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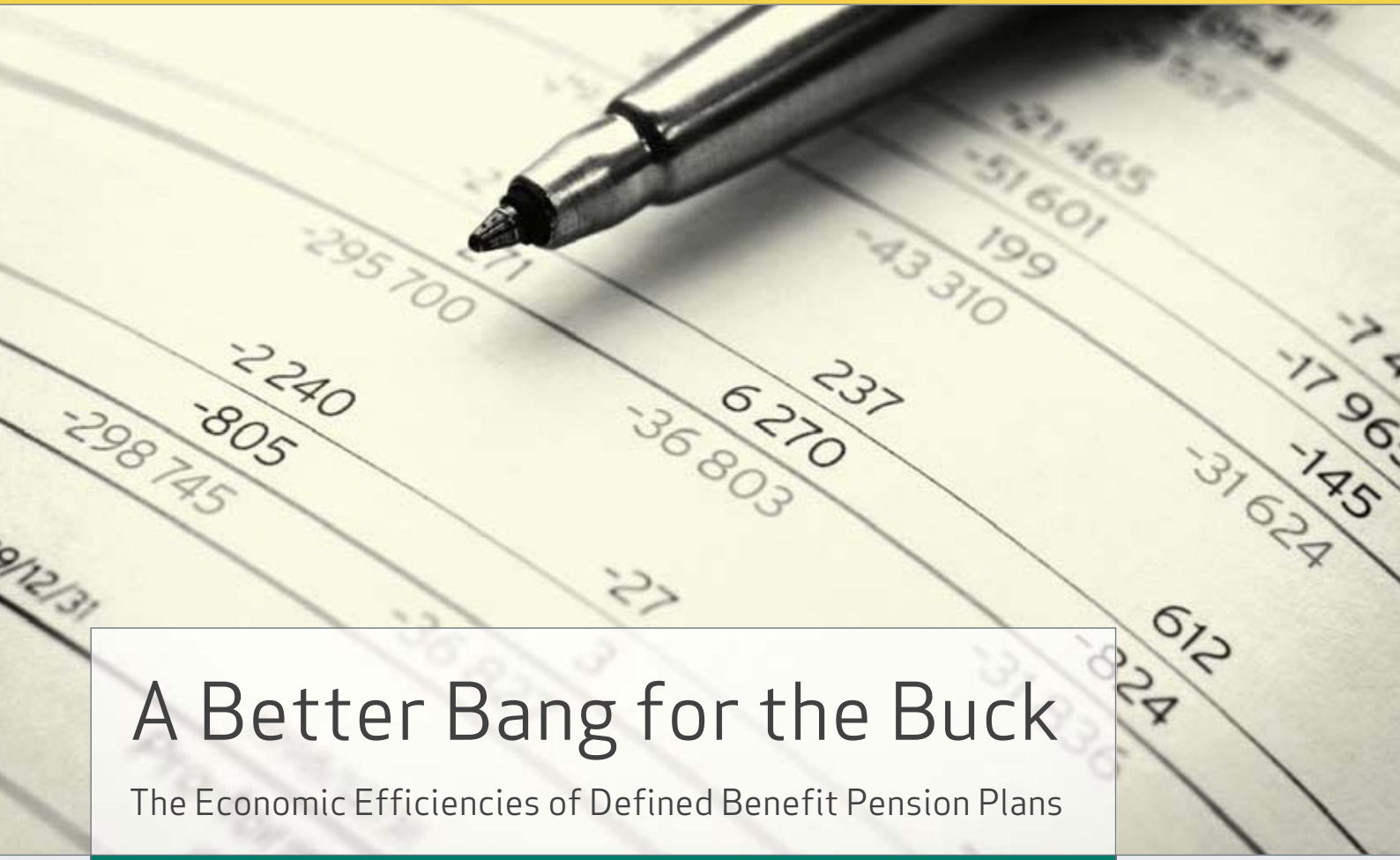

A Better Bang for the Buck

The Economic Efficiencies of Defined Benefit Pension Plans

by Beth Almeida and William B. Fornia, FSA

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ABOUT THE AUTHORS

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INTRODUCTION

Worries about retirement security abound. Families fear that they won't have enough to support an adequate retirement income as home values and financial markets plummet. Dwindling profit margins have employers looking to cut costs. And governments are concerned about delivering on the promises that they have made to their citizens and to their employees as tax revenues shrink amid a weakening economy.

In this environment, some have proposed replacing traditional defined benefit (DB) pensions with 401(k)-type defined contribution (DC) retirement savings plans in an effort to save money. But decision makers would be wise to look before they leap. To deliver the same level of retirement benefits, a DB plan can do the job at almost half the cost of a DC plan. Hence, DB plans should remain an integral part of retirement income security in an increasingly uncertain world because they offer employers and employees a better bang for the buck.

The value of traditional DB pensions to employees is generally recognized: they provide a secure, predictable retirement income that cannot be outlived. But less well known is the value of a DB pension to an employer. Due to their group nature, DB plans possess "built-in" savings, which make them highly efficient retirement income vehicles, capable of delivering retirement benefits at a low cost to the employer and employee. These savings derive from three principal sources.

First, DB plans better manage longevity risk, or the chance of running out of money in retirement. By pooling the longevity risks of large numbers of individuals, DB plans avoid the "over-saving" dilemma – that is, saving more than people need on average to avoid running out of cash – that is inherent in DC plans. Consequently, DB plans are able to do more with less.

Second, because DB plans, unlike the individuals in them, do not age, they are able to take advantage of the enhanced investment returns that come from a balanced portfolio throughout an individual's lifetime.

Third, DB plans, which are professionally managed, achieve greater investment returns as compared with DC plans that are made up of individual accounts. A retirement system that achieves higher investment returns can deliver any given level of benefit at a lower cost.

Because of these three factors, we find that a DB pension plan can offer the same retirement benefit at close to half the cost of a DC retirement savings plan. **Specifically, our analysis indicates that the cost to deliver the same level of retirement income to a group of employees is 46% lower in a DB plan than it is in a DC plan.** This is an important factor for policy makers to consider, especially with respect to public sector workforces, where tax dollars are an important source of funds for retirement benefits. DB plans are a more efficient use of taxpayer funds when offering retirement benefits to state and local government employees.

More specifically, this study finds that …

- Longevity risk pooling in a DB plan saves 15%,
- Maintenance of a balanced portfolio diversification in a DB plan saves 5%, and
- A DB plan's superior investment returns save 26%

… as compared with a typical DC plan.

TWO APPROACHES TO RETIREMENT: DB AND DC PLANS

Employers who offer retirement benefits can consider two basic approaches: a traditional defined benefit (DB) pension plan and a defined contribution (DC) retirement savings plan.[1] Each type of plan has certain distinguishing characteristics that influence their cost to employers and employees.[2]

How DB plans work

While employers have a good degree of flexibility in designing the features of a DB plan, there are some features all DB plans share.

DB plans are designed to provide employees with a predictable monthly benefit in retirement. The amount of the monthly pension is typically a function of the number of years an employee devotes to the job and the worker's pay – usually at the end of their career.[3] For example, the plan might provide a benefit in the amount of 1.5% of final average pay for each year worked. Thus, a worker whose final average salary was $50,000, and who had devoted 30 years to the job, would earn a monthly benefit of $1,875 ($22,500 per year), a sum that would "replace" 45% of his final average salary after he stops working. This plan design is attractive to employees because of the security it provides. Employees know in advance of making the decision to retire that they will have a steady, predictable income that will enable them to maintain a stable portion of their pre-retirement standard of living.

Benefits in DB plans are pre-funded. That is, employers (and, in the public sector, employees) make contributions to a common pension trust fund over the course of a worker's career. These funds are invested by professional asset managers whose activities are overseen by trustees and other fiduciaries. The earnings that build up in the fund, along with the dollars initially contributed, pay for the lifetime benefits a worker receives when he retires.

How DC plans work

DC plans function very differently than DB plans.

First, there is no implicit or explicit guarantee of retirement income in a DC plan. Rather, employers (and usually employees) contribute to the plan over the course of a worker's career. Whether the funds in the account will ultimately be sufficient to meet retirement income needs will depend on a number of factors, such as the level of employer and employee contributions to the plan, the investment returns earned on assets, whether loans are taken or funds are withdrawn prior to retirement, and the individual's lifespan.

DC plans are typically "participant directed," meaning that each individual employee can decide how much to save, how to invest the funds in the account, how to modify these investments over time, and at retirement, how to withdraw the funds.

While DC plan assets are also held in a pension trust, that trust is comprised of a large number of individual accounts. DC plans are typically "participant directed," meaning that each individual employee can decide how much to save, how to invest the funds in the account, how to modify these investments over time, and at retirement, how to withdraw the funds. Retirement experts typically advise individuals in DC plans to change their investment patterns over their lifecycle.

In other words, at younger ages, because retirement is a long way off, workers should allocate more funds to stocks, which have higher expected returns, but also higher risks. As one gets closer to retirement, experts suggest moving money away from stocks and into safer, but lower returning assets like bonds. This is to guard against a large drop in retirement savings on the eve of retirement, or in one's retirement years.

