

Preparing for Retirement in an Uncertain World

Policy Report No. 325

by Liqun Liu, Andrew J. Rettenmaier
and Thomas R. Saving

January 2010

In previous generations, many workers could expect to automatically receive a steady stream of retirement income from Social Security and a pension from their union or employer. Like Social Security, traditional defined benefit pension plans promised a monthly annuity for life. Along with personal savings, pensions and Social Security were the mainstays of retirement. Increasingly, however, American workers must make their own retirement investment decisions.

Executive Summary

Defined contribution retirement plans, such as 401(k)s, have been replacing traditional pensions for some time. Today, more than nine out of 10 private employer-sponsored retirement plans are defined contribution plans.

Defined benefit pensions promise employees a retirement income typically based on a formula that takes into account their salaries and the number of years of employment. The income from defined contribution plans, by contrast, depends on the amount employees and their employers contribute and the rate of return on investments. Usually, individuals choose from among a number of portfolios with different investment strategies and mixes of stocks and bonds, or they are defaulted into a plan with relatively safe investments but a lower potential rate of return.

Defined benefit plans are not completely safe because the promised retirement income often depends on the long-term financial health of the sponsoring employer and the willingness of the federal government to insure a portion of the employer's promises in the event of a default. Defined contribution plans are risky for different reasons. The volatility of stock prices means that an individual who retires in a year when the stock market is down risks receiving lower retirement income. As an alternative, an employee could choose to invest in a no-risk government bond fund. Since the interest rate is low, however, securing an adequate retirement income in this way requires a much larger investment.

Lifecycle investment strategies reduce the risks of volatile stock prices by gradually shifting the mix of investments from stocks to bonds as an individual ages. As the individual approaches retirement, the portfolio becomes increasingly less risky.

A better investment strategy, however, would take into account the individual's other sources of retirement income. These include expected wage income beyond the age of retirement, Social Security benefits, and



Dallas Headquarters:
12770 Coit Road, Suite 800
Dallas, TX 75251
972.386.6272
Fax: 972.386.0924

www.ncpa.org

Washington Office:
601 Pennsylvania Avenue NW,
Suite 900, South Building
Washington, DC 20004
202.220.3082
Fax: 202.220.3096

ISBN #1-56808-202-9
www.ncpa.org/pub/st325.com

Preparing for Retirement in an Uncertain World

income from trusts and pensions. This strategy is based on the idea that at any given point in time an individual's wealth consists of the capitalized value of future wage earnings, the capitalized value of Social Security benefits and other private retirement income, and the amount accumulated in one's defined contribution account.

Consider a worker whose 401(k) savings represents 10 percent of his wealth, so defined. A 50 percent drop in investment returns would affect only 5 percent of the person's total wealth. However, for a worker for whom 401(k) savings are 50 percent of total wealth, the same 50 percent drop in investment returns would affect 25 percent of the total wealth. The former can afford to take more risks with his 401(k) investments than the latter.

Workers whose expected future labor earnings and Social Security and private pension benefits are large relative to their 401(k) savings can afford to take more risks with their 401(k) funds. Further, workers with more certain expected wage income may be more inclined to invest more heavily in stocks than would workers whose expected wages are more volatile.

To account for these factors, we recommend a dynamic lifecycle strategy that involves individualized portfolio updating and adjustments each year, based on prevailing market conditions, changing investor expectations about future earnings and changes in the investment horizon. The dynamic lifecycle strategy is responsive to market conditions that affect the current value of the investor's retirement account. For example, during a bull market, the ratio of 401(k) assets to total wealth would rise, suggesting lower stock holdings are in order. The converse would hold during bear markets.

In general, the shift to bonds with the dynamic account occurs over a shorter time span than with a conventional static lifecycle account. Dynamic lifecycle investing can reduce the potential variation in returns due to the volatility of stock prices, while offering a higher rate of return than other strategies.

