

# How much risk is acceptable?

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# HOW MUCH RISK IS ACCEPTABLE?

BY ALICIA H. MUNNELL, ANTHONY WEBB, AND ALEX GOLUB-SASS\*

## Introduction

The financial crisis has sparked proposals to reform the retirement income system. One component of such a system could be a new tier of retirement accounts. These accounts would augment declining Social Security replacement rates for low-wage workers and provide a buffer of security for middle- and upper-wage workers who, increasingly, will rely totally on 401(k) plans to supplement their Social Security. Designing such a new tier requires answering a number of questions: Mandatory or voluntary? Employee and/or employer contributions? Subsidies for low earners? Payments as lump sums or annuities? Tax favored or not? But the most fundamental question is whether the goal of the new tier is to provide a defined contribution account, where the retirement income will depend on market performance, or an account that can provide a certain percent of final earnings – that is, a target replacement rate.

This *brief* takes the first step in exploring the question of how much risk is acceptable. The first section makes the case for a new tier of retirement income. The second section describes the implications of using a defined contribution approach for the new tier. The third section uses a model developed by Gary Burtless<sup>1</sup> to demonstrate that even using target date funds and full annuitization at retirement, a defined contribution approach produces enormous variation in outcomes. The fourth section explores the implications of modifying these fluctuations. The final section concludes.

## The Need for More Retirement Income

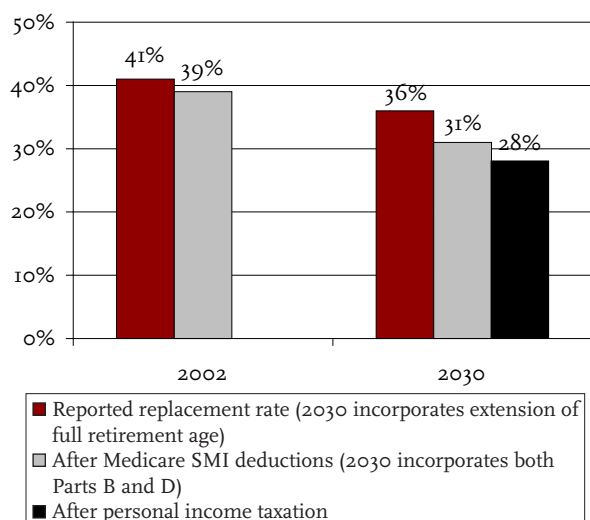
People need more retirement saving because the existing retirement income system is contracting and people are living longer.

### *Social Security*

At any given retirement age, Social Security benefits will replace a smaller fraction of pre-retirement earnings than in the past for three reasons. First, the increase in the Full Retirement Age from 65 to 67 is equivalent to an across-the-board cut.<sup>2</sup> Second, premiums for Medicare Part B and for the new Part D drug benefit, which are automatically deducted from Social Security benefits, are slated to increase sharply due to rising health care costs.<sup>3</sup> Finally, Social Security benefits will be taxed more under the personal income tax, as the exemption amounts in the tax code are not indexed to inflation, so taxation will move further down the income distribution. As shown in Figure 1 on the next page, these three factors will reduce the net replacement rate for the median worker, who claims at age 65, from 39 percent in 2002 to 28 percent in 2030. Note that this figure does not include any additional benefit cuts that might be enacted to shore up the solvency of the Social Security program.<sup>4</sup>

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FIGURE 1. SOCIAL SECURITY REPLACEMENT RATES FOR THE MEDIAN EARNER, 2002 AND 2030



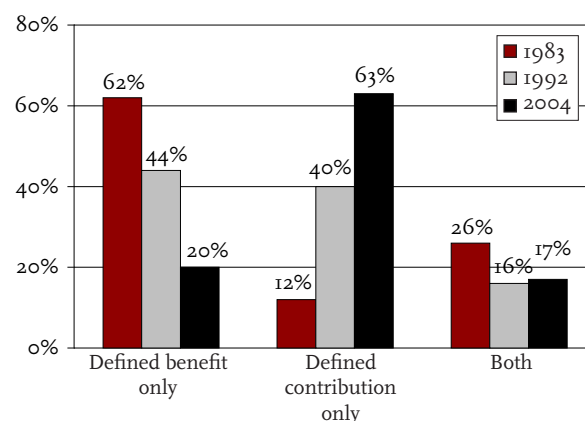
Source: Authors' update from Munnell (2003).