This high degree of participant direction makes DC plans very flexible in accommodating individuals' desires, decisions, and control. Employees, however, do not always follow the best expert advice when it comes to saving and investing for retirement.[4] Too many workers fail to contribute sufficient amounts to the plans, and individuals' lack of expertise in making investment decisions can subject individual accounts to extremely unbalanced portfolios with too little or too much invested in one particular asset, such as stocks, bonds, or cash. For example, one study found that more than half of all DC plan participants had either no funds invested in stocks—which exposes them to very low investment returns—or had almost all their assets allocated to stocks, making for a much more volatile portfolio.[5]

Another important difference between DC and DB plans becomes apparent at retirement. Unlike in DB plans, where workers are entitled to receive regular, monthly pension payments, in DC plans it is typically left to the retiree to decide how to spend one's retirement savings. Research suggests that many individuals struggle with this task, either drawing down funds too quickly and running out of money, or holding on to funds too tightly and enjoying a lower standard of living as a result.[6] In theory, employers that offer DC plans could provide annuity payout options, but in practice they rarely do.[7]

BOTH DB *AND* DC PLANS ARE IMPORTANT TO RETIREMENT SECURITY

Because individuals do not have perfect knowledge as to whether they will remain in a given job (and therefore in a given DB plan) until retirement, taking advantage of the opportunity to save in a supplemental DC plan can provide employees with useful diversification of retirement income sources.

DC plans are also flexible vehicles that can accommodate individual retirement income needs that can vary. For example, two otherwise identical workers might have different family situations, health needs, or simply different preferences and expectations about their retirement income needs. DC plans give workers the opportunity to save for retirement in a manner that reflects their individual situations.

This is why most retirement experts liken the ideal design of retirement income sources to a "three-legged stool," consisting of Social Security, a DB plan, and a supplemental DC savings plan. Indeed, researchers have found that workers who have access to all three sources of retirement income are in the best position to achieve a secure retirement.[8]

However, to the extent that retirement benefits for private sector employees constitute a cost to employers, and since benefits for public employees are supported by taxpayer contributions, designing retirement benefits in a fiscally responsible fashion is an important public policy goal. To that end, it is important for policymakers to recognize that the features that make DB plans highly attractive to employees – a predictable monthly retirement benefit, low fees and professional management of retirement assets – also provide significant savings for employers and taxpayers.

DB PLANS ARE MORE COST EFFECTIVE

The cost of either a DB or DC plan depends primarily, but not only, on the generosity of the benefits that it provides. Economists have found that DB plans are typically more generous than DC plans, and obviously, more generous benefits are more expensive.[9]

However, for any given level of benefit, a DB plan will cost less than a DC plan.[10] This makes DB plans, in the language of economists, *more efficient* since they stretch taxpayer, employer or employee dollars further in achieving any given level of retirement income.

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There are three primary reasons behind DB plans' cost advantage.

- First, because DB plans pool the longevity risks of large numbers of individuals, they avoid the "over-saving" dilemma inherent in DC plans. DB plans need only accumulate enough funds to provide benefits for the average life expectancy of the group. In contrast, individuals will need to set aside enough funds to last for the "maximum" life expectancy if they want to avoid the risk of running out of money in retirement. Since the maximum life expectancy can be substantially greater than the average life expectancy, a DC plan will have to set aside a lot more money than a DB plan to achieve the same level of monthly retirement income.
- Second, because DB plans do not age, unlike the individuals in them, they are able to take advantage of the enhanced investment returns that come from a balanced portfolio over long periods of time. For instance, ongoing DB plans generally include individuals with a range of ages. As older workers retire, younger workers enter the plan. As a result, the average age of the group in a mature DB plan does not change much. This means DB plans can ride out bear markets and take advantage of the buying opportunities that they present without having to worry about converting all of their money into cash for benefits in the near future. By contrast, individuals in DC plans must gradually shift to a more conservative asset allocation as they age, in order to protect against financial market shocks later in life. This process can sacrifice investment returns because people may have to sell assets when they are worth too little due to market fluctuations coinciding with retirement timing. Moreover, they are not able to take advantage of higher expected returns associated with a balanced portfolio.
- Third, DB plans achieve greater investment returns as compared with DC plans based on individual accounts. Superior returns can be attributed partly to lower fees that stem from economies of scale. Also, because of professional management of assets, DB plans achieve superior investment performance as compared to the average individual investor.

METHODOLOGY

We compare the relative costs of DB and DC plans by constructing a model that first calculates the cost of achieving a target retirement benefit in a typical DB plan. We express this cost as a level percent of payroll over a career. We then calculate the cost of providing the same retirement benefit under a DC plan. Additional details on our methodology can be found in the Technical Appendix to this report.

Our model is based on a group of 1,000 newly-hired employees. For the purposes of simplicity, we give all individuals a common set of features. All newly hired employees are female teachers aged 30 on the starting date of their employment. They work for three years and then take a two-year break from their careers to have and raise children. They return to work at age 35 and continue working until age 62. Thus, the length of the career is 30 years. By their final year of work, their salary has reached $50,000, having grown by about 4% percent each year.

Next, we define a target retirement benefit that, combined with Social Security benefits, will allow our 1,000 teachers to achieve generally accepted standards of retirement income adequacy. The plan provides a benefit in retirement equal to $26,684 per year or $2,224 per month. A cost of living adjustment is provided to ensure the benefit maintains its purchasing power during retirement. Thus, each teacher will receive a benefit equal to 53% of her final year's salary that adjusts with inflation, which we estimate at 2.8% per year. With this benefit and Social Security benefits, each teacher can expect to receive roughly 83% of her pre-retirement income – a level of retirement income that can be considered adequate, but not extravagant.

We define certain parameters for life expectancy and investment returns. Then, on the basis of all these inputs, we calculate the contribution that will be required to fund our target retirement benefit through the DB plan over the course of a career. We do the same for the DC plan.

WHAT IS AN "ADEQUATE" RETIREMENT BENEFIT?

Experts generally believe that in order for a retiree to maintain the same standard of living enjoyed during working years, income from all sources (Social Security, DB pensions, DC savings plans, etc.) should replace roughly 70 to 90 percent of pre-retirement income. Because some expenses (commuting costs, payroll taxes, etc.) disappear after retirement, it may be possible to maintain one's pre-retirement standard of living, even with a replacement ratio (that is, the ratio of retirement income to pre-retirement income) of less than 100%.

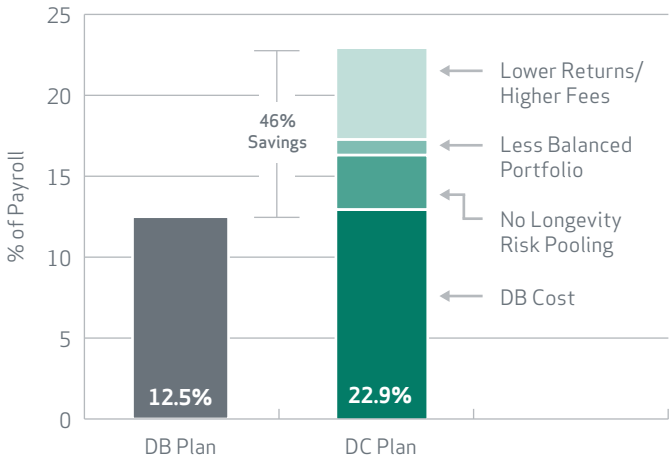
For example, Aon Consulting and Georgia State University estimate that a single retiree with a pre-retirement income of $50,000 would need to achieve a replacement ratio of 80% in order to maintain pre-retirement living standards.[11] Other analysts have recommended that workers seek to achieve an even higher replacement ratio. Human resources consulting firm Hewitt Associates predicts that employees will actually need *more* money in retirement than during their working years, and suggests a target replacement ratio of 125% to cover retiree healthcare and other expenses.[12] In our discussion, we target a replacement rate of 83% of pre-retirement income for both the DB and the DC plan.

DB PLANS ARE MORE COST EFFECTIVE BECAUSE OF LONGEVITY RISK POOLING, PORTFOLIO DIVERSIFICATION, AND SUPERIOR RETURNS

We find that the cost to fund the target retirement benefit under the DB plan comes to 12.5% of payroll each year. By comparison, we find that the cost to provide the same target retirement benefit under the DC plan is 22.9% of payroll each year. In other words, the DB plan can provide the same benefit at a cost that is 46% lower than the DC plan, as shown in Figure 1.

The DB cost advantage stems from differences in how benefits are paid out in each type of plan, how investment allocations shift in DC plans as individuals age, and how actual investment returns in DC plans compare with those in DB plans.

