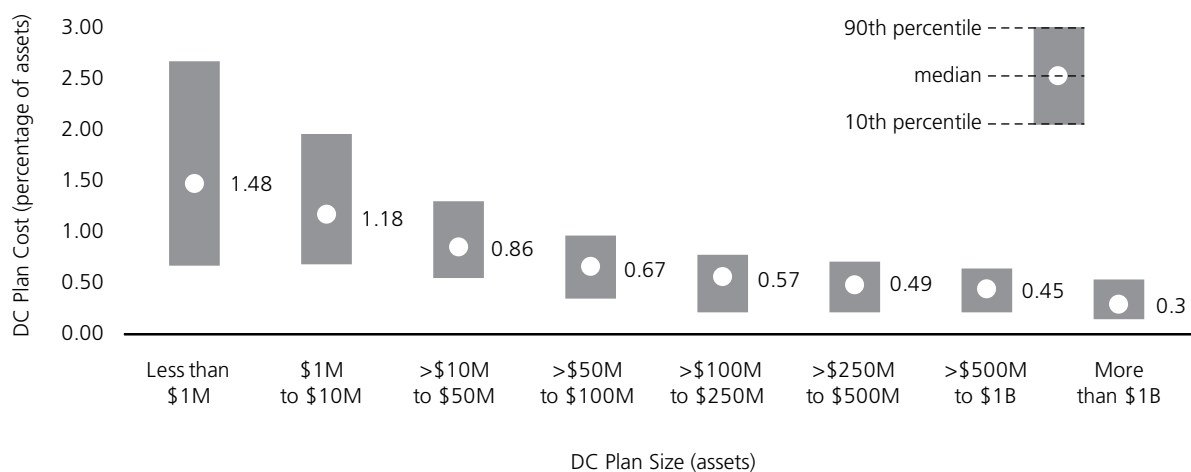
For DC plans, critics often use average fee information for mutual funds. But these fee data do not match the experience of DC plan members. Empirical estimates show that observed total DC plan cost is similar to DB plan cost and that DC cost has declined over time.⁵¹ A recent BrightScope /

Investment Company Institute paper found that DC plan fees have fallen significantly since 2009.⁵²

Figure 8 uses the paper’s analysis to illustrate the current distribution of DC plan fees, by plan size: median total cost for large DC plans ranged from 57 basis points, for plans with \$100 million–\$250 million in assets, to 30 basis points, for plans with more than \$1 billion in assets. The Federal Thrift Savings Plan (TSP) provides a useful example of how low DC plan fees can be—with nearly \$400 billion in assets, the TSP has an expense ratio of approximately 2.9 basis points.⁵³

Size matters when it comes to fees. No matter the plan design, smaller plans will tend to pay higher fees as a percentage of assets. But when current plans of similar size are compared, there is no evidence that the total plan cost under DC plans differs from cost under DB plans. Further, a recent rigorous analysis by Farrell and Shoag found no relationship between plan design and fees in their large sample of public plans.⁵⁴

Figure 8. DC Total Plan Cost, by Plan Size



Distribution of Total Plan Cost by Plan Assets 10th percentile, median, and 90th percentile plan-weighted total plan cost* as a percentage of assets among plans with audited 401(k) filings in the BrightScope database by plan assets (2012)

*Total plan cost is BrightScope’s measure of the total cost of operating the 401(k) plan and includes asset-based investment management fees, asset-based administrative and advice fees, and other fees (including insurance charges) from the Form 5500 and audited financial statements of ERISA-compliant 401(k) plans. Total plan cost is computed only for plans with sufficiently complete information. Note: The sample is 14,020 plans with \$2.5 trillion in assets. Audited DC/401(k) filings generally include plans with 100 or more participants. Plans with fewer than four investment options or more than 100 investment options are excluded from this analysis.

Source: BrightScope (2014)

II. ANNUITIZATION

Annuities are an important retirement-payment vehicle, providing predictable annual payments for retirees until death. Annuities are an insurance product that pools longevity risk, protecting retirees against the risk of outliving their savings. Annuities are generally provided in DB plans as the default payout option but are also available to DC plan participants through their retirement plan or other providers.

The availability and pricing of annuities plays a large role in previous analyses purporting to show that DB plans are more efficient. The NIRS papers assume that DC plan participants do not have access to annuities—forcing participants to save much more before retirement to ensure that they will not outlive their savings. The assumption that DC plans do not offer annuities accounts for the entire 29 percent cost advantage that the NIRS claims DB plans have over NIRS's so-called ideal DC plan, as well as for more than half the claimed cost advantage over self-directed DC plans.⁵⁵ The TRS paper handicaps DC plans by assuming that DC account balances would be annuitized at a 5 percent interest rate, rather than the 8 percent rate used for the current DB system, dramatically increasing the cost of conversion under the DC system.

It is true that many private-sector DC plans do not offer annuities; and when they do, plan members often do not use them. However, it is incorrect to conclude that these are inherent flaws of DC plan designs (i.e., that DC plans cannot include annuities and that people would not use them if favorably priced), nor is it correct to assume that fully annuitizing retirement benefits is optimal from the employee's perspective.

The limited availability of annuities in private-sector DC plans is largely the result of federal regulation. Private-sector firms have interpreted federal rules as setting a very high fiduciary standard for choosing DC plan annuity providers. Most firms have chosen to avoid potential legal liability by simply not offering annuity options through their plans. The U.S.

Department of the Treasury and the DOL have made moves recently to encourage use of annuities in private-sector DC plans. The situation could be further remedied if the DOL were to establish clear safe-harbor provisions, as recommended by numerous experts.⁵⁶

Even in the presence of regulation that greatly reduces the attractiveness of offering annuities, many private-sector firms still offer them. One need only look at public-sector DC plans, where such regulations are not an impediment, to see that the provision and pricing of annuities does not have to be different between the two plan designs. Annuities are widely offered and used by members in public-sector DC plans.

TIAA-CREF, long a provider of DC plans to institutions of higher education, reports that 75 percent of participants receiving benefit payments in a given year receive annuity payments.⁵⁷ Most statewide public-sector DC plans, even those that are part of hybrid systems, offer annuities. **Figure 9** lists all DC plans offered by statewide retirement systems and indicates whether and how they provide annuities: of the 25 DC plans, 17 offer annuities through the retirement plan, with at least three states offering government-sponsored annuities. Of the plans that do not provide annuities directly through the plan, many appear to provide referrals to annuity providers that, in turn, likely offer members institutional pricing (e.g., Georgia, Michigan, and Tennessee).