### Private Sector Employer-Sponsored Pensions

With a diminished role for Social Security, retirees will be increasingly dependent on employer-sponsored pensions. At any moment in time, however, less than half of the private sector workforce age 25-64 participates in an employer-sponsored plan of any type. This fraction has remained virtually unchanged since the late 1970s, and is unlikely to improve.<sup>5</sup> Since pension participation tends to increase with earnings, only middle- and upper-income individuals can count on receiving meaningful benefits from employer-sponsored pension plans.

While the level of pension coverage has remained flat, the nature of pension coverage has changed dramatically. Twenty years ago, most people with pension coverage had a traditional defined benefit plan that pays a lifetime annuity at retirement (see Figure 2). Today, most people with a pension have a defined contribution plan – typically a 401(k). In theory, workers could accumulate substantial wealth in a 401(k) and offset the decline in both Social Security and employer provided pensions. But reality looks quite different. The Federal Reserve's 2004 *Survey of Consumer Finances* (SCF) reports that the typical household head approaching retirement (55-64) had 401(k)/IRA balances of only \$60,000.<sup>6</sup> Nor do younger cohorts seem to be on track to accumulate sufficient wealth to support themselves in retirement.

FIGURE 2. PERCENT OF WORKERS WITH PENSION COVERAGE BY TYPE OF PLAN FROM SCF, 1983-2004

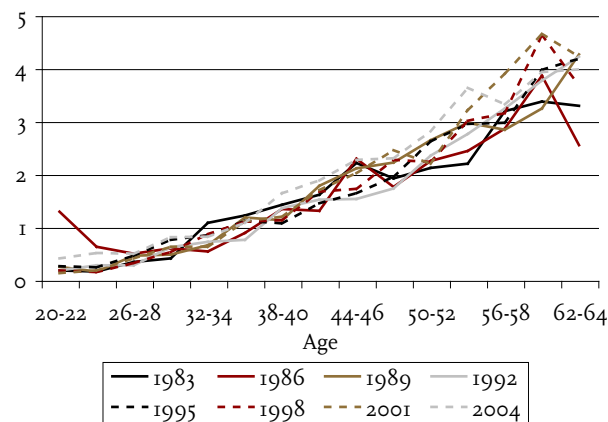


Source: Munnell and Sundén (2006).

### Individual Saving

Given the decline in Social Security and employer provided pensions and the rise in longevity, workers could save more. But that does not appear to be the case. A recent study based on the SCF found that median household wealth, excluding Social Security and employer defined benefit pensions, has remained remarkably constant relative to household income. This phenomenon is demonstrated in Figure 3 by the fact that the wealth-to-income ratios for each survey

FIGURE 3. RATIO OF WEALTH TO INCOME IN THE SCF, BY AGE GROUP, SELECTED YEARS 1983-2004



Source: Authors' update from Delorme, Munnell, and Webb (2006).

lie on top of one another. In other words, households have not increased their accumulation of wealth to offset the demise of employer defined benefit plans or the scheduled reduction in Social Security replacement rates.<sup>7</sup>

Thus, the outlook for retirement income for future cohorts of retirees is dismal.<sup>8</sup> And it is dismal both for those who must rely only on Social Security and for those who have a supplementary 401(k) plan. Efforts to expand coverage through automatic Individual Retirement Accounts (IRAs) and other proposals imply that those who already have a supplementary plan will be adequately prepared for retirement. Although 401(k) plans received a boost from the Pension Protection Act of 2006, which encouraged employers to make their plans easier and more automatic, the basic fragility of 401(k)s was exposed by the current financial crisis, which has reduced the value of equities in 401(k)s/IRAs by about \$2 trillion.<sup>9</sup> Thus, virtually all future retirees will need an additional tier of retirement saving (see Figure 4).

FIGURE 4. ADDITIONAL TIER OF FUNDED, PRIVATELY-MANAGED RETIREMENT SAVING



Source: Authors' illustration.