Figure 1:
Cost of DB and DC Plan as % of Payroll

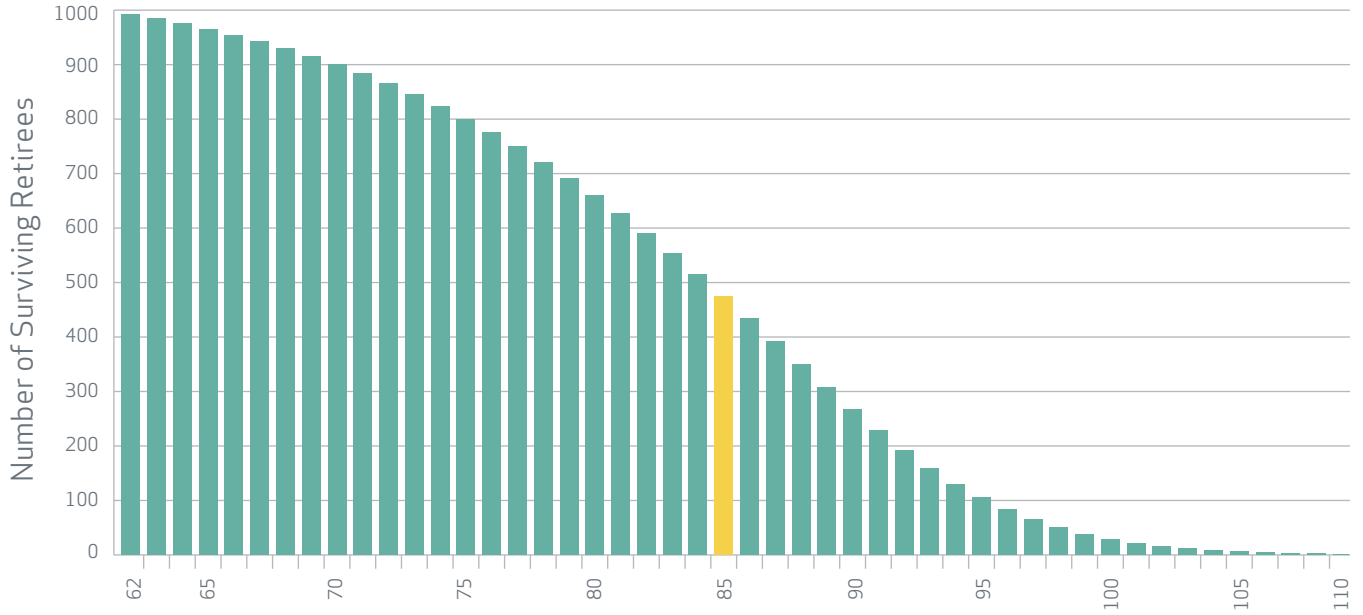


Longevity Risk Pooling

Longevity risk describes the uncertainty an individual faces with respect to their exact lifespan. While actuaries can tell us that, on average, our pool of female teachers who retire at age 62 will live to be 85, they can also predict that some will live only a short time, and some will live to be over 100. Figure 2 illustrates the longevity patterns among our 1,000 teachers. With each passing year, fewer retirees are still living. Age 85 corresponds to the year when roughly half of retirees are still alive.

In a DB plan, the normal form of benefit is a lifetime annuity, that is, a series of monthly payments that lasts until death. A DB plan with a large number of participants can plan for the fact that some individuals will live longer lives and others will live shorter lives. Thus, a DB plan needs only to ensure that it has enough assets set aside to pay for the *average* life expectancy of all individuals in the plan, or in this case, to age 85. Based on our target benefit level, the DB plan needs to have accumulated approximately $355,000 for each participant in the plan by the time they turn 62. This amount will ensure that every individual in the plan will receive a regular, inflation-adjusted monthly pension payment that lasts as long as they do. The contribution required to fund this benefit, smoothed over a career, comes to 12.5% of payroll.

Figure 2: **Longevity of 1,000 Retired Female Teachers**



WHAT ABOUT MONEY FOR A SURVIVING SPOUSE?

Our analysis did not explicitly analyze the effect of providing income to a retiree's surviving spouse. But the method of providing for spouse benefits would be similar under either the DB or DC approach. Under a DB plan, a retiree has the option of electing a reduced monthly benefit in exchange for a portion of the benefit continuing on to her surviving spouse if there is one. Virtually all pension plans offer at least a "50% Joint and Survivor" option and a "100% Joint and Survivor" option. For example, in our model, the retired teacher could have three payment options:

- $2,224 per month for as long as she lives, with no surviving spouse benefit, or
- $2,046 per month for as long as she lives, with half ($1,043) continuing to her surviving husband for as long as he lives, or
- $1,882 per month for as long as either the retiree or her husband lives

These three options are roughly "actuarially equivalent," meaning that for a large group following the actuarially assumed mortality and investment return patterns, the plan costs are neutral with respect to the option chosen.

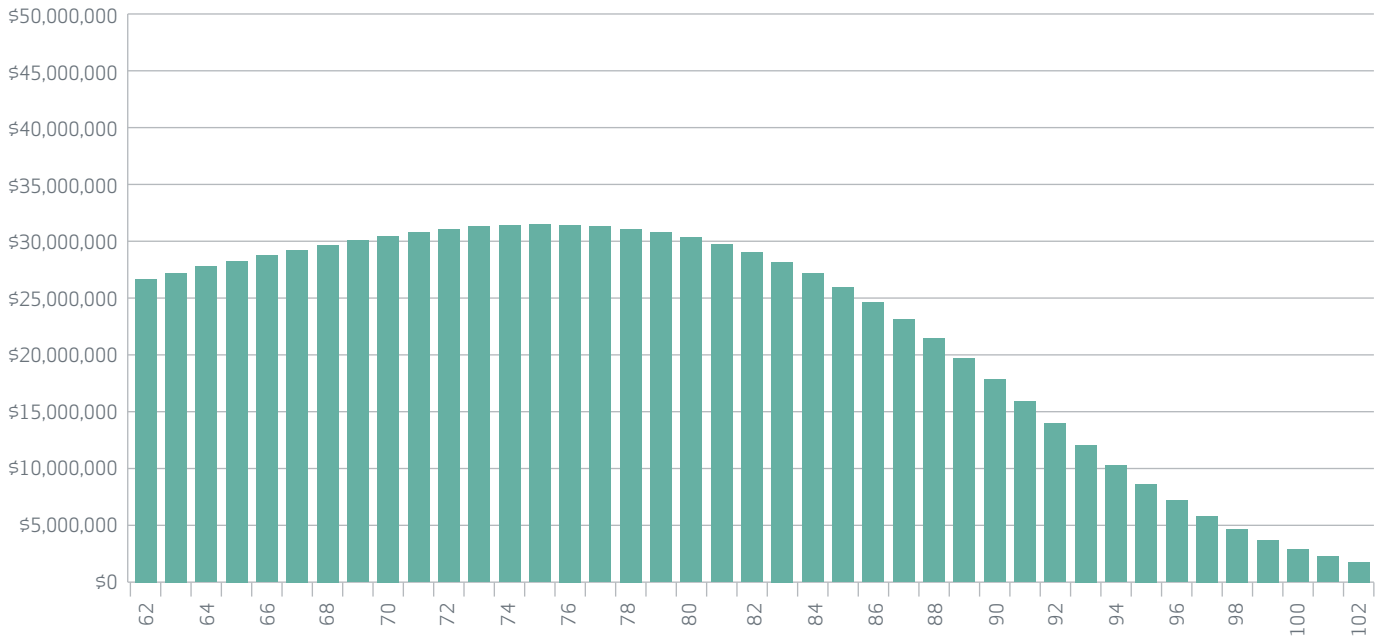
Under a DC plan, if this retiree wanted to provide her husband with retirement income should he outlive her, she would reduce the amount of her monthly withdrawals to enable him to be more likely to have residual assets available for him upon her death. If the retired couple were to make calculations as to how much to reduce their benefit, they would make calculations identical to those made by the plan to determine the actuarially equivalent benefit.

In other words, the desire of providing survivor income can be met through either a DB or DC plan.

We could have modeled our analysis based on a married retiree seeking survivor income protection, but adding this complexity would not have made a material difference in our analysis. This is because while it is difficult for a retiree to predict how long she will live, it is also difficult for a couple to predict how long they each will live.

Total annual payments out of the DB plan will have a hump-shaped pattern as seen in Figure 3. The amount of benefits paid out will increase for a number of years, because the effect of inflation adjustments is greater than the effect of individuals gradually dying off. At age 77, the impact of retiree deaths overtakes the effect of the cost of living adjustments and payments decline with each passing year. In the DB plan, every retiree recieves a steady inflation-adjusted monthly income that lasts until her death.