The government annuities provided through these state-sponsored DC plans can be—and have been—priced similarly to annuities provided through public-sector DB plans.⁵⁸ What's more, public-plan sponsors have the authority not only to offer annuities at prices that match public DB plans but also to require participants to take all, or part of, their benefits in the form of an annuity.⁵⁹

III. THE HIGH COST OF PENSION DEBT

A defining feature of U.S. DB pension plans is that plan sponsors generally carry some unfunded liability or pension debt. **Figure 10** shows state and local

Figure 9. Public-Sector DC Plans and Annuities⁶⁰

Plan	Plan Type	Offers	
		Annuity	Annuity Type
Colorado PERA—PERAChoice	Optional DC plan	Yes	External Provider
Florida FRS Investment Fund	Optional DC plan	Yes	External Provider
Montana PERS—DCRP	Optional DC Plan	No	
North Dakota PERS—DCRP	Optional DC Plan	Yes	External Provider (TIAA—CREF)
South Carolina SCRS—State ORP	Optional DC Plan	Yes	External Provider
Utah—Tier II Defined-Contribution Plan	Optional DC Plan	No	
Ohio PERS—Member-Directed & Combined Plans	Optional DC /Hybrid Plan	Yes	Government Annuity
Ohio STRS—Member-Directed & Combined Plans	Optional DC/Hybrid Plan	Yes	Government Annuity
Washington PERS—Plan 3	Optional Hybrid Plan	Yes	Government Annuity or External Provider
Washington SERS—Plan 3	Optional Hybrid Plan	Yes	Government Annuity or External Provider
Washington TRS—Plan 3	Optional Hybrid Plan	Yes	Government Annuity or External Provider
Alaska PERS—DCR Plan	Mandatory DC Plan	Yes	External Provider
Alaska TRS—DCR Plan	Mandatory DC Plan	Yes	External Provider
Michigan SERS	Mandatory DC Plan	No	
Federal Government Retirement System	Mandatory Hybrid Plan	Yes	External Provider
California CalSTRS—DB Supplement Program	Mandatory Hybrid Plan	Yes	Unknown
Georgia GSEPS	Mandatory Hybrid Plan	No	
Indiana PERF—ASA	Mandatory Hybrid Plan	Yes	Government Annuity but Converting to External Provider
Indiana TRF—ASA	Mandatory Hybrid Plan	Yes	Government Annuity but Moving to External Provider
Michigan MPSERS	Mandatory Hybrid Plan	No	
Oregon PERS—IAP	Mandatory Hybrid Plan	No	
Rhode Island ERSRI	Mandatory Hybrid Plan	Yes	External Provider (TIAA—CREF)
Tennessee—TCRS State and Teachers	Mandatory Hybrid Plan	No	
Utah—Tier II Contributory Hybrid	Mandatory Hybrid Plan	No	
Virginia VRS Hybrid	Mandatory Hybrid Plan	Yes	External Provider

Source: Munnell, Aubry, and Cafarelli (2014) and author's tabulation from plan documents

pension debt as a percentage of U.S. GDP. Since 1945, there have been only two brief periods when public DB plans were at least 100 percent funded—in the late 1980s and late 1990s. Over the remainder of their existence, public DB plans have been a creditor to state and local governments. A similar story exists for the private sector; but because of stricter funding requirements, private-sector firms have generally carried less pension debt. Carrying pension debt—as with all debt—results in debt-service costs.

Surprisingly, all analyses of plan cost—including those previously cited—do not include the cost of carrying pension debt. Ignoring the cost of underfunding is an oversight that omits one of DB plans' largest cost drivers. Governments now owe public-pension plans somewhere between \$1.3 trillion and \$6 trillion for benefits that public workers have already earned. Debt-service payments to pay off the accumulated pension debt are now larger than the annual cost of benefits earned by workers in most jurisdictions (2013 debt-service payments made up approximately 70 percent of annual required contributions). Since 2001, annual government contributions have nearly tripled, from 6.7

percent to 18.6 percent of payroll—even though, over the same period, benefits were reduced in many jurisdictions.⁶²

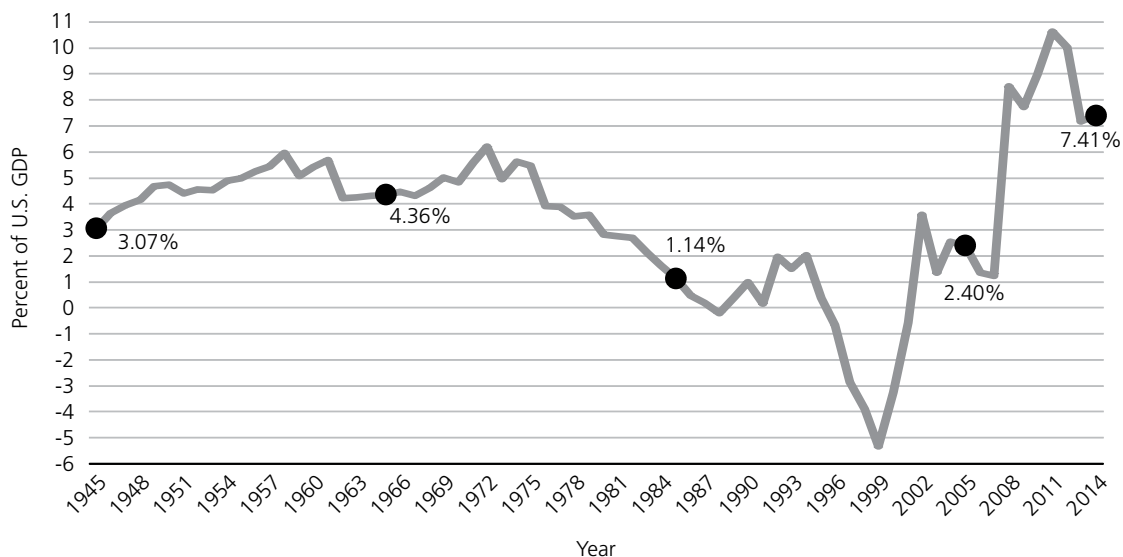
To estimate the annual cost of carrying pension debt, this paper constructs a simple model of pension financing. The model does not capture the effect of various funding policies but instead provides an estimate of the increased cost that would be incurred for carrying various levels of debt in perpetuity. It assumes that benefit payments and contributions occur midyear. In **Equation 1**, A_t represents assets at the end of period, r is the expected return on plan assets; C represents contributions as a percentage of payroll; P represents payroll; and B represents benefit payments:

$$A_t = A_{t-1}(1 + r) + (C_t P_t)(1 + r)^{\frac{1}{2}} - B_t(1 + r)^{\frac{1}{2}}$$