This study simulates portfolios using the earnings profiles assumed in the 2009 Social Security Trustees Report. The simulations assume that a constant 10 percent of earnings are added to the savings account each

year. Replacement rates are equal to the ratio of the annuitized value of wealth at retirement divided by average real lifetime earnings. Risk is measured by a "coefficient of variation." The simulated portfolios show that, on the average, dynamic lifecycle portfolios have a higher replacement rate than conventional lifecycle strategies for every level of risk. For example:

- The dynamic average replacement rate is 14 percent higher — and its relative variation lower — than a portfolio that is constantly invested 60 percent in stocks and 40 percent in bonds.
- The dynamic account produces a 21 percent higher average replacement rate than an aggressive static lifecycle account (one that is weighted more toward stocks), but exhibits only slightly higher relative variation.

Thus, appropriately chosen lifecycle investment strategies can take advantage of the average higher returns offered by the stock market, but with less risk. On the average, as a percentage of lifetime wages:

- An account invested 100 percent in stocks offers the highest wage replacement rate (197 percent), but the coefficient of variation is 27 percent.
- An account invested 100 percent in bonds offers the lowest wage replacement rate (62 percent) and the coefficient of variation in replacement rates is only 6 percent.
- By contrast, an account invested using a dynamic lifecycle strategy offers a wage replacement rate of 182 percent, which is only slightly lower than the all-stock portfolio, but the coefficient of variation is only 18 percent.
- For individuals who want to minimize their risk, the baseline dynamic lifecycle account offers a 145 percent replacement rate, and a coefficient of variation that is only slightly higher than the all-bond portfolio, at 8 percent.

The results of this study support a change in public policy to allow employers offering 401(k)s to default their employees into a dynamic lifecycle fund.

Introduction

In previous generations, many workers could expect to automatically receive a steady stream of retirement income from Social Security and a pension from their union or employer. Like Social Security, traditional defined benefit pension plans promised a monthly annuity for life. Along with personal savings, pensions and Social Security were the mainstays of retirement. Increasingly, however, American workers must make their own retirement investment decisions.

Over the past three decades, defined benefit pension plans have been replaced by defined contribution plans under which workers (and often their employers) make deposits to retirement accounts invested in stocks and bonds. As they retire, workers must decide what to do with their retirement funds, including the rate at which to draw down their account, and how much and when to annuitize the balance.

Today, there is uncertainty about both traditional pensions and Social Security. Many pension plans are underfunded, which means employers and unions have not invested sufficient funds to cover workers' benefits. Furthermore, the number of retirees is increasing compared to the number of workers funding retiree benefits; therefore, taxes on wages, Social Security benefits and/or other retirement income are likely to rise in the future to maintain anticipated benefit payments.

Stock market volatility, poor investment choices and the lack of worker participation in defined

contribution plans have led to calls to replace 401(k)s and IRAs with a government-run retirement program with guaranteed rates of return. In order to determine whether it is better to let government invest workers' retirement savings or to improve upon private retirement plans, this study compares the performance of retirement funds invested in the market to the returns on workers' contributions to Social Security.

“Over the past three decades, defined contribution plans have largely replaced defined benefit plans.”

The study also evaluates alternative approaches to lifecycle investing and introduces a new, individualized lifecycle strategy that takes into account an individual's past accumulations and future earnings to determine the optimal allocation between stocks and bonds at each age. This strategy is applied for workers with different tolerances for risk.

Sources of Retirement Income

Traditionally, retirement income consisted of defined benefit pensions, Social Security and personal savings. However, the number of workers covered by defined benefit pension plans is shrinking, while defined contribution plans are