Figure 3: **Total Payments under the Defined Benefit Plan**

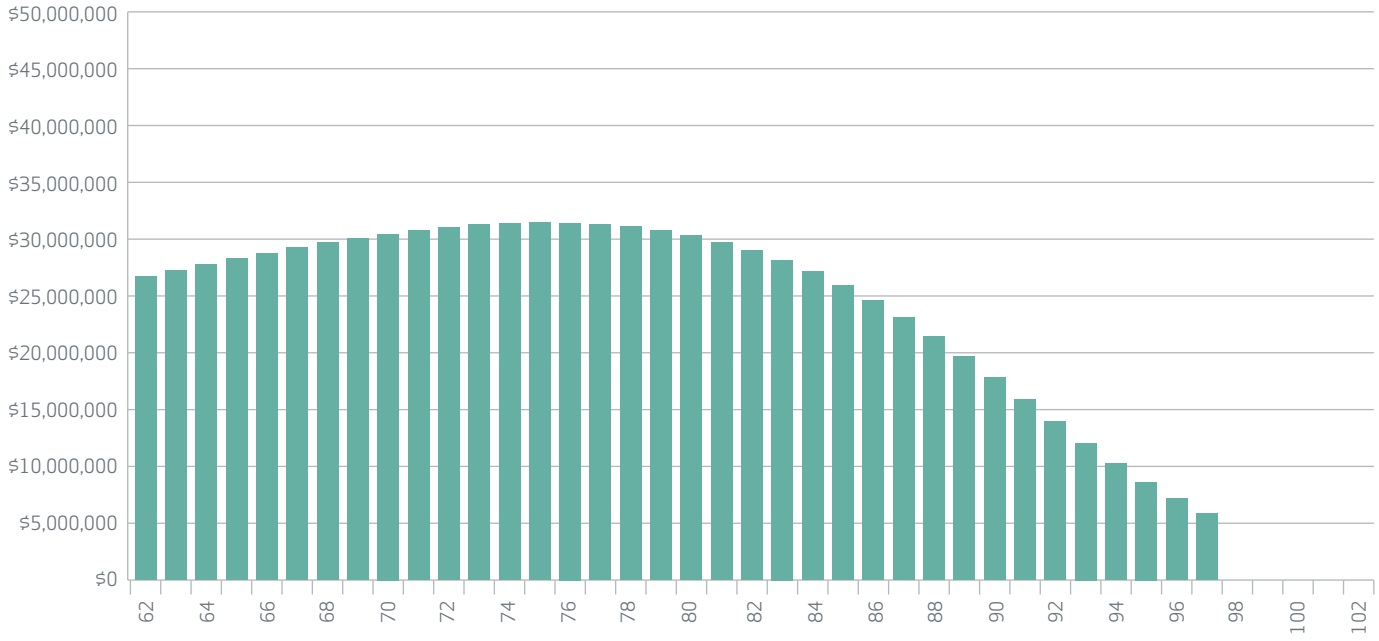


Next, we contrast this situation with that in a DC plan. Because DC plans rarely offer annuity options, individuals must self-insure longevity risks. This can be an expensive proposition. Because an individual in a DC plan does not know exactly how long she will live, she will probably not be satisfied with socking away an amount sufficient to last for the *average* life span, for if she lives past age 85, she will have depleted her retirement savings. For this reason, an individual will probably want to be sure that she has enough money saved to last for the *maximum* life span (or something close to it).

We define the "maximum life expectancy" for purposes of this analysis as 97 years old. It corresponds to the age beyond which only 10% of individuals survive, and therefore it is not a "true" measure of maximum life expectancy.[13] In fact, our mortality table indicates that one lucky individual out of the 1,000 will celebrate her 110th birthday. This simplifying assumption is intended to be more realistic (that most individuals will be satisfied with a 90% chance of not outliving their money, rather than a 100% chance), but it will also tend to understate the cost of the DC plan. Figure 4 illustrates the payout pattern under the DC plan, where individuals withdraw funds on an equivalent basis to the DB plan until age 97 – that is, in a series of regular, inflation adjusted payments. After age 97, there are no more withdrawals, even though 100 (10% of our initial pool of 1,000) teachers are still living. The money has simply run out.

Thus, our simplifying assumption of using a 90th percentile life expectancy of 97, rather than the true maximum life expectancy, will reduce the cost of providing the target benefit under the DC plan, but will also mean that individuals with exceptionally long lives will experience a reduced standard of living, compared to what they would experience under a DB plan. Thus, in our example, the DC plan ends up actually delivering less in total retirement benefits than the DB plan.

Figure 4: **Total Benefit Payments under the DC Plan Based on Life Expectancy of 97**



Of course, those 10% of individuals who do survive beyond age 97 would want to avoid the possibility of having their retirement income reduced to zero. It is likely that individuals will respond to a long life by gradually reducing their withdrawals from the plan to avoid running out of money. Thus, we assume that once an individual reaches age 90, she begins to reduce the size of annual withdrawals from the plan. This changes the withdrawal pattern to avoid the steep drop off in payments at age 97, as shown in Figure 5. However, it should be noted that those with very long lives will see their standard of living reduced significantly.

It is important to acknowledge that if a retiree dies before exhausting all of her retirement savings, the money in the account does not simply evaporate. Rather, it will pass to her estate. Benefits that were intended to be pension benefits become death benefits paid to heirs instead. This is the "over-saving" dilemma that is inherent in DC plans. As Figure 6 illustrates, the aggregate amount of money transferred to estates is substantial – totaling 24% of all assets accumulated in the plan.

While some individual heirs will benefit from these inter-generational transfers of wealth, they are not economically efficient from a taxpayer or employer perspective. Because heirs did not provide services that the employer/taxpayer benefited from, providing additional benefits to heirs is economically inefficient. Moreover, these additional "death benefits" are not tied in any direct way to an individual employee's productivity during her working years, rather their value is a function of living a shorter life.

DB plans avoid this problem entirely. By pooling longevity risks, DB plans can not only ensure that all participants in the plan will have enough money to last a lifetime, they can accomplish this goal with less money than would be required in a DC plan. Because DB plans need to fund only the *average* life expectancy of the group, rather than the *maximum* life expectancy for all individuals in the plan, less money needs to be accumulated in the pension fund. Remember that the DB plan needed to accumulate about $355,000 for each participant in the plan by the time they turn 62 in order to fund the target level of benefit. Due to the "over-saving" dilemma, DC plans must accumulate at least $455,000 per participant, or $100,000 more, in order to minimize the likelihood of running out of funds. In order to accumulate those additional amounts, contributions to the plan would climb to 16.0% of pay, from 12.5% under the DB plan.

Figure 5: **Total Benefit Payments under the DC Plan Based on Adjusted Life Expectancy**

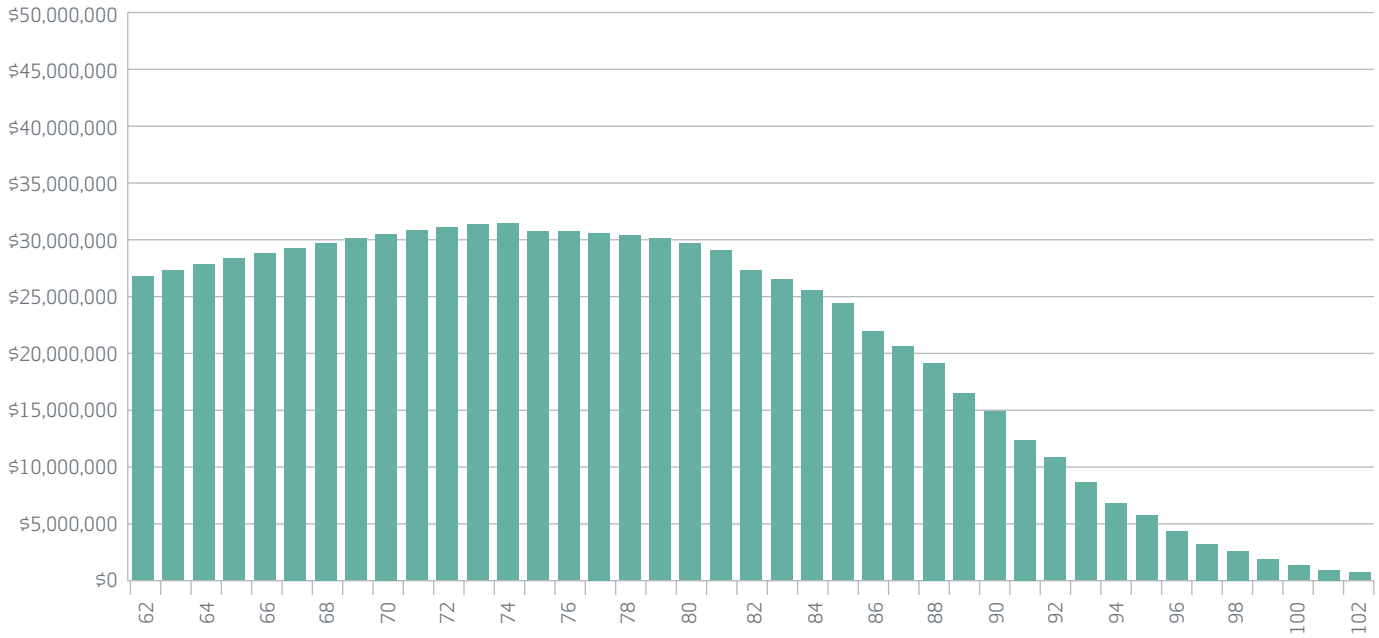
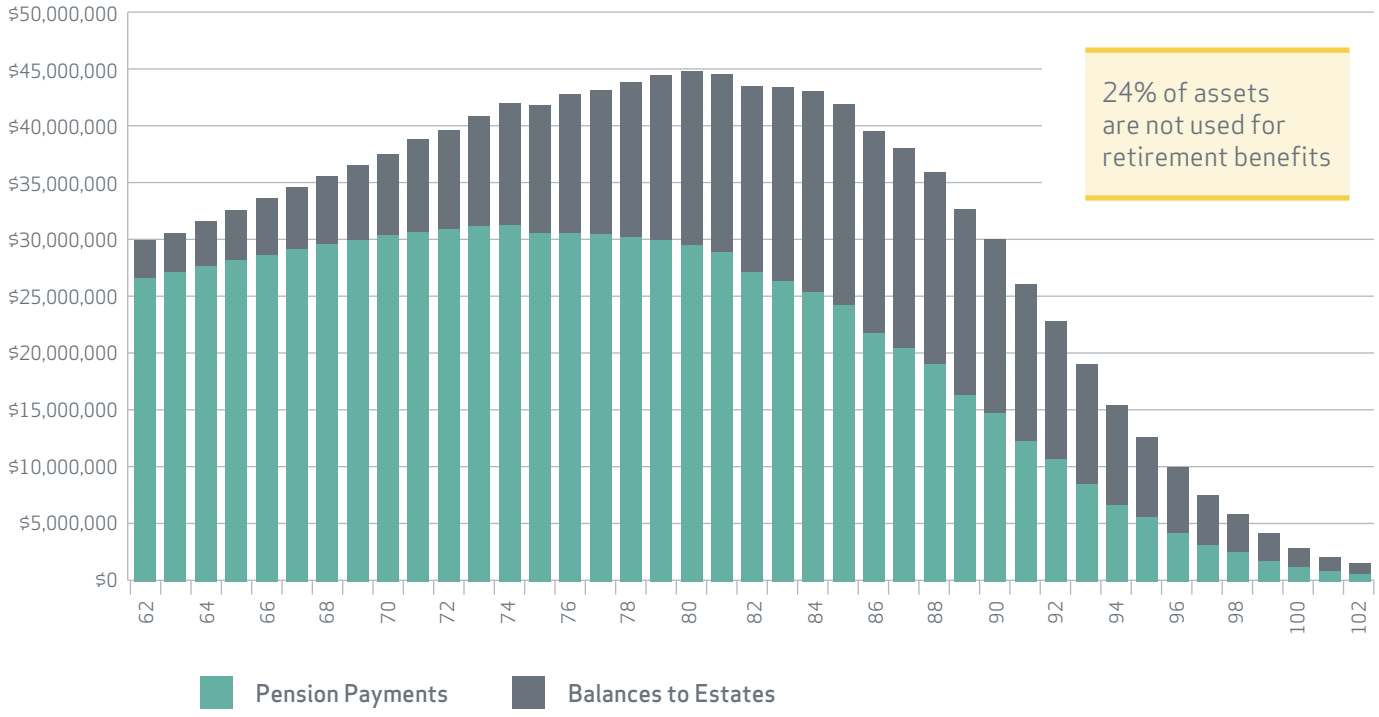