In **Equation 2**, contributions each year are made up of normal cost, N_t ; the cost of benefits earned by employees in that year, C_t ; and debt service, S_t , to pay off any accumulated unfunded liability:

$$C_t = N_t + S_t$$

Figure 10. State and Local Pension Debt, as Percentage of U.S. GDP⁶¹



Source: Author's calculations using data from the Federal Reserve Board of Governors' Financial Accounts of the United States (Z.1) release and the U.S. Bureau of Economic Analysis (BEA)

In this model, the sponsoring government maintains a specific level of pension debt or unfunded liability. In **Equation 3**, the unfunded liability at the end of period t , D_t , is determined by multiplying one minus the target-funded percentage, T , by liabilities, L :

$$D_t = (1 - T)L_t$$

If it is assumed that the plan achieves its target investment rate of return and meets all other plan assumptions, the only source of growth of the unfunded liability is interest on the pension debt. In other words, the sponsoring government needs to make an additional payment to cover missed investment returns on assets that were not in the fund (**Equation 4** and **Equation 5**):

$$S_t P_t (1 + r)^{\frac{1}{2}} = r D_{t-1} = r(1 - T)L_{t-1}$$

$$S_t = (1 - T) \left(\frac{L_{t-1}}{P_t} \right) \left(\frac{r}{(1 + r)^{\frac{1}{2}}} \right)$$

In this paper's model, the cost of carrying pension debt is determined by three variables: target-funded percentage; expected return on plan assets; and ratio of liabilities to payroll. In 2012, the median expected rate of return for public plans was approximately 7.75 percent, and the ratio of liabilities to payroll ranged from 389 percent, at the 10th percentile, to 889 percent, at the 90th percentile—with a median of 595 percent.⁶³ Maintaining a 90 percent funded ratio at the median expected rate of return and ratio of liabilities to payroll would result in additional debt-service cost of approximately 4.48 percent of payroll; maintaining an 80 percent or 70 percent funded ratio would cost 8.96 or 13.44 percent of payroll, respectively (**Figure 11**).

If 2001 employer-contribution levels (rounded down to 6.5 percent of payroll) were in the vicinity of the plan's normal cost (i.e., the cost of benefits earned in 2001), carrying a pension debt equal to 10 percent of liabilities would increase annual cost as a percentage of payroll by around 70 percent; carrying a debt equal to 20 percent

of liabilities would increase cost by around 140 percent. The cost of carrying pension debt will, of course, vary by plan; but in all cases, it is a relatively expensive proposition.

It could reasonably be argued that DC plans could result in a savings deficit, relative to a target benefit. However, a savings deficit under a DC plan is not—unlike DB plan pension liabilities—a hard-debt obligation for the plan sponsor that must be paid. If plan members experience a funding deficit under a DC plan (i.e., are below the savings path required to reach an adequate retirement), there are numerous ways to flexibly adjust employee and employer behavior to fix the problem, including increasing contributions or delaying retirement. Under DB plans, there is almost no flexibility: the plan sponsor is solely responsible for making up all funding deficits.

Most important, DB plans do not eliminate workers' exposure to risk. DB plan sponsors that find themselves with growing pension-debt service are likely to pass a significant share of the cost on to workers, through reductions to wages, jobs, and benefits—a trend visible across the United States. Because of these negative effects, cost comparisons between different plan designs must consider the cost of carrying pension debt.

CONCLUSION

All primary retirement plans should incorporate adequate annual contribution/accrual rates; offer access only to pooled, professionally managed, and appropriately allocated investment options; and offer access to annuity options upon retirement. Primary retirement plans should have well-designed defaults so that if workers do nothing, they will still be placed on the path to a secure retirement. The DC plan design can incorporate all these features. Many, in fact, already do, especially those sponsored by public-sector employers.

Some DC plan critics have argued that DC plans are less cost-effective than DB models, even when the former are well designed. This paper demonstrates that the empirical evidence does not support

such claims: DC plans deliver investment returns on par with DB plans; and DC plans offer annuities at prices equivalent to DB plans. Indeed, public-sector sponsors have the authority to create fully managed DC plans that eliminate plan-member choice regarding investments and payout. As other authors have noted, any observed differences between DB and DC plans are the product of policy choices made by the plan sponsor, not of structural differences between the two models.⁶⁴

There is no empirical justification for the claim that DB plans are structurally more cost-effective than DC plans: in theory and in practice, DC plans can be designed to offer retirement benefits efficiently while solving many of the political-economy and benefit-design problems presented by DB plans. By moving beyond the current, largely misinformed, DB vs. DC debate, policymakers can better focus on placing all workers on the path to retirement security.