## The Defined Contribution Approach

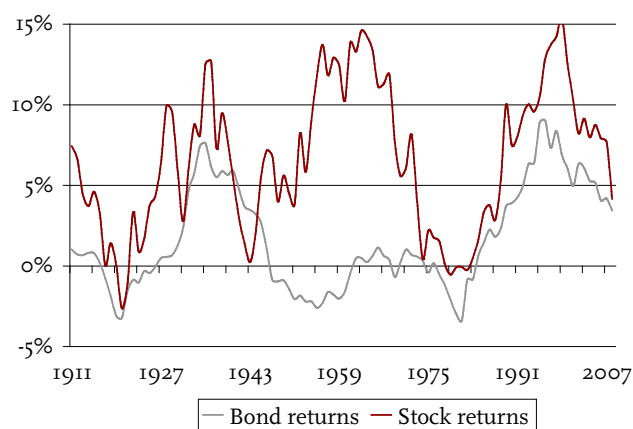
If the decision were made to introduce a new tier of retirement income, the next question is how that tier should be structured. One option is a defined benefit plan where participants contribute towards a fixed replacement rate. The alternative is a defined contribution plan where participants invest their contribu-

tions in stocks and bonds. The following discussion focuses on the implications of a defined contribution approach for a new tier, and parenthetically provides information about the inevitable outcomes from the 401(k) system already in place.

Accumulating money in an account and then turning the accumulated balances into a stream of income involves two types of financial risk. The first occurs before retirement. Figure 5 shows the real (inflation-adjusted) returns on stocks and bonds during the last hundred years. Over this period, the average real return on stocks was 7.5 percent and on bonds 2.6 percent.<sup>10</sup> The variability, as measured by the standard deviation, was much higher for stocks than bonds: 19.0 percent compared to 8.4 percent.

The returns achieved during the 15-year period leading up to retirement have an enormous impact on replacement rates, as during this period the effect of returns on savings dominates the effect of additional contributions. Figure 5 shows the annual average real return on stocks and bonds over 15-year periods ending 1911 to 2008. Stock returns varied from negative numbers in 1920 and 1980 to annual returns in excess of 12 percent for 15-year periods ending in the mid-1930s, the 1960s, and the 1990s.

FIGURE 5. REAL RETURNS TO STOCK AND BONDS, 1911-2008



Note: To eliminate some of the fluctuations in annual rates of return, the chart shows the annual rate of return on a dollar invested in the stock market 15 years before the indicated date.

Source: Burtless (2008).

The second source of financial risk occurs if the participant wishes to purchase an annuity to avoid outliving his or her accumulated wealth. The price of the annuity depends on a host of factors: the age of the worker, marketing and other expenses incurred by the insurance company, the amount of adverse selection (that is, the extent to which only people who expect to live for a long time purchase annuities), and the interest rate. If interest rates are high, the insurance company can expect to make substantial earnings on the participant's initial payment and therefore can provide a high monthly amount to the purchaser. If interest rates are low at the time the annuity is purchased, the monthly payment will also be low.

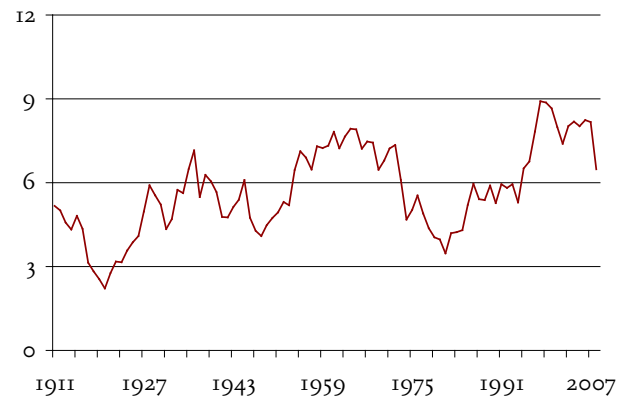
## How Market Risk Affects Retirement Income

To show how these two types of financial risk can affect the retirement income received by participants, we adopt a model developed by Gary Burtless. This model involves a number of assumptions. Workers are assumed to enter the workforce at 22, work for 40 years, retire at age 62, and annuitize their pension wealth at retirement. Each year they contribute 6 percent of their income to their account. The assumption is that they invest their contributions in a target date fund, where the percent in equities at age 25 is 90 percent, declining to about 45 percent by age 65. Real wages are assumed to grow at 2 percent a year.