Figure 6: **Total Benefit + Estate Payments under the DC Plan**



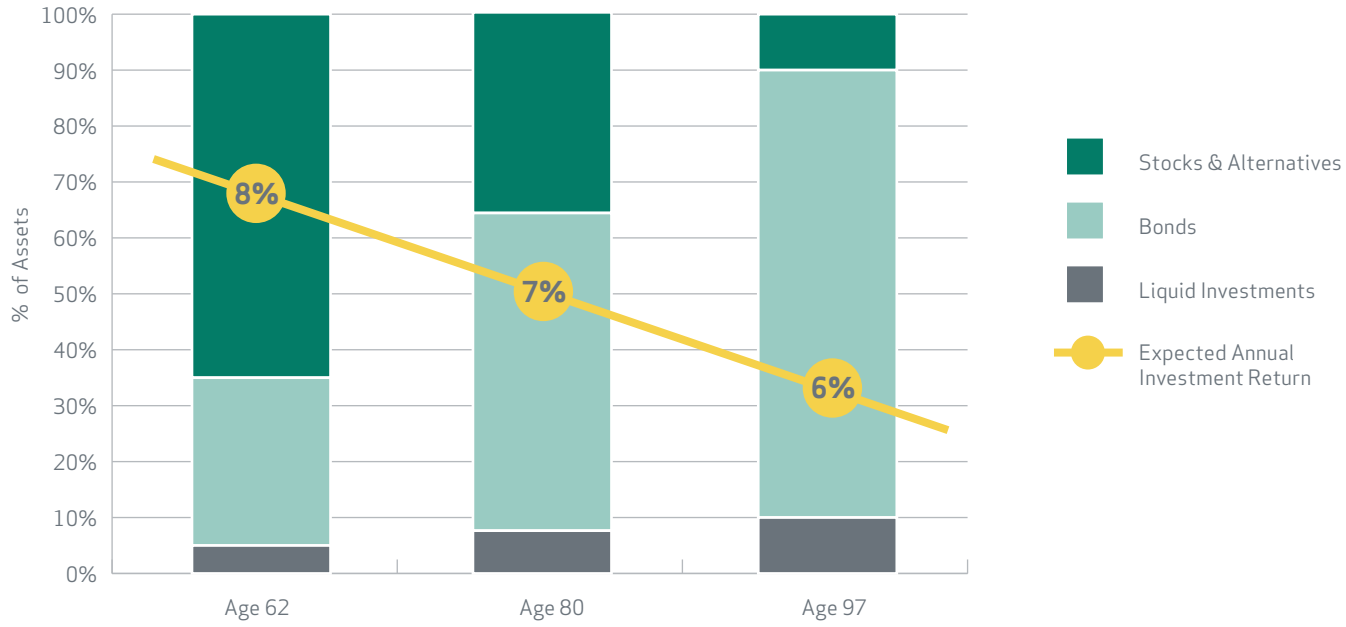
Maintenance of Portfolio Diversification

A retirement system that achieves higher investment returns can deliver a given level of benefit at a lower cost. All else equal, the greater the level of investment earnings, the lower contributions to the plan will need to be.[14] Prior research substantiates DB plans' significant advantage in investment returns, as compared with DC plans.

Part of the reason why DB plans tend to achieve higher investment returns as compared with DC plans is that they are long-lived. That is, unlike individuals, who have a finite career and a finite lifespan, a DB pension fund endures across generations; thus a DB plan, unlike the individuals in it, can maintain a well-diversified portfolio over time. In DC plans, individuals' sensitivity to the risk of financial market shocks increases as they age. The consequences of a sharp stock market downturn on retirement assets when one is in their 20s are minor, compared to when one is on the eve of retirement. For this reason, individuals are advised to gradually shift away from higher risk/higher return assets as they approach retirement. While this shift offers insurance against the downside risk of a bear market, it also sacrifices expected return since more money will be held in cash or similar assets that offer low rates of return in exchange for more security. A reduction in expected investment returns will require greater contributions to be made to the plan in order to achieve the same target benefit.

In our model, the well-diversified DB plan is expected to achieve investment returns of 8% per year, net of fees. In the DC plan, individuals gradually shift out of higher risk/higher return assets in favor of lower-risk/lower return assets. This results in a sacrifice of expected annual return of 2% by age 97, as shown in Figure 7.

Figure 7: **As Portfolio Allocation Shifts, Expected Return in DC Plan Falls**



We find that the shift in portfolio allocation has a modest, but nonetheless, significant effect on cost. Specifically, we find that the per-retiree amount that must be accumulated in the DC plan by retirement age now climbs to about $485,000. By comparison, the DB plan requires about $355,000. The contributions required to fund the target benefit level now climb to 17.0% of payroll (compared to 12.5% of payroll under the DB plan).

Another important reason why DB plans achieve higher investment returns than DC plans is that assets are pooled and professionally managed.

Superior Returns

Another important reason why DB plans achieve higher investment returns than DC plans is that assets are pooled and professionally managed. Expenses paid out of plan assets to cover the costs of administration and asset management reduce the amount of money available to provide benefits. As a result, a plan that can reduce these costs will require fewer contributions. By pooling assets, large DB plans are able to drive down asset management and other fees. For example, researchers at Boston College find that asset management fees average just 25 basis points for public sector DB plans.[15] By comparison, asset management fees for private sector 401(k) plans range from 60 to 170 basis points.[16] Thus, private DC plans suffer from a 35 to 145 basis point cost disadvantage, as compared with public DB plans.[17] On their face, these differentials may appear small, but over a long period of time, they compound to have a significant impact. To illustrate, over 40 years, a 100 basis point difference in fees compounds to a 24% reduction in the value of assets available to pay for retirement benefits.[18]

Administrative costs are largely driven by scale. Thus, a similarly-sized DB plan and DC plan can have opportunities to negotiate minimized administrative expenses. A DC plan involves costs that do not exist in a DB plan, such as the costs of individual recordkeeping, individual transactions, and investment education to help employees make good decisions. However, DB plans, unlike DC plans, bear the administrative costs of making regular monthly payments after retirement.

But fees are only part of the story – differences in the way retirement assets are managed in DB and DC plans play a substantial role. As previously discussed, investment decisions in DB plans are made by professional investment managers, whose activities are overseen by trustees and other fiduciaries. Research has found that DB plans have broadly diversified portfolios and managers who follow a long-term investment strategy.[19] We also know that individuals in DC plans, despite their best efforts, often fall short when it comes to making good investment decisions. Thus, it should not be surprising that researchers find a large and persistent gap when comparing investment returns in DB and DC plans. Munnell and Sunden put the difference in annual return at 80 basis points.[20] A 2007 report from the global benchmarking firm, CEM, Inc., concluded that between 1998 and 2005, DB plans showed annual returns 180 basis points higher than DC plans, largely due to differences in asset mix.[21] And Watson Wyatt found that, between 1995 and 2006, DB plans outperformed DC plans by 109 basis points, on average. Among large plans, the DB advantage was even greater – at 121 basis points. [22]

In our model, we use conservative estimates of the differences in DB and DC plan costs and expected returns. We model a 100 basis point (1%) net disadvantage for the DC plan annual investment returns as compared with DB plan returns. While this is slightly higher than the estimate of Munnell and Sunden,[23] it is lower than the more recent estimates of Flynn and Lum,[24] and Watson Wyatt.[25] This 100 basis point differential persists into the retirement years and magnifies the effects of the shift in asset allocation discussed previously. However, our model separates these effects to avoid double-counting. We do not isolate the impact of expenses and fees from the impact of superior investment management skill.