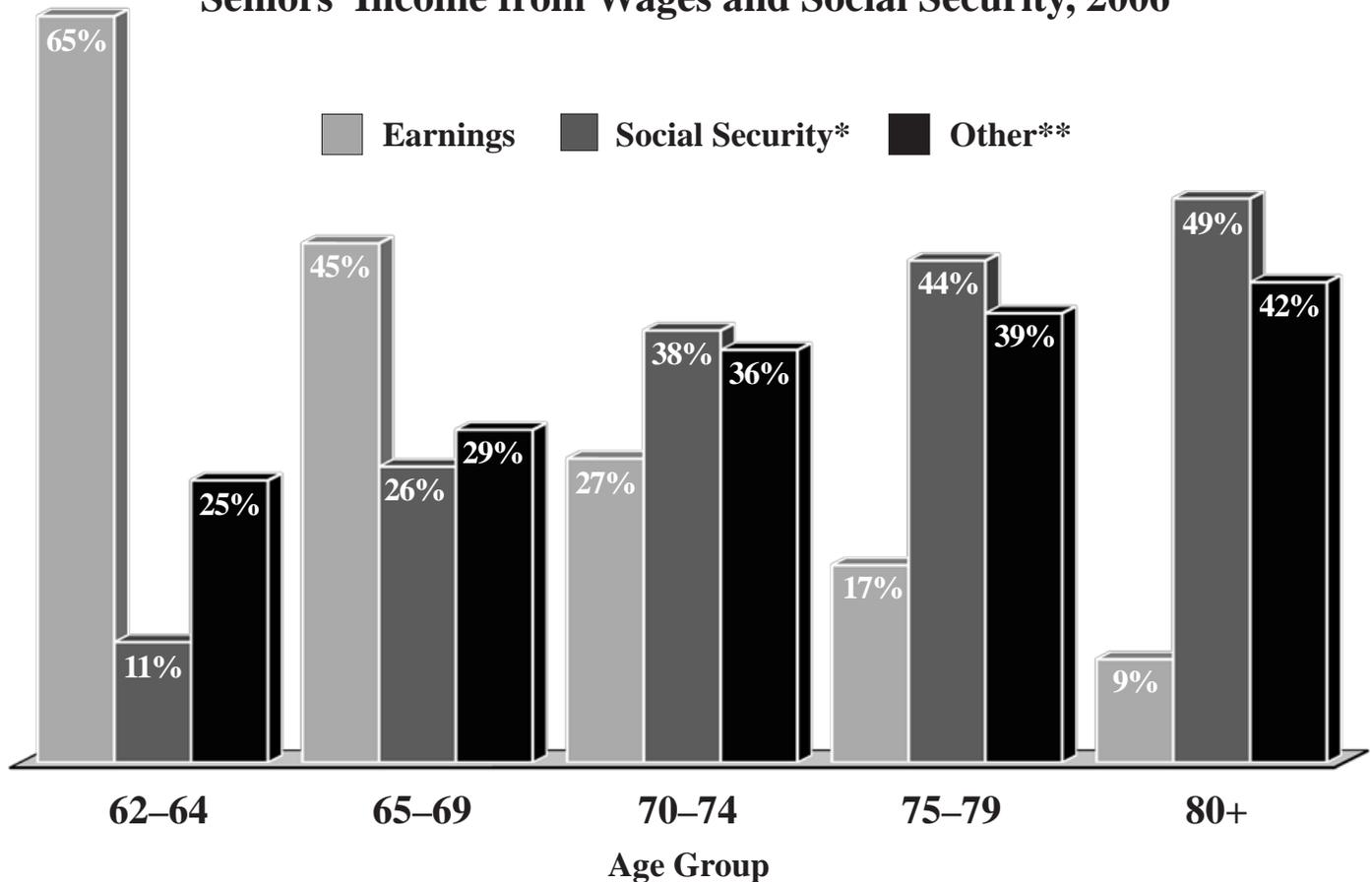
becoming the norm. Earnings from labor during retirement have become an increasingly important source of retirement income.

Labor Earnings. Many individuals continue to work during retirement. Some defined benefit pensions begin paying benefits at age 50 or 55 years, and nondisabled individuals can begin receiving Social Security benefits at age 62 years (albeit at lower replacement rates). However, the ability to begin claiming benefits early does not necessarily induce workers to exit the labor force. It is expected that the importance of labor earnings may grow in future years for several reasons. First, the shift away from defined benefit plans means that fewer future retirees will face a pension benefit formula that may encourage early retirement. Second, Social Security reforms may encourage workers to stay in the labor force. For example, there have been various proposals to drop the earnings test that penalizes work by Social Security retirees ages 62 to 64, to raise the normal retirement age further, and to phase out payroll taxes on workers after they reach the retirement age. Longer life expectancies may also increase labor force participation.

Figure I depicts the relative importance of earnings from work and Social Security for older families in 2006.¹ As the figure indicates, labor earnings provide the largest income share among young retirees and it remains important for workers well into their 70s. Specifically:

- For the 62- to 64-year-old population, labor earnings comprise about 65 percent of income.