Figure II. Cost of Carrying Pension Debt, as Percentage of Payroll

	Discount Rate/Ratio of Liabilities to Payroll	300%	400%	500%	600%	700%	800%	900%	1,000%
90 Percent Funded Target	6.00%	1.75%	2.33%	2.91%	3.50%	4.08%	4.66%	5.24%	5.83%
	6.50%	1.89%	2.52%	3.15%	3.78%	4.41%	5.04%	5.67%	6.30%
	7.00%	2.03%	2.71%	3.38%	4.06%	4.74%	5.41%	6.09%	6.77%
	7.50%	2.17%	2.89%	3.62%	4.34%	5.06%	5.79%	6.51%	7.23%
	7.75%	2.24%	2.99%	3.73%	4.48%	5.23%	5.97%	6.72%	7.47%
	8.00%	2.31%	3.08%	3.85%	4.62%	5.39%	6.16%	6.93%	7.70%
	8.50%	2.45%	3.26%	4.08%	4.90%	5.71%	6.53%	7.34%	8.16%
80 Percent Funded Target	6.00%	3.50%	4.66%	5.83%	6.99%	8.16%	9.32%	10.49%	11.66%
	6.50%	3.78%	5.04%	6.30%	7.56%	8.82%	10.08%	11.34%	12.60%
	7.00%	4.06%	5.41%	6.77%	8.12%	9.47%	10.83%	12.18%	13.53%
	7.50%	4.34%	5.79%	7.23%	8.68%	10.13%	11.57%	13.02%	14.47%
	7.75%	4.48%	5.97%	7.47%	8.96%	10.45%	11.95%	13.44%	14.93%
	8.00%	4.62%	6.16%	7.70%	9.24%	10.78%	12.32%	13.86%	15.40%
	8.50%	4.90%	6.53%	8.16%	9.79%	11.42%	13.06%	14.69%	16.32%
70 Percent Funded Target	6.00%	5.24%	6.99%	8.74%	10.49%	12.24%	13.99%	15.73%	17.48%
	6.50%	5.67%	7.56%	9.45%	11.34%	13.23%	15.12%	17.00%	18.90%
	7.00%	6.09%	8.12%	10.15%	12.18%	14.21%	16.24%	18.27%	20.30%
	7.50%	6.51%	8.68%	10.85%	13.02%	15.19%	17.36%	19.53%	21.70%
	7.75%	6.72%	8.96%	11.20%	13.44%	15.68%	17.92%	20.16%	22.40%
	8.00%	6.93%	9.24%	11.55%	13.86%	16.17%	18.48%	20.78%	23.09%
	8.50%	7.34%	9.79%	12.24%	14.69%	17.14%	19.58%	22.03%	24.48%

*Bolted percentages signify the median assumed investment rate of return and ratio of liabilities to payroll.

Source: Author's calculations

REFERENCES

- Aaronson, S. and J.L. Coronado. (2005). "Are Firms or Workers Behind the Shift Away from DB Pension Plan?" FEDS Paper No. 2005-17.
- Abowd, J.M., P.A. Lengermann, and K.L. McKinney. (2002). "The Measurement of Human Capital in the U.S. Economy." U.S. Census Bureau Longitudinal Employer-Household Dynamics Technical Paper No. TP-2002-10.
- Almeida, B., and W. B. Forna. (2008). "A Better Bang for the Buck: The Economic Efficiencies of Defined Benefit Pension Plans." National Institute on Retirement Security.
- Ambachtsheer, K. (2012). "The Dysfunctional 'DB vs. DC' Pensions Debate: Why and How to Move Beyond It." *Rotman International Journal of Pension Management* 5, no. 2: 36–39.
- Andonov, A., R. Bauer, and M. Cremers. (2014). "Pension Fund Asset Allocation and Liability Discount Rates." SSRN 2070054.
- Banerjee, S. (2013). "Annuity and Lump-Sum Decisions in Defined Benefit Plans: The Role of Plan Rules." Employee Benefit Research Institute, EBRI Issue Brief, no. 381.
- Benartzi, S., and R. H. Thaler. (2001). "Naive Diversification Strategies in Defined Contribution Saving Plans." *American Economic Review* 91 no. 1. 79-98.
- Beshears, J., J.J. Choi, D. Laibson, and B.C. Madrian. (2009). "The Importance of Default Options for Retirement Saving Outcomes: Evidence from the United States." In *Social Security Policy in a Changing Environment*, ed. J. R. Brown, J. B. Liebman, and D. A. Wise, 167–95. University of Chicago Press.
- Bodie, Z., A. J. Marcus, and R. C. Merton. (1988). "Defined benefit versus defined contribution pension plans: What are the real trade-offs?" In *Pensions in the US Economy*, 139-162. University of Chicago Press.
- BrightScope and Investment Company Institute. (2014). "The BrightScope/ICI Defined Contribution Plan Profile: A Close Look at 401(k) Plans."
- Brown, J. R., and S. J. Weisbenner. (2014). "Defined Contribution Plans as a Foundation for Retirement Security." *The Journal of Retirement* 1, no. 4: 22–45.
- Brown, J., J. Pollet, and S. Weisbenner. (2015). "The In-State Equity Bias of State Pension Plans." National Bureau of Economic Research, no. w21020.
- Buck Consultants. (2001). "Study of Retirement Plan Designs for the State of Colorado Office of the State Auditor Pursuant to Senate Bill 01-149."
- CEM Benchmarking. (2006). "DC Plans Under Performed DB Funds."
- Choi, J. J., D. Laibson, and B. C. Madrian. (2004a). "Plan Design and 401(k) Savings Outcomes." National Bureau of Economic Research, no. w10486.
- Choi, J. J., D. Laibson, B.C. Madrian, A. Metrick. (2004b). "For Better or for Worse: Default Effects and 401(k) Savings Behavior." In *Perspectives on the Economics of Aging*, ed. D. A. Wise, 81–126. University of Chicago Press.
- Costrell, R. M., and M. Podgursky. (2010). "Distribution of Benefits in Teacher Retirement Systems and their Implications for Mobility." *Education Finance and Policy* 5, no. 4: 519-557.
- Farrell, J., and D. Shoag. (2012). "Asset Management in Public DB and Non-DB Pension Plans." *Journal of Pension Economics and Finance* (forthcoming).