We find that a 1% per year disadvantage in DC plan investment returns compounds over time to create a significant cost disadvantage. In particular, we find that the amount which must be set aside for each individual at retirement age now climbs to about $550,000 (compared to the roughly $355,000 required in the DB plan). The level of contributions to the plan climbs again, this time to 22.9% of payroll (compared to 12.5% under the DB plan).

"BUT I THOUGHT DC PLANS WERE CHEAPER?" UNTANGLING BENEFIT GENEROSITY AND ECONOMIC EFFICIENCY

GM Will Freeze Salaried Pensions, Shift to 401(k)s
"…move will save the struggling automaker $420 million in 2007."
USA Today - April 10, 2007

IBM Adds Its Name to the List of Firms Freezing Pensions
"…cut worldwide retirement-related expenses by $450 million to $500 million this year."
The Washington Post - January 6, 2006

Verizon to Halt Pension Outlay for Managers
"…company hopes to save about $3 billion over the next decade".
The New York Times - December 6, 2005

Headlines like these have, understandably but unfortunately, led to a good deal of confusion about the relative costs and economic efficiencies of DB plans versus DC plans. While many employers have cited the financial burden of DB plans as their main reason for shifting from a DB to a DC plan, it is important to separate the question of benefit generosity from the question of the economic efficiency of a retirement plan.[26]

A review of the economic literature helps in this regard. Researchers have found that when employers move out of DB and into DC plans, they almost always cut the average employee benefit in the process. [27] Ghilarducci and Sun find, for instance, that between 1981 and 1998 the average employer pension contribution declined from $2,140 to $1,404 per employee, while the share of pension contributions attributed to DC plans increased from 23% to 68% in that time period.[28] Also, a UK study found that the average contribution per employee is 15-18% under a DB system, but only 9% under a DC system.[29] Thus, when employers simultaneously reduce their contributions along with the move from DB to DC, they will undoubtedly save money. Yet this does not mean that DC plans are inherently cheaper than DB plans; it simply means that employers are reducing employee benefits, while also changing the benefit design. Shifting costs from one party (the employer who reduces contributions) to another (employees who receive less in retirement) does not reduce costs overall. As the *The Economist* succinctly put it, "Whatever the arguments about the merits of the new wave of [DC] schemes, if you put less money in, you will get less money out."[30]

Whether an employer chooses a DB plan, a DC plan, or both, it has to decide how generous the benefits should be. But, as our analysis demonstrates, the economic efficiencies built into DB plans mean that such systems can provide the same benefit at a much lower cost, as compared with a DC plan.

SUMMARY OF RESULTS: DB PLANS REDUCE COSTS BY ALMOST HALF

Taken together, the economies that stem from investment pooling and longevity risk pooling can result in significant cost savings to employees and employers (or in the case of the public sector, taxpayers). In our model, required contributions are 46% lower in the DB plan as compared with the DC plan.

Our analysis clearly demonstrates that DB plans are far more cost-effective than DC plans. We find that to achieve roughly the same target retirement benefit that will replace 53% of final salary, the DB plan will require contributions equal to 12.5% of payroll, whereas the DC plan will require contributions to be almost twice as high – 22.9% of payroll.

We find that due to the effects of longevity risk pooling, maintenance of portfolio diversification, and greater investment returns over the lifecycle, a DB plan can provide the same level of retirement benefits at almost half the cost of a DC plan.

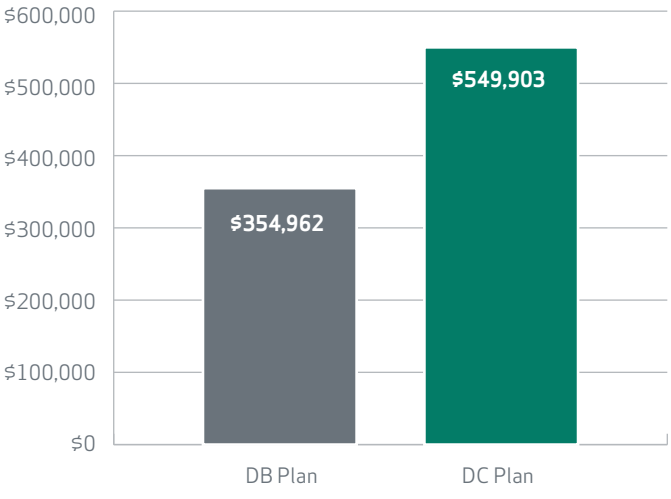
Figure 8: **Tallying DB Plan Cost Savings**

1. Longevity risk pooling saves	15%
2. Maintenance of portfolio diversification saves	5%
3. Superior investment returns save	26%
All-in costs savings in DB plan	**46%**

The longevity risk pooling that occurs in the DB plan accounts for 15% of the incremental cost savings. DB plans' ability to maintain a more diversified portfolio drives another 5% cost savings, and their superior investments returns across the lifecycle generate an additional 26% reduction cost.

Our results also indicate that DB plans can do more with less. That is, they can ensure that all individuals in the plan (even those with very long lives) are able to enjoy an adequate retirement benefit that lasts a lifetime, at the same time that they require less money to be contributed to a retirement plan and fewer assets to accumulate in the plan. We calculated the amount of money that would be required to be set aside for each retiree in each type of plan, to provide a modest retirement benefit of about $2,200 per month. As shown in Figure 9, at retirement age, the DB plan requires only about $355,000 to be set aside for each individual, whereas the DC plan requires almost $550,000. The difference – nearly $195,000 for each and every employee – illustrates that the efficiencies embedded in DB plans can yield large dollar savings for employers, employees and taxpayers.[31]

Figure 9:
Per Employee Amount Required at Age 62 DB Plan vs. DC Plan



CONCLUSION

Our findings indicate that DB plans provide a better bang for the buck when it comes to providing retirement income. We find that a DB plan can provide the same level of retirement income at almost half the cost of a DC plan. Hence, DB plans should remain a centerpiece of retirement income policy and practice, especially in light of current fiscal and economic constraints.

We find that the biggest drivers of the cost advantages in DB plans are longevity pooling and enhanced investment returns that derive from reduced expenses and professional management of assets. The sacrifice of investment returns that results from life-cycle driven shifts in portfolio allocation in DC plans had a smaller, but still significant, effect. The sources of cost savings in DB plans reflect, at a very basic level, the differences in how DB and DC plans operate. Group-based DB plans provide lifetime benefits and feature pooled, cost-efficient, professionally managed assets: these features drive significant cost savings that benefit employers, employees, and taxpayers.

When considering our results, it is important to keep in mind that in our effort to construct an "apples to apples" comparison, we made a number of simplifying assumptions that actually reflected more favorably on DC plans. For instance, we did not model any asset leakage from the DC plan before retirement, through loans or early withdrawals nor any terminations of employment under either plan. We also assumed that individuals followed a sensible "goldilocks-like" withdrawal pattern in retirement – not too fast, not too slow, but just right. We used conservative estimates of the difference in actual investment returns between DB and DC plans. And, we used a 90th percentile life expectancy to project required accumulations in the DC plan, rather than "full" life expectancies. Thus, if anything, our analysis likely underestimates the cost of providing benefits in a DC plan and thereby understates the cost advantages of DB plans.

Due to the built-in economic efficiencies of DB plans, employers and policy makers should continue to carefully evaluate claims that "DC plans will save money." As discussed, benefit generosity is a separate question from the economic efficiency of a retirement plan. While either type of plan can offer more or less generous benefits, DB plans have a clear cost advantage for any given level of retirement benefit. Considering the magnitude of the DB cost advantage, the consequences of a decision to switch to a DC plan could be dramatic for employees, employers, and taxpayers.

While either type of plan can offer more or less generous benefits, DB plans have a clear cost advantage for any given level of retirement benefit. Considering the magnitude of the DB cost advantage, the consequences of a decision to switch to a DC plan could be dramatic for employees, employers, and taxpayers.

Finally, policymakers should consider proposals that can strengthen existing DB plans and promote the adoption of new ones. When viewed against the backdrop of workers' increasing insecurities about their retirement prospects and the economic and fiscal challenges facing employers and taxpayers, now more than ever, policy makers ought to focus their attention and energy on this important goal. The very features that make DB plans attractive to employees drive cost savings for employers and taxpayers. In this way, DB plans represent a rare "win-win" approach to achieving economic security in retirement that should be recognized and replicated.

TECHNICAL APPENDIX: CALCULATING THE COST SAVINGS EMBEDDED IN DB PLANS

We calculate the cost, expressed as a level percent of payroll over a career, of achieving a target benefit in a typical DB plan and compare that with the cost of providing the same target benefit in a typical DC plan.

We begin by constructing a cohort of 1,000 newly-hired employees. For the purposes of simplicity, we give this cohort a common set of features. All newly hired employees are age 30 on the starting date of their employment and they are all female teachers. They work for three years and then take a two-year break from their careers to have and raise children. They return to work at age 35 and continue working until age 62. Thus, the length of the career is 30 years. By their final year of work, their salary has reached $50,000, having grown by 4.05% percent each year.