FIGURE I
Seniors' Income from Wages and Social Security, 2006



Note: Household headed by a senior in the age group. *Social Security includes Railroad Retirement.

**Other includes cash public assistance, government employee pensions, private pensions, annuities and income from assets.

Source: U.S. Social Security Administration, Office of Retirement and Disability Policy, Income of the Population 55 or Older, 2006, Table 10.1.

Available at: http://www.socialsecurity.gov/policy/docs/statcomps/income_pop55/2006/.

- In the 65 to 69 age group, labor earnings account for about 45 percent of income.

(As discussed in a later section, income from labor earnings is critical in determining a worker's optimal investment strategy over time.)

Figure I also shows that Social Security is an important income source for older age groups, rising from 25.8 percent of income for the 65 to 69 age

group to nearly half (49.1 percent) for the oldest age group.

Social Security Income. Labor earnings remain an important component of older Americans' incomes well into retirement, particularly for higher income retirees. Social Security is the most important source of retirement income for low-income seniors. As Figure II shows:

- Social Security provides 83 percent of income among the 20 per-

cent of senior households with the lowest income.

- It accounts for nearly two-thirds (65 percent) of income for families in the middle fifth.
- In the top 20 percent of earners, Social Security still accounts for 17 percent of income.

There is only one senior income group for whom Social Security is a smaller percentage of income than

labor earnings: the highest income group. This is also the only group of seniors for whom income from nonpension assets (such as personal savings) is higher than income from Social Security.

Pension Plans. Until recently, many American workers financed their retirement through Social Security and defined benefit pension plans sponsored by employers or unions. In defined benefit pension plans, employers, unions and/or employees contribute to a fund from which benefits are paid. The plans provide a steady income from retirement to death. Benefits are typically based on a formula that includes longevity with a firm, preretirement earnings and retirement age. Employees never have to worry about how to invest savings or what to do with the accumulated assets at retirement.

The landscape of retirement financing has undergone a massive transformation from employer-sponsored defined benefit plans or pensions to employer-sponsored defined contribution plans. The main reason for this transformation was that defined benefit plans tended to be underfunded and the security of beneficiaries' retirement income was dependent on the long-term viability of their former employers. The defined benefit plans of successful enterprises provided stable pensions, but the funds of unsuccessful corporations were at risk. The Employee Retirement Income Security Act (ERISA) of 1974 established the Pension Benefit Guaranty Corporation (PBGC) to insure participating defined benefit plans. However, the PBGC insures

only a fraction of the benefits of workers in participating plans and it doesn't have enough assets to pay all the benefits it insures.²

The new ERISA regulations made the less-regulated defined contribution plans more attractive to employers. Defined contribution plans also have features that are attractive to employees, including ownership (account balances can be bequeathed to heirs), portability (accounts can be carried from one job to another) and flexibility (investment and annuitization strategies can be tailored to individual needs).

Defined Benefit Plans versus 401(k) Plans. Between 1975 and 2005, the percentage of private employer-sponsored retirement plans that were defined contribution plans grew from 67 percent to 93 percent. Over the same period, the percentage of total participants in any private employer-sponsored plans who were in defined contribution plans grew from 26 percent to 64 percent.³ Economists James Poterba, Steven Venti and David A. Wise report that:⁴

- In 2000, contributions to 401(k) plans comprised 73 percent of all contributions to private pensions.
- In 2005, total 401(k) assets equaled 37 percent of gross domestic product (GDP) while defined benefit assets were just over 50 percent of GDP.
- They estimate that 401(k) assets will grow to 87 percent of GDP in 2040 while assets in defined benefit plans will fall to 23 percent of GDP.