Figure 6 shows the total accumulations relative to average (age 54-58) earnings for a worker in each year. People who were lucky enough to retire during the 1960s would have built up assets equal to 9 times their average earnings, whereas those retiring in the 1980s would have assets equal to less than four times earnings. Or consider a more recent comparison. Those retiring in 2000 would have accumulated assets equal to eight times their final earnings, while those retiring in 2008 would have had assets of only about 6 times earnings.

The goal, however, is not simply to accumulate a pile of assets but to provide retirement income. The most efficient way to transform assets into income is to purchase an annuity. The two types considered here are nominal annuities and inflation-adjusted annuities. It is possible that those who had a good accumulation experience could face low interest rates when it came to purchasing an annuity, or that those who had a bad accumulation experience could enjoy

FIGURE 6. RATIO OF ASSETS TO EARNINGS USING A TARGET DATE FUND, 1911-2008



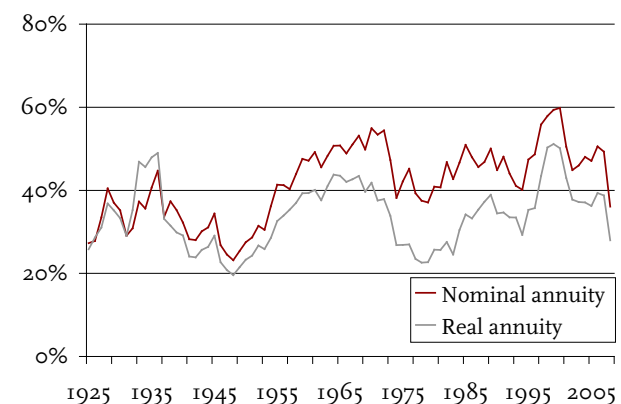
Note: Figure shows the ratio of assets to average (age 54-58) earnings for individuals who enter the labor force at 22 and retire at 62.

Sources: Authors' calculations based on Burtless (2000); Burtless (2008); and Fidelity (2008).

high interest rates. In such a case, the purchasing of the annuity could mitigate some of the variation in accumulated balances.

Figure 7 shows the initial replacement rate for participants retiring and purchasing either a nominal or inflation-adjusted annuity in a given year.<sup>11</sup> The replacement rate for the nominal annuity exceeds that for a real annuity, because the latter starts low and increases over time in line with changes in the Con-

FIGURE 7. REPLACEMENT RATE FROM REAL AND NOMINAL ANNUITIES BASED ON ASSETS ACCUMULATED IN A TARGET DATE FUND, 1925-2008



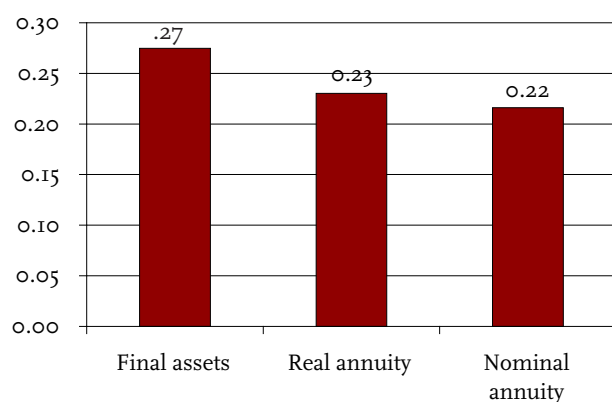
Sources: Authors' calculations based on Burtless (2000); Burtless (2008); Federal Reserve Bank of Philadelphia (2008); and Federal Reserve Bank of St. Louis (2008).

sumer Price Index. As in the case of accumulations, replacement rates vary significantly over time. To take the most recent period as an example, a person retiring in October 2000 with an inflation-adjusted annuity would have had a replacement rate of 50 percent whereas someone retiring in October 2008 would have had a replacement rate of 28 percent.