- Fornia, W. B., and N. Rhee. (2014). "Still a Better Bang for the Buck: An Update on the Economic Efficiencies of Defined Benefit Pensions." National Institute on Retirement Security.
- Gabriel, Roeder, Smith & Company. (2005). "New Mexico Educational Retirement Board: Defined Contribution Retirement Plan Study."
- . (2015). "A Comprehensive Study Comparing the Cost and Effectiveness to Alternative Plan Designs."
- Ghilarducci, T., R. Hiltonsmith, and L. Schmitz. (2012). "State Guaranteed Retirement Accounts: A Low-Cost, Secure Solution to America's Retirement Crisis." Schwartz Center for Economic Policy Analysis at the New School.
- Gustman, A. L., and T. L. Steinmeier. (1992). "The stampede toward defined contribution pension plans: fact or fiction?" *Industrial Relations* 31 no. 2: 361-369.
- Herzenberg, S. (2013). "Less Bang for Pennsylvania's Buck." Keystone Research Center, Keystone Pension Primers.
- Hochberg, Y. V., and J. D. Rauh. (2012). "Local Overweighting and Underperformance: Evidence from Limited Partner Private Equity Investments." *Review of Financial Studies*, hhs128.
- Johnson, R. W., B.A. Butrica, O. Haaga, and B.G. Southgate. (2014). "How Long Must State and Local Employees Work to Accumulate Pension Benefits?." Urban Institute.
- Madland, D. (2012). "Making Saving for Retirement Easier, Cheaper, and More Secure." Center for American Progress.
- , and N. Bunker. (2012). "In Defense of Defined-Benefit Pensions: Modest Reforms to State Plans Are Best Option for Taxpayers." Center for American Progress.
- Mahler, P. P., M. M. Chingos, and G. J. Whitehurst (2014). "Improving Public Pensions: Balancing Competing Priorities." Brown Center on Education Policy at the Brookings Institution.
- McGee, J. B. (2013). "Equivalent Cost for Equivalent Benefits: Primary DC Plans in the Public Sector". Laura and John Arnold Foundation, Policy Perspective.
- McGee, J. B., and M. A. Winters. (2013). "Better Pay, Fairer Pensions: Reforming Teacher Compensation." Manhattan Institute, Civic Report no. 79.
- McGee, J. B., and M. A. Winters. (2014). "Better Pay, Fairer Pensions II: Modeling Preferences Between Defined-Benefit Teacher Compensation Plans." Manhattan Institute, Civic Report no. 90.
- Mitchell, O. S., and S. Utkus. (2012). "Target-Date Funds in 401(k) Retirement Plans." National Bureau of Economic Research, no. w17911.
- Morrissey, M. (2015). "Will Switching Government Workers to Account-Type Plans Save Taxpayers Money?." Economic Policy Institute, Briefing Paper no. 390.
- Mottola, G. R., and S. P. Utkus. (2009). "Red, Yellow, and Green: Measuring the Quality of 401(k) Portfolio Choices." In *Overcoming the Saving Slump: How to Increase the Effectiveness of Financial Education and Saving Programs*, ed. A. Lusardi, 119–39. University of Chicago Press.
- Munnell, A. H., J. P. Aubry. (2015). "The Funding of State and Local Pensions: 2014-2018." Center for Retirement Research, State and Local Pension Plans, no. 45.
- Munnell, A. H., J. P. Aubry, and M. Cafarelli. (2014). "Defined Contribution Plans in the Public Sector: An Update." Center for Retirement Research, State and Local Pension Plans, no. 37.

- Munnell, A. H., J. P. Aubry, J. Hurwitz, and L. Quinby. (2011). "A Role for Defined Contribution Plans in the Public Sector." Center for Retirement Research, State and Local Pension Plans, no. 16.
- Munnell, A. H., M. Soto, J. Libby, and J. Prinzivalli. (2006). "Investment Returns: Defined Benefit vs. 401(k) Plans." Center for Retirement Research, Issue Brief no. 52.
- National Association of State Retirement Administrators (NASRA). (2014). "Effects of Pension Plan Changes on Retirement Security."
- Pew Charitable Trusts and Laura and John Arnold Foundation. (2014). "State Public Pension Investments Shift over Past 30 Years."
- Poterba, J., et al. (2007a). "Defined Contribution Plans, Defined Benefit Plans, and the Accumulation of Retirement Wealth." *Journal of Public Economics* 91, no. 10: 2062–86.
- Poterba, J., S. Venti, and D. A. Wise. (2007b). "The Changing Landscape of Pensions in the United States." National Bureau of Economic Research, no. w13381.
- Samwick, A. A., and J. Skinner. (2004). "How Will 401(k) Pension Plans Affect Retirement Income?" *American Economic Review* 94, no. 1: 329–343.
- The Segal Group. (2010). "Public Employees' Retirement System of the State of Nevada: Analysis and Comparison of Defined Benefit and Defined Contribution Retirement Plans."
- The Segal Group. (2012). "Michigan Public School Employees' Retirement System: Public Act 300 of 2012 Study."
- Teacher Retirement System of Texas. (2012). "Pension Benefit Design Study."
- Towers Watson. (2013). "DB Versus DC Investment Returns: The 2009–2011 Update."
- Vanguard. (2015). "Target-Date Fund Adoption in 2014."

Figure 12. Plan-Level Median Investment Returns, by Plan Type

	CRR		TW	
	DB Median Annual Return (%)	DC Median Annual Return ⁶⁵ (%)	DB Median Annual Return (%)	DC Median Annual Return (%)
1988	9.8	10.1		
1989	12.0	11.3		
1990	4.2	5.7		
1991	15.4	13.1		
1992	7.1	7.7		
1993	8.0	8.2		
1994	0.0	2.3		
1995	19.6	17.8	19.35	17.39
1996	12.6	12.9	12.72	12.59
1997	16.3	17.4	16.29	17.26
1998	12.1	14.6	12.17	14.22
1999	10.6	12.4	10.92	16.07
2000	-0.3	-4.9	-0.23	-4.33
2001	-4.4	-7.1	-4.02	-7.31
2002	-8.2	-11.7	-8.64	-12.26
2003	16.7	19.4	17.29	19.65
2004	9.3	9.7	8.87	9.30
2005			6.17	6.62
2006			11.19	11.39
2007			6.28	6.91
2008			-23.16	-27.13
2009			17.65	21.42
2010			11.20	11.74
2011			0.36	-1.15

Source: Munnell et al. (2006) and Towers Watson (2013)