Modeling DB Plan Benefits and Costs

The DB plan provides a benefit in retirement equal to 1.85% of final average salary for each year worked. This represents the median benefit among DB plans covering public employees who are also covered by Social Security.[32] Final average salary is calculated on the basis of the final three years of one's career, which in this case is $48,079. Thus, the initial benefit in the DB plan is $26,684 per year or $2,224 per month.

The DB plan provides a cost of living adjustment that ensures the benefit maintains its purchasing power during retirement. Inflation is projected at 2.8% per year. Thus, each individual in our cohort will receive a benefit equal to 53% of her final year's salary that adjusts with inflation. This DB plan (in combination with Social Security) would allow an employee to meet generally accepted standards of retirement income adequacy, or roughly 83% of pre-retirement income.

DB plans typically offer married participants the ability to receive joint-and-survivor annuity benefits, whereby when the retiree dies, her spouse can continue to receive a monthly benefit that will last the spouse's lifetime. But the retiree pays the cost of this survivor's benefit. That is, the monthly benefit that would be payable on a single-life basis will be reduced by an actuarially determined factor to account for the fact that payments may continue if the retiree dies before her spouse. Therefore, for simplicity, we model all benefit payouts on a single-life basis (and do the same for the DC plan), using the RP-2000 Healthy Female Annuitants mortality table.

In order to model the contributions that are required to fund these benefits, we start by establishing expected investment returns. The DB plan is expected to achieve nominal investment returns of 8.01% per year, net of fees. We calculate a weighted average return, based on assumptions about asset allocation and returns for each asset class.

The DB plan follows a typical asset allocation of 2% in cash/liquid assets, 15% in treasuries/agency debt, 13% in corporate bonds, and 70% in equities and alternative assets. Our expected investment returns for each asset class are based on the projections prepared by the Office of the Actuary of the Social Security Administration to support analysis of the impact of private accounts by the President's Commission to Strengthen Social Security. The Commission's report described these assumptions as "conservative," noting that these assumptions are "much lower than that used in many academic and policy studies."[33] We expect cash/liquid investments to earn a nominal 2.8% per year, treasuries and agency debt to earn 5.8%, corporate bonds to earn 6.3%, and stocks and alternatives to earn 9.3%. Asset management fees of 0.25% are deducted from these returns, reflecting the average for DB plans in the public sector.[34]

Figure 10	% of Assets	Expected Annual Investment Return
Cash/Liquid Investments	2%	2.8%
Treasuries and Agency Debt	15%	5.8%
Corporate Bonds	13%	6.3%
Stocks and Alternatives	70%	9.3%
Less Asset Management Fees		-0.25%
Overall Portfolio		**8.0%**

On the basis of these inputs, we calculate the contribution that will be required to fund this benefit through the DB plan over the course of a career, and express this as a level percent of payroll. We find that the cost to fund the target retirement benefit, smoothed over a career, comes to 12.5% of payroll. Contributions could be made entirely by the employer, or, in the public sector, they may be split between the employer and employee.

Modeling DC Plan Benefits and Costs

Modeling the cost of the target retirement benefit in the DC plan requires some adjustments based on what we know about how DC plans differ from DB plans.

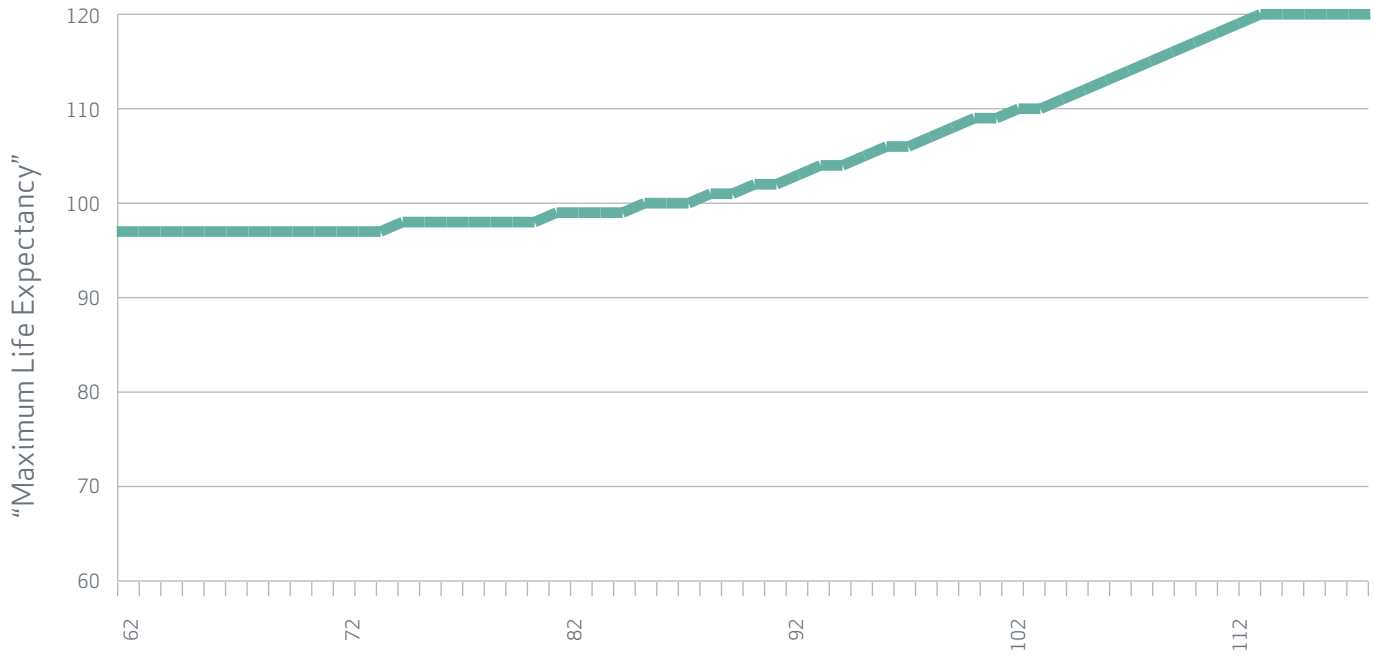
First, because employees are not provided with an annuity benefit at retirement under the DC plan, we determine the size of the lump sum amount that an individual would need to accumulate by their retirement date in order to fund a retirement benefit equivalent to that provided by the DB plan (including inflation adjustments) for a period of 35 years, or to age 97. This represents our estimate of the "maximum life expectancy." It corresponds to the age beyond which only 10% of individuals survive, and therefore is not a "true" measure of maximum life expectancy. In fact, our mortality table indicates that one individual out of 1,000 will survive to 110. This simplifying assumption is intended to be more realistic (that most individuals will be satisfied with a 90% chance of not outliving their money, rather than a 100% chance). Using a 90th percentile life expectancy of 97, rather than the true maximum life expectancy will reduce the cost of providing the target benefit under the DC plan, but will also mean that individuals with exceptionally long lives will experience a reduced standard of living, compared to what they would experience under a DB plan.

Of course, those 10% of individuals who do survive beyond age 97 would see their standard of living drop quite dramatically once their DC accounts were depleted. In reality, individuals would be likely to respond to a long life by gradually reducing their withdrawals from the plan to avoid the possibility of having their retirement income reduced to zero. For this reason, we assume that once an individual reaches age 90, she reduces annual withdrawals from the plan. We assume that the individual monitors her "maximum life expectancy" each year, and whenever it increases by a year, she adjusts her withdrawals accordingly. Figure 11 illustrates this process.

To model the impact of the shift to a more conservative portfolio allocation, starting at age 62, we have individuals begin to shift their portfolio allocation to gradually reduce the share held in equities and increase the holdings of cash and liquid investments, treasuries and agency debt, and corporate bonds. At age 62, the portfolio holds 65% of assets in equities; by age 72 it holds 49%; by age 82, it holds 33%; by age 92, it holds 16%; and so on. This drives the expected return on the baseline portfolio down from 8% per year to 6% per year in nominal terms.

The investment/withdrawal strategy we model is not the result of an optimization rule, rather it follows ad hoc rules. The investment strategy is modeled as a "glide path," along which the retiree gradually reduces her exposure to equities. Withdrawals are designed to mimic DB plan payouts, at least in the early years of retirement, declining in later years. Work by William Sharpe and colleagues suggests that an optimal approach would integrate investment and withdrawal

Figure 11: **"Maximum Life Expectancy" increases as one gets older**



strategies. Specifically, they find that a constant withdrawal rate must be paired with a riskless investment strategy in order to be optimal for an individual.[35] However, a post-retirement asset allocation entirely concentrated in risk-free assets would dramatically drive up the cost of the DC plan. Thus our model's ad hoc investment and withdrawal strategies would tend to understate the cost advantage of DB plans.

We use conservative estimates of the differences in DB and DC plan costs and expected returns. We assume that a large, sophisticated employer will seek to use whatever economies of scale are available to negotiate fees down on both types of plans. To capture the effect of lower DC plan returns over a lifetime, due to fee differentials and superior investment decisions, we model a 100 basis point disadvantage in net return as compared with DB plan returns. While this is slightly higher than the estimates of Munnell and Sunden,[36] it is lower than the more recent estimates of Flynn and Lum[37] and Watson Wyatt.[38] Thus, we assume individuals achieve a 7% nominal rate of return during their working years. This 100 basis point differential persists into the retirement years. So the return disadvantage compounds on top of the shift in portfolio allocation. (We calculate the impact of each effect separately to avoid double counting.) As a result, the expected return on the portfolio gradually declines from 7% per year to 5% in nominal terms.