As to the question of whether interest rates offset the accumulation experience, it appears that the answer is ‘somewhat.’ Figure 8 shows a measure of the fluctuations – the standard deviation relative to the mean – for the ratio of accumulations to income and for the two annuity types relative to income. The real and nominal interest rates appear to somewhat offset the variability from the accumulation phase.

The bottom line is that the defined contribution approach for the provision of retirement income produces dramatically different levels of retirement income depending on the performance of the markets. This story is true even when the participants invest in target date funds that reduce their exposure to equity markets as they approach retirement.

FIGURE 8. RATIO OF STANDARD DEVIATION TO MEAN OF ACCUMULATIONS TO INCOME, REAL ANNUITY AND NOMINAL ANNUITY, 1925-2008



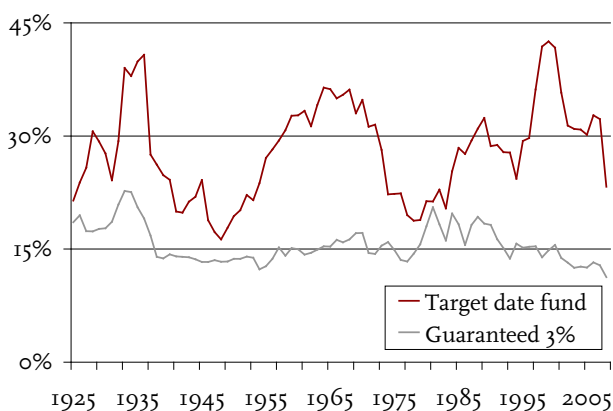
Sources: Authors' calculations based on Burtless (2000); Burtless (2008); U.S. Bureau of Labor Statistics (2008); Federal Reserve Bank of Philadelphia (2008); and Federal Reserve Bank of St. Louis (2008).

## Reducing the Risk in Defined Contribution Plans

One way to overcome the enormous fluctuations in replacement rates described above is to guarantee participants a real rate of return during the accumulation

phase and then provide an inflation-adjusted annuity at retirement. As an example, consider a 3.0 percent guaranteed rate, which is likely on the high-end of what is feasible.<sup>12</sup> Figure 9 compares the outcome from such a guarantee, assuming a 5-percent contribution rate, with that from investing an equivalent amount in a target date fund. Three facts emerge from this comparison. First, a guaranteed rate reduces most of the fluctuations, although some remain because the real interest rate and life expectancies faced by annuity providers vary over time. Second, the replacement rate on average is much lower. That is, over the period 1925-2008, the average replacement rate using a guaranteed real rate of three percent is 15 percent compared to 28 percent from the target date fund. Third, in every period, including 1929 and 2008, the guaranteed return retirement plan would have produced a lower replacement rate than the life-cycle fund, or indeed a 100 percent equity fund.

FIGURE 9. REPLACEMENT RATE FROM REAL ANNUITY FROM TARGET DATE FUND VERSUS FUND WITH 3-PERCENT REAL RETURN, 1925-2008



Sources: Authors' calculations based on Burtless (2000); Burtless (2008); U.S. Bureau of Labor Statistics (2008); Federal Reserve Bank of Philadelphia (2008); and Federal Reserve Bank of St. Louis (2008).

This simulation highlights the inherent trade-off between accepting the fluctuations inherent in investing in the stock and bond markets and the lower return involved in any form of guarantee. Although historical data indicate that it is unlikely that a household investing in a life-cycle fund would obtain a lower replacement rate than one investing in a guaranteed fund, the possibility cannot be ruled out, particularly if, as many commentators believe, future equity returns will be lower than those enjoyed over

the past century. And a household investing in a life-cycle fund may be lulled into a false sense of security by favorable returns in the years leading up to retirement, only to face a calamitous decline in the value of its portfolio immediately prior to retirement.

## Conclusion

The analysis in this *brief* suggests that in a defined contribution plan, replacement rates will vary dramatically depending on the period over which the participant is working and accumulating assets. This pattern occurs even when individuals invest in a target date fund. These accumulation effects are only somewhat offset by interest rates at retirement.