Figure I3. DB Plan-Level Returns, by Year

Year	Observations (Plans)	Mean (%)	10th Pctl. (%)	25th Pctl. (%)	50th Pctl. (%)	75th Pctl. (%)	90th Pctl. (%)
1990	1,106	4.23	-3.59	-1.08	2.18	7.35	14.83
1991	1,150	19.15	9.48	13.33	19.51	23.80	27.79
1992	1,294	8.75	4.11	5.83	7.86	10.51	14.45
1993	1,337	10.24	0.98	6.01	10.75	14.03	16.88
1994	1,388	2.67	-3.85	-1.81	-0.20	5.02	16.18
1995	1,375	21.95	12.16	17.90	22.62	25.87	29.57
1996	1,536	14.69	8.74	11.76	14.32	17.03	22.10
1997	1,640	17.83	9.83	15.24	18.18	20.97	24.73
1998	1,784	13.80	6.77	10.18	13.49	16.62	21.02
1999	1,235	12.98	2.83	8.10	13.01	17.66	24.05
2000	1,852	0.33	-7.75	-3.53	0.11	3.73	8.35
2001	1,800	-2.94	-9.81	-7.07	-4.08	-0.84	3.55
2002	1,749	-7.47	-13.88	-11.04	-8.37	-5.08	-0.33
2003	1,678	16.38	1.40	12.66	18.71	22.54	25.48
2004	1,823	11.28	6.81	8.75	10.59	12.67	15.88
2005	1,961	7.47	3.92	5.43	7.08	9.00	11.88
2006	2,077	11.60	7.08	9.63	11.73	13.50	15.70
2007	2,230	8.94	4.39	6.16	7.89	10.90	15.21
2008	2,277	-19.50	-30.27	-27.22	-23.07	-14.26	-2.61
2009	1,543	16.75	7.90	13.24	17.60	21.49	24.93
2010	2,077	12.40	8.02	10.32	12.03	13.66	16.22
2011	2,240	4.38	-1.99	-0.15	2.43	7.79	14.53
2012	2,301	10.55	3.04	9.03	11.50	13.17	14.75

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Figure I4. DC Plan-Level Returns, by Year

Year	Observations (Plans)	Mean (%)	10th Pctl. (%)	25th Pctl. (%)	50th Pctl. (%)	75th Pctl. (%)	90th Pctl. (%)
1990	677	3.45	-13.08	-1.43	4.77	9.17	16.79
1991	713	15.25	1.33	9.22	13.84	21.13	31.31
1992	866	9.23	-0.62	5.20	8.19	12.02	21.00
1993	955	8.98	-2.07	4.51	8.86	13.19	20.45
1994	1,027	2.93	-7.03	-1.07	2.58	6.71	15.03
1995	1,118	19.39	7.85	13.21	18.39	24.79	32.95
1996	1,303	14.45	4.30	10.23	13.40	17.88	26.87
1997	1,474	18.97	6.48	13.52	18.05	22.54	34.44
1998	1,714	14.53	1.76	8.91	14.51	20.13	27.11
1999	1,418	13.04	-4.43	6.44	13.90	20.08	28.08
2000	2,103	-1.46	-13.92	-7.55	-2.82	3.00	14.55
2001	2,041	-4.52	-14.24	-9.83	-5.88	-1.27	7.41
2002	2,060	-8.99	-18.23	-13.88	-10.21	-5.52	1.89
2003	1,887	18.97	7.83	15.17	19.43	23.00	29.13
2004	2,208	11.36	5.59	8.13	9.98	12.59	19.27
2005	2,493	7.42	2.03	5.24	6.76	8.71	13.31
2006	2,727	12.16	7.07	9.73	11.63	13.67	18.00
2007	3,017	8.11	2.28	5.65	7.63	10.07	15.29
2008	3,209	-23.72	-32.79	-29.95	-26.29	-21.31	-8.24
2009	2,623	21.40	13.57	17.70	21.64	24.87	29.28
2010	3,477	12.58	8.58	10.27	11.93	13.57	16.91
2011	3,878	0.76	-3.19	-1.75	-0.48	1.03	7.51
2012	3,949	11.73	6.70	10.13	11.59	12.95	16.03

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Figure 15. Ten-Year Average Annual Returns,
Across Multiple Starting Years and at Multiple Points in Return Distribution

Starting Year	Observations (Plans)		Mean (%)		10th Pctl. (%)		25th Pctl. (%)		50th Pctl. (%)		75th Pctl. (%)		90th Pctl. (%)	
	DB	DC	DB	DC	DB	DC	DB	DC	DB	DC	DB	DC	DB	DC
1990	350	173	12.35	10.95	9.83	6.48	11.14	8.91	12.23	11.06	13.28	13.33	14.87	15.83
1991	325	171	11.79	10.35	8.88	6.31	10.24	8.11	11.81	10.35	13.21	12.24	14.62	15.58
1992	332	197	9.49	8.59	7.24	4.35	8.24	6.78	9.45	8.72	10.60	10.33	11.96	14.04
1993	343	211	7.65	7.18	5.33	3.71	6.38	5.31	7.61	6.82	8.72	8.73	10.46	11.17
1994	347	227	8.36	7.82	5.84	3.99	6.94	5.76	8.22	7.59	9.53	9.26	10.80	12.22
1995	364	247	9.22	8.91	6.13	4.78	7.66	6.62	9.17	8.55	10.67	10.59	12.16	13.51
1996	410	298	8.03	7.81	5.55	4.10	6.74	5.98	7.87	7.40	9.21	9.33	10.36	12.08
1997	426	359	7.67	7.58	4.74	3.71	6.12	5.65	7.78	7.33	8.97	9.09	10.33	12.12
1998	466	446	6.93	6.63	4.61	3.19	5.65	4.93	6.88	6.35	8.08	8.27	9.43	10.97
1999	500	516	3.17	2.52	0.86	-0.93	1.94	0.71	3.04	2.09	4.35	4.15	6.09	6.63
2000	674	801	3.30	2.98	1.08	-0.25	2.04	1.24	3.16	2.67	4.31	4.54	6.31	7.17
2001	730	886	4.36	4.26	2.29	1.48	3.19	2.70	4.18	3.92	5.37	5.83	7.07	8.17
2002	770	962	4.87	4.74	2.88	2.22	3.77	3.47	4.77	4.40	5.88	5.94	7.39	8.17
2003	806	997	6.95	7.00	4.89	4.55	5.85	5.69	6.90	6.79	8.05	8.18	9.23	10.33

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

Figure I6. DB Minus DC Ten-Year Average Annual Return,
Across Multiple Starting Years and at Multiple Points in Return Distribution