On the basis of these inputs, we calculate the contribution that will be required to fund this benefit through the DC plan over the course of a career, and express this as a level percent of payroll. We find that the cost to fund the target retirement benefit, smoothed over a career, comes to 22.9% of payroll in the DC plan.

Future extensions of our model might incorporate additional differences between DB and DC plans. For example, one could analyze the impact of "leakage" of assets from DC plans through loans or early withdrawals, two features which are rare in DB plans. Pre-retirement death and disability benefits, which are a common feature of DB plans, but not DC plans, could be considered as well. Finally, the model could be extended to capture cyclical and idiosyncratic variances in investment returns. That is, one could analyze the effects of ups and downs in financial markets and the impact that these have on investment returns and costs in both DB and DC plans over a career. Also, the fact that in DC plans some individuals will have "better luck" with investing than others means that individuals' retirement prospects will exhibit a wider dispersion than what is predicted by our model.

ENDNOTES

1 The most common type of DC plan in the private sector is the 401(k) plan. Public sector employees often save for retirement in 403(b) plans or through 457 plans. These nomenclatures reflect the sections of the Federal tax code that spells out the rules governing these plans.

2 Both types of plans also share some common features. For instance, they both are employment-based plans that make preparing for retirement easier than if employees had to tackle the job completely on their own. Both DB and DC plans benefit from tax incentives designed to encourage retirement preparedness. And both types of plans are governed by laws designed to protect employees and their benefits.

3 The benefit factor could also be a function of a worker's earnings over their entire career (a so-called "career average plan.") Or, the factor could be a flat dollar amount: for example, the plan will pay a monthly benefit equal to $50 per year of service, so that a 30 year employee would have a benefit of $1,500 per month. "Flat dollar" plans are primarily seen among blue-collar workers in the private sector.

4 Benartzi, S. & R.H. Thaler. 2007. "Heuristics and Biases in Retirement Savings Behavior." *Journal of Economic Perspectives.* Vol. 21 No. 3. 81-104. Mitchell, O. and S. Utkus. 2004. *Pension Design and Structure: New Lessons from Behavioral Finance*. New York: Oxford University Press. Munnell, A. H. and A. Sunden. 2004. *Coming Up Short: The Challenge of 401(k) Plans*. Washington, DC: Brookings Institution Press.

5 Holden, S. and J. VanDerhei. 2001a. "401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2000." *EBRI Issue Brief* 239. Washington, DC: Employee Benefit Research Institute.

6 Copeland, C. 2007. "How Are New Retirees Doing Financially in Retirement?" *EBRI Issue Brief.* No. 302. Washington DC: Employee Benefit Research Institute. Love, D., P.A. Smith and L. McNair. 2007. "Do Households Have Enough Wealth for Retirement?" *Finance and Economics Discussion Series.* 2007-17. Federal Reserve Board, Washington DC.

7 Perun, P. 2007. "Putting Annuities Back into Savings Plans." In Ghilarducci and Weller, eds. *Employee Pensions: Policies, Problems, and Possibilities.* Champaign IL: Labor and Employment Relations Association.

8 Munnell, A. H., M. Soto, A. Webb, F. Golub-Sass, and D. Muldoon. 2008. "Health care costs drive up the National Retirement Risk Index." Center for Retirement Research Issue in Brief, No. 8-3. Boston College. Munnell, A.H., A. Webb and F. Golub-Sass. 2007 "Is there Really a Retirement Savings Crisis? An NRRI Analysis." Center for Retirement Research Issue in Brief, No. 7-11. Boston College. Love, D. et al., op. cit.

9 Ghilarducci, T., & W. Sun. 2006. How defined contribution plans and 401(k)s affect employer pension costs. *Journal of Pension Economics and Finance, 5(2),* 175-96. Blake, D. 2000. Does it matter what type of pension scheme you have? *The Economic Journal, 110(461), F46-F81.*

10 Fuerst, D. & A. Rappaport. 2004. "Defined Benefit Plans: Still a Good Idea?" *AARP Global Report on Aging*. Washington DC: AARP International. at http://www.aarpinternational.org/gra_sub/gra_sub_show.htm?doc_id=562911

11 Palmer, B., R. DeStefano, M. Schachet, J. Paciero, and C. Bone. 2008. *2008 Replacement Ratio Study.* Chicago, IL: Aon Consulting.

12 Hewitt Associates. 2008. *Total Retirement Income at Large Companies: The Real Deal.* Chicago, IL: Hewitt Associates.

13 Authors' calculations based on RP-2000 Healthy Female Annuitants mortality rates. Society of Actuaries. "Table 4-6: Female RP-2000 Rates." *RP-2000 Mortality Tables*. at http://www.soa.org/files/pdf/rp00_mortalitytables.pdf.

14 Another factor is particularly important in the discussion of investment – the degree to which contributions and investment earnings remain in the plan until retirement. This is generally not an issue in DB plans, but is a concern in most DC plans, where employees can borrow from their retirement account or take money out before retirement age (with the attendant tax penalties). This problem of "leakage" from DC plans has been well-documented and is receiving more attention by researchers and policy-makers. (See Weller, C., and J. Wenger. 2008. "Robbing Tomorrow to Pay for Today: Economically Squeezed Families are Turning to their 401(k)s to Make Ends Meet." CAP Economic Policy Report. Washington, DC: Center for American Progress.)

15 One basis point is equal to 0.01%. Thus 25 basis points is equal to one-quarter of one percent, or 0.25%.

16 Munnell, A.H. & M. Soto. 2007. "State and Local Pension Plans are Different from Private Plans." Center for Retirement Research State and Local Pensions, No. 1. Boston College.

17 This large fee gap may be attributable to several factors. One is plan size. Since most public pension plans tend to be very large compared to many private sector DC plans, their lower fees may be attributable to scale economies. Another factor may be differences in asset mix, which analysts find to be a key driver of asset management fees. However, here the direction of the effect is not entirely predictable. Although DB plans invest in less expensive index funds more often than DC plans, they also are

more likely to invest in assets that involve higher expenses (but also higher returns), such as real estate, private equity, or hedge funds. (Flynn, C. 2008. Author's correspondence.)

18 Weller, C., and S. Jenkins. 2007. "Building 401(k) Wealth One Percent at a Time: Fees Chip Away at People's Retirement Nest Eggs." CAP Economic Policy Report. Washington, DC: Center for American Progress.

19 Weller, C. and J. Wenger. 2008. "Prudent Investors: The Asset Allocation of Public Pension Plans." Unpublished manuscript. University of Massachusetts Boston.

20 Munnell, A.H. and A. Sunden, op. cit. 2007.

21 Flynn, C. & H. Lum. 2007. "DC Plans Underperformed DB Funds." Toronto, ON: CEM Benchmarking, Inc.

22 Watson Wyatt. 2008. "Defined benefit vs. 401(k) plans: Investment returns for 2003-2006." *Watson Wyatt Insider*, 18(5).

23 Munnell, A.H. and A. Sunden, op. cit. 2007.

24 Flynn, C. and H. Lum, op. cit.

25 Watson Wyatt, op. cit.

26 Clark, R.L., & A.A. McDermed. 1990. *The Choice of Pension Plans in a Changing Regulatory Environment*. Washington, DC: AEI Press. Kruse, D.L. 1995. "Pension substitution in the 1980s: Why the shift toward defined contribution pension plans?" *Industrial Relations, 34(2),* 218–41.

27 *The Economist*. 2008. Falling short: The trouble with pensions. *The Economist*, June 12, 2008.

28 Ghilarducci, T. and W. Sun, op. cit.

29 Blake, D. op. cit.

30 *The Economist*, op. cit.

31 There is an additional consideration for taxpayers we do not explore. Qualified retirement plans involve a significant amount of foregone revenue to federal and state treasuries, because taxes on contributions and investment earnings are deferred. To illustrate, the exclusion of DB and DC plan contributions and income from Federal tax involved a loss of $108.6 billion in revenue in 2007. By comparison, the mortgage interest tax deduction cost $73.7 billion. (See Joint Committee on Taxation. 2007. *Estimates of Federal Tax Expenditures for Fiscal Years 2007-2011*. Washington, DC: US GPO. September 24.) Since our analysis demonstrates that DC plans require more assets to be accumulated to deliver the same amount of retirement benefits, it is likely that the implicit tax subsidy to deliver $1 in retirement benefits through a DC plan exceeds that provided to deliver $1 in benefits through a DB plan. Valuing this impact is beyond the scope of this report, however, and analysis this issue must be left for future research.

32 Brainard, K. 2007. *Public Fund Survey Summary of Findings for FY 2006*. Georgetown, Texas: NASRA.

33 President's Commission to Strengthen Social Security. 2001. "Strengthening Social Security and Creating Personal Wealth for All Americans: Report of the President's Commission." Washington, DC.

34 Munnell A.H. and M. Soto, op. cit.

35 Sharpe, W.F., J.S. Scott, and J.G. Watson. 2007. "Efficient Retirement Financial Strategies." *Pension Research Council Working Paper PRC WP2007-19*. Philadelphia, PA: The Wharton School, University of Pennsylvania.

36 Munnell, A.H. and A. Sunden, op. cit.

37 Flynn, C. and H. Lum, op. cit.

38 Watson Wyatt, op. cit.

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