The question is whether such variation is acceptable in a new tier of retirement income. If so, policymakers would be agreeing to widely different replacement rates each year depending on the performance of the market over the participants' working years. If such an outcome is not acceptable, mechanisms would be needed to eliminate some or all of the variation. But such mechanisms are not costless. So the challenge becomes one of weighing the costs and benefits of alternative approaches.

The analysis also has implications for the outcomes of 401(k) plans. After all, investing in a target date fund for forty years, without any withdrawals, is as good as a 401(k) participant can do. Yet these simulations show that replacement rates generated by even the most effective saving behavior in a 401(k) system will vary as much as 32 percentage points depending on the performance of the stock market and interest rates.



## Endnotes

1 For more details, see Burtless (2000, 2008).

2 Under legislation enacted in 1983, the increase in the Full Retirement Age began with those born in 1938 (turning 62 in 2000) and will be fully phased in for those born in 1960 (turning 62 in 2022).

3 The premium for Medicare Part B alone is projected to increase from 9 percent of the average Social Security benefit in 2007 to 12 percent in 2030 (according to unpublished data from the Centers for Medicare and Medicaid Services, 2008).

4 For married couples, and most Americans retire as part of a married couple, Social Security already replaces a significantly smaller share of household earnings than it did as recently as 1990, and will replace even less going forward (Munnell, Sanzenbacher and Soto 2007). The reason is the dramatic increase in the labor force participation of married women. As married households have increasingly relied on the earnings of working wives, these earnings have not produced a comparable increase in Social Security benefits. The reason is that the program provides a guaranteed spousal benefit for the wife equal to 50 percent of her husband's Primary Insurance Amount – the benefit to which he would be entitled at the Full Retirement Age. The increased labor force participation of married women will increase the household's Social Security benefits only to the extent that benefits based on their earnings records exceed this spousal minimum. The average Social Security replacement rate for one-earner couples in the *Health and Retirement Study* is thus 58 percent compared to 41 percent for two-earner couples (Munnell and Soto, 2005).

5 The pension coverage data discussed above apply only to individual workers at any given point in time. Over a lifetime and on a household – rather than an individual – basis, coverage rates are somewhat higher. For households age 55-64, the Federal Reserve's *Survey of Consumer Finances* shows that approximately 66 percent of households had some sort of pension coverage in 2004.

6 Munnell and Sundén (2006).

7 Delorme, Munnell, and Webb (2006).

8 Important studies by John Karl Scholz (Scholz et al., 2006, 2008) suggest that Americans up to the

Early Baby Boom generation are adequately prepared for retirement. Alternatively, Munnell, Webb, and Golub-Sass (2007) shows a large decline in preparedness over time, with the initial cohort in the *Health and Retirement Survey* well prepared for retirement and the Baby Boom and subsequent cohorts at significant risk.

9 Munnell and Muldoon (2008).

10 Bond returns are measured for investments in government bonds with a remaining maturity longer than seven years.

11 We assume that individuals purchase a joint life and two-thirds survivor annuity. The annuity is priced using Social Security Administration life tables for the appropriate birth cohort. Following Mitchell, Poterba, Warshawsky, and Brown (1999), we assume that the annuity has a money's worth of 84.1 percent to a household with population average mortality when the income stream is discounted at either the ten year treasury bond interest rate (for the nominal annuity), or the 10-year Treasury Inflation-Protected Securities (TIPS) interest rate (for the real annuity). TIPS were first issued in 1997. For the period 1991 to 1996, we estimate a real interest rate by deducting the ten-year inflation forecast published in the *Livingston Survey* (Federal Reserve Bank of Philadelphia, 2008) from the ten-year Treasury rate. For years prior to 1990, we estimate a forecast inflation rate by first estimating forecast inflation for the period 1991 to 2008 as a function of the previous five years' actual inflation, and then back-casting forecast inflation for 1925 to 1990. To correct for the abnormal inflation during World War II and the Korean War, we substitute average inflation during the period 1925 to 1940 for actual inflation during the period 1941 to 1953.