Starting Year	Mean (%)	10th Pctl. (%)	25th Pctl. (%)	50th Pctl. (%)	75th Pctl. (%)	90th Pctl. (%)
1990	1.40	3.35	2.23	1.17	-0.04	-0.96
1991	1.44	2.56	2.13	1.46	0.97	-0.96
1992	0.90	2.88	1.46	0.73	0.27	-2.08
1993	0.47	1.62	1.07	0.79	0.00	-0.71
1994	0.54	1.85	1.18	0.63	0.27	-1.42
1995	0.31	1.35	1.04	0.61	0.09	-1.35
1996	0.21	1.45	0.75	0.47	-0.12	-1.72
1997	0.08	1.03	0.47	0.45	-0.12	-1.79
1998	0.30	1.42	0.72	0.53	-0.19	-1.54
1999	0.65	1.80	1.23	0.95	0.19	-0.54
2000	0.31	1.33	0.81	0.48	-0.23	-0.86
2001	0.10	0.81	0.49	0.26	-0.46	-1.10
2002	0.13	0.66	0.30	0.36	-0.06	-0.78
2003	-0.05	0.34	0.16	0.12	-0.13	-1.10
Average Difference, 1990–2003	0.49	1.60	1.00	0.64	0.03	-1.21
Average Difference, 2000–2003	0.12	0.79	0.44	0.31	-0.22	-0.96

Source: Author's calculations using DOL form 5500 data for private-sector retirement plans

ENDNOTES

1. A total of 78 percent of full-time workers have access to retirement benefits, and 64 percent participate. See <http://www.bls.gov/ncs/ebs/benefits/2014/ownership/civilian/table02a.htm>.
2. See <http://www.dol.gov/dol/topic/retirement/typesofplans.htm> for a description of different plan designs within each category.
3. Bodie et al. (1988) provide a good summary of perceived differences between the two plan designs.
4. See <http://www.ebri.org/publications/benfaq/index.cfm?fa=retfaqt14fig2>.
5. See <http://www.bls.gov/ncs/ebs/benefits/2014/ownership/govt/table02a.htm>.
6. Gustman and Steinmeier (1992), Abowd et al. (2002), and Aaronson and Coronado (2005).
7. Author's calculations, based on Financial Accounts of the United States (Z.1) release and Selected Interest Rates (H.15) release, both from the Federal Reserve Board of Governors. For the public plan discount rate, the author calculated the liability-weighted discount rate (7.65 percent) using data in the Public Plans Database. Adjusted unfunded liabilities based on 15-year average liability duration, rediscounted using 20-year Treasury bond yield.
8. Munnell and Aubry (2015).
9. National Association of State Retirement Administrators (NASRA) (2014) and author's tabulation from the National Conference of State Legislatures (NCSL) reports and pension legislation tracker at <http://www.ncsl.org/research/fiscal-policy/pensions.aspx>.
10. See Munnell, Aubry, and Cafarelli (2014) for a summary of public-sector DC plans.
11. Almeida and Fornia (2008) and Fornia and Rhee (2014).
12. Many public retirement plans host the NIRS reports on their websites. For think-tank examples, see Madland and Bunker (2012), Herzenberg (2013), Ghilarducci, Hiltonsmith, and Schmitz (2012), and Morrissey (2015).
13. See Buck Consultants (2001), Gabriel, Roeder, Smith & Company (2005 and 2015), the Segal Group (2010 and 2012), and Teacher Retirement System of Texas (2012).
14. Ambachtsheer (2012), McGee (2013), and Brown and Weisbenner (2014).
15. The NIRS papers and a number of other reports also include more consistent asset allocation as a third source of DB efficiency. At least in the NIRS papers, this claim is a result of the assumption that DC plans do not offer annuities. It enters significantly into NIRS's modeling only after retirement, when it is assumed that workers in a DC plan would need to shift to a more conservative investment strategy, sacrificing investment returns for lower risk. If, however, DC plan members can annuitize their account balances at retirement, this claim is no longer valid.
16. Benartzi and Thaler (2001) and Mottola and Utkus (2009).
17. Many of these automatic features were encouraged by the DOL's issuance in 2007 of regulations for the qualified default investment alternative (QDIA).
18. Mitchell and Utkus (2012), Beshears et al. (2009), Choi et al. (2004a), and Choi et al. (2004b).
19. BrightScope (2014).
20. See http://www.ebri.org/pdf/briefspdf/EBRI_IB_408_Dec14.401%28k%29-update.pdf.
21. Ibid.
22. Vanguard (2015).
23. Brown, Pollet, and Weisbenner (2015) and Hochberg and Rauh (2012).
24. Andonov, Bauer, and Cremers (2014).
25. The DOL collects information on private-sector retirement plans using form 5500. Information on form 5500 and the data are available at <http://www.dol.gov/ebsa/5500main.html>. See also <http://crr.bc.edu/data/form-5500-annual-reports>.
26. CEM Benchmarking also did an analysis of investment returns. It found that DB plans outperformed DC plans, but their methods relied on imputed investment results rather than actual plan data. See CEM Benchmarking (2006).
27. See <http://www.dol.gov/ebsa/pdf/historicaltables.pdf>.
28. Data for Figure 1 include all plans in the form 5500 data, with more than 100 members.
29. Plan-weighted metrics use the plan as the unit of analysis, while dollar-weighted metrics use each invested dollar as the unit of analysis.
30. There is variation in the realized return for individual participants within a DC plan. The plan-level results reported here represent the aggregate (dollar-weighted) return of all participants within the plan.