12 A 3.0 percent real return is consistent with the rate used by the Social Security Administration in projections of the program's long-term financial situation (U.S. Social Security Administration, 2008). It is somewhat higher than the 2.5 percent average return on long-term Treasury bonds over the 1926-2005 period (Ibbotson Associates, 2006) and the 2.8 percent average yield on 10-year Treasury Inflation-Protected Securities (TIPS) over the past 12 years. Because interest rates can fluctuate substantially, no private insurer would be able to provide such guaranteed returns. Therefore, any meaningful guarantee would require government involvement.



## References

- Burtless, Gary. 2000. "How Would Financial Risk Affect Retirement Income Under Individual Accounts?" *Issue in Brief* 5. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Burtless, Gary. 2008. "Stock Market Fluctuations and Retiree Incomes: An Update." Washington, DC: The Brookings Institution.
- Centers for Medicare and Medicaid Services. 2008. "Additional Information Regarding Comparisons of Beneficiary Income and Out-of-Pocket Costs for Medicare SMI." Memo from Richard S. Foster and M. Kent Clemens. Washington, DC: Department of Health and Human Services.
- Delorme, Luke, Alicia H. Munnell, and Anthony Webb. 2006. "Empirical Regularity Suggests Retirement Risks." *Issue in Brief* 41. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Federal Reserve Bank of Philadelphia. 2008. 10-Year Inflation Forecasts from the *Livingston Survey*, 1991-2008. Philadelphia, PA.
- Federal Reserve Bank of St. Louis. 2008. Yields on 10-Year Treasury Inflation-Indexed Securities, 1997-2008. St. Louis, MO.
- Fidelity Investments. 2008. Allocations to Equities for Fidelity Freedom Funds 2010-2050 as of September 30, 2008. Boston, MA.
- Ibbotson Associates. 2006. *Stocks, Bonds, Bills, and Inflation: 2006 Yearbook*. Chicago, IL.
- Mitchell, Olivia S., James M. Poterba, Mark J. Warshawsky, and Jeffrey R. Brown. 1999. "New Evidence of the Money's Worth of Individual Annuities." *The American Economic Review* 89(5).
- Munnell, Alicia H. 2003. "The Declining Role of Social Security." *Just the Facts on Retirement Issues* 6. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Munnell, Alicia H. and Dan Muldoon. 2008. "Are Retirement Savings Too Exposed To Market Risk?" *Issue in Brief* 8-16. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Munnell, Alicia H., Geoffrey Sanzenbacher, and Mauricio Soto. 2007. "Working Wives Reduce Social Security Replacement Rates." *Issue in Brief* 7-15. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Munnell, Alicia H. and Mauricio Soto. 2005. "Sorting Out Social Security Replacement Rates." *Just the Facts on Retirement Issues* 19. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Munnell, Alicia H. and Annika Sundén. 2006. "401(k) Plans Are Still Coming Up Short." *Issue in Brief* 43. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Munnell, Alicia H., Anthony Webb, and Francesca Golub-Sass. 2007. "Is There Really a Retirement Savings Crisis? An NRRI Analysis." *Issue in Brief* 7-11. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Scholz, John Karl and Ananth Seshadri. 2008. "Are All Americans Saving 'Optimally' for Retirement?" Working Paper 2008-189. Ann Arbor, MI: University of Michigan Retirement Research Center.
- Scholz, John Karl, Ananth Seshadri and Surachai Khittarakun. 2006. "Are Americans Saving 'Optimally' for Retirement?" *Journal of Political Economy* 114(4): 607-643.
- U.S. Board of Governors of the Federal Reserve System. *Survey of Consumer Finances* 1983-2004. Washington, DC.
- U.S. Bureau of Labor Statistics. 2008. Historical Data from the *Consumer Price Index*, 1913-2008. Washington, DC.
- U.S. Social Security Administration. 2008. *The 2008 Annual Report of the Board of Trustees of the Federal Old Age, Survivors and Disability Insurance Trust Funds*. Washington, DC: U.S. Government Printing Office.

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The Center for Retirement Research at Boston College was established in 1998 through a grant from the Social Security Administration. The Center's mission is to produce first-class research and forge a strong link between the academic community and decision makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

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