31. The compound annual return—the geometric average return across years—represents the constant annual return that is equivalent to earning the realized rates of return across the specified time period. Arithmetic averages of annual investment returns do not accurately capture the compound effect of those returns on assets, overtime.
32. See Almeida and Forna (2008), Forna and Rhee (2014), Madland (2012), Madland and Bunker (2012), and Teacher Retirement System of Texas (2012).
33. See Figure 12 for investment-return data from the CRR and TW papers.
34. In this section, the data used for analysis include all private-sector plans in the form 5500 data with at least 100 members and \$100 million in beginning-of-year (BOY) assets. The calculation of investment returns follows Munnell et al. (2006)—and, where investment returns exceeded ± 75 percent, eliminates outlier plan-year observation from the sample.
35. In Figure 3, Figure 5, and Figure 6, each regression included a full set of year-dummy variables (except in Figure 6), as well as controls for BOY assets, squared BOY assets, interaction between BOY assets and a DB plan indicator (except in OLS specifications), and total plan membership.
36. Farrell and Shoag (2012) found that under a well-designed public DC plan with good investment defaults, wealthier participants tended to pay higher fees than less wealthy participants—the less affluent tended to stay in the low-fee default investment.
37. Fully managed or collectivized DC plans have been described in detail in papers by Mahler, Chingos, and Whitehurst (2014) and Madland (2012). One practical example of this approach is the DC portion of the Oregon Public Employee Retirement System’s hybrid plan, where members are offered only a single investment option that is fully managed by the plan.
38. Cash-balance DB plans that do not exhibit the same degree of back-loading are becoming more prevalent in the public and private sectors.
39. Costrell and Podgursky (2010), McGee and Winters (2013), and McGee and Winters (2014).
40. Johnson et al. (2014).
41. Ibid.
42. Figures based on author’s calculations. Additional information on the calculation and other systems can be found in McGee and Winters (2013).
43. See <http://www.bls.gov/news.release/tenure.t05.htm>.
44. See <http://www.bls.gov/news.release/tenure.t04.htm>.
45. Author’s calculations using data from *Teacher Attrition and Mobility: Results from the 2008–09 Teacher Follow-Up Survey*, National Center for Education Statistics, Institute of Education Sciences, 2010–353. This calculation includes only those who leave the profession and ignores those who simply switch between districts or state systems.
46. Samwick (2004) and McGee and Winters (2014).
47. The plan-fee estimates used in the NIRS papers are taken from a 2007 paper from the CRR. However, fee estimates were not based on original work by the CRR but rather, in the case of DB fees, on a simple average of figures reported in a 2007 National Association of State Retirement Administrators paper; and, in the case of DC fees, average mutual-fund fee information was provided in a personal communication with Lipper.
48. Pew Charitable Trusts and Laura and John Arnold Foundation (2014).
49. Brown and Weisbenner (2014) also provide a slightly higher estimate than Munnell et al. (2011)—49 rather than 43 basis points—of average total DB plan cost for public plans in the Public Plans Database.
50. See Teacher Retirement System of Texas (2012) and <http://www.post-gazette.com/business/pittsburgh-company-news/2015/04/12/Gov-Wolf-thinks-pension-funds-paying-too-much-in-fees/stories/201504120009>.
51. Brown and Weisbenner (2014) and BrightScope (2014).
52. BrightScope (2014).
53. See <https://www.tsp.gov/investmentfunds/fundsoverview/expenseRatio.shtml>.
54. Farrell and Shoag (2012).
55. As noted, the claim that DB plans offer a more balanced portfolio is based on the assumption that DC participants would need to shift to a more conservative asset allocation for retirement. DB participants would, presumably, avoid this shift because their benefits are annuitized. Thus, both the “Less Balanced Portfolio” and “No Longevity Risk Pooling” portions of NIRS claim are attributable to the false assumption that DC plan participants lack access to annuities.

56. See <http://www.thompson.com/public/headlines.jsp?id=56>;
<http://www.treasury.gov/press-center/press-releases/Pages/jl2673.aspx>; and
<http://www.forbes.com/sites/jeffreybrown/2014/02/17/income-as-the-outcome-reframing-the-401k-plan>.
57. McGee (2013).
58. Strangely, William Fornia, one of the authors of the NIRS papers, acknowledges in a previous report that governments can provide annuities under a DC plan that match DB plan annuity terms. See Gabriel, Roeder, Smith & Company (2005), p. 21.
59. This paper does not discuss annuity-demand issues, but there is evidence that plan design plays a significant role in annuitization rates (see, for example, Banerjee 2013). However, as noted in the text, retirement-plan design elements encouraging/requiring annuitization can be incorporated into both DB and DC plans.
60. The list of public DC plans, as well as description of plan type, was taken from Munnell, Aubry, and Cafarelli (2014). The provision of annuities and provider was based on a review of each plan's publicly available plan documentation.
61. Author's calculations based on public-pension data from the Financial Accounts of the United States (Z.1) release by the Federal Reserve Board of Governors and GDP data from the Bureau of Economic Analysis (BEA) at the U.S. Department of Commerce.
62. Munnell and Aubry (2015).
63. Author's calculations based on the Public Plans Database, maintained by Boston College's Center for Retirement Research.
64. Brown and Weisbenner (2014).
65. It is unclear from the CRR paper whether the DC sample is—for the paper's return analysis—limited to plans with 401(k) features, but it appears that the paper uses "401(k)" to refer to all DC plans.

CENTER FOR STATE AND
LOCAL LEADERSHIP

Isaac Gorodetski
Director

Charles Sahm
Education Policy Director

Dean Ball
Policy Manager

FELLOWS

Rick Baker

Daniel DiSalvo

Richard C. Dreyfuss

Stephen D. Eide

Nicole Gelinas

Edward Glaeser

George Kelling

Steven Malanga

Josh B. McGee

Edmund J. McMahon

Aaron M. Renn

Fred Siegel

Jacob Vigdor

Marcus A. Winters

The Manhattan Institute's **Center for State and Local Leadership (CSLL)** promotes promising new approaches to reform of state and local government. CSLL works on a broad range of issues, including public sector reform (specifically of pensions and health benefits), education, prisoner reentry, policing, public housing, infrastructure, immigration, and public-service delivery. By spotlighting new ideas and providing the research and proposals to inform creative new policies, CSLL hopes to lay the groundwork for an environment in which commerce, employment, and a rich civic life can flourish.

CSLL operates across the country, working in states such as California, Illinois, and Rhode Island, and cities such as Newark, New Jersey, and Detroit, Michigan. CSLL's tools include regular writing and research reports by affiliated Manhattan Institute scholars and senior fellows, along with public events and media appearances. CSLL also annually hosts both the James Q. Wilson Lecture on Urban Affairs—a forum for distinguished policymakers and scholars to explore the challenges and opportunities facing American cities—and the Manhattan Institute's Social Entrepreneurship Awards, which recognize those who identify social needs and take it upon themselves to address them privately.

www.manhattan-institute.org/csll

The Manhattan Institute is a 501(C)(3) nonprofit organization. Contributions are tax-deductible to the fullest extent of the law. EIN #13-2912529