Defined benefit plans remain prevalent in the public sector, but new accounting standards require state and local governments to account for other post-employment

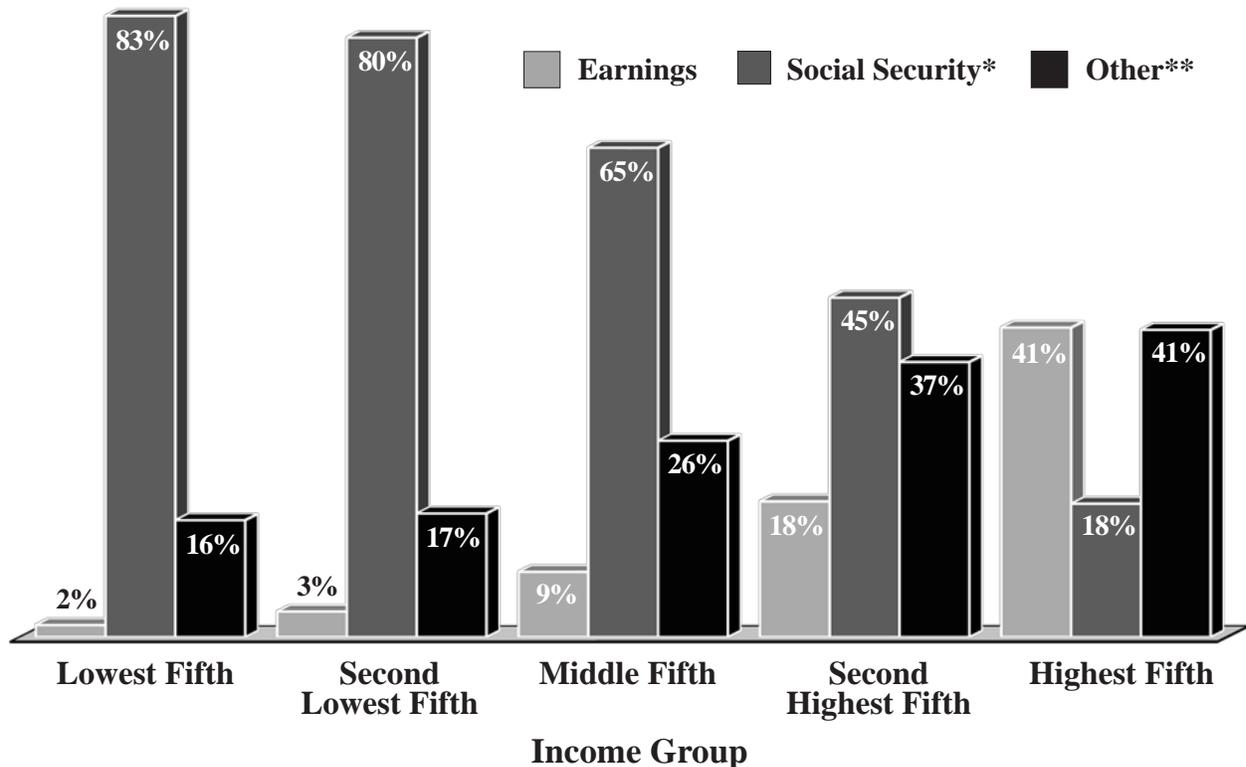
“Many defined benefit plans were underfunded.”

benefits — primarily health care coverage — as well as accrued pension liabilities. This accounting will expose the degree to which their entire retirement packages are underfunded and thus rely on future tax revenues. In 2006, the Government Accountability Office (GAO) reported that 42 percent of state and local government pension plans did not meet the requirement that they have 80 percent of projected benefit payments set aside in savings. The GAO also reported that in 2006, 46 percent of the plans it analyzed contributed less to their investments than was necessary to keep pace with their benefit costs.⁵

Returns to Social Security versus Stocks and Bonds

The recent financial crisis and economic downturn demonstrated that defined contribution plans can expose employees to the risk of uncertain asset returns. Furthermore, choosing a lump-sum payout at

FIGURE II
Major Source of Seniors' Retirement Income in 2006



Note: Household headed by a senior in the age group. *Social Security includes Railroad Retirement.

**Other includes cash public assistance, government employee pensions, private pensions, annuities and income from assets.

Source: U.S. Social Security Administration, Office of Retirement and Disability Policy, Income of the Population 55 or Older, 2006, Table 10.5.

Available at: http://www.socialsecurity.gov/policy/docs/statcomps/income_pop55/2006/.

retirement rather than a lifetime annuity exposes employees to the risk of outliving their income stream. The risks associated with a specific stock or bond can be eliminated with diversified investments under both defined benefit and defined contribution plans. However, there is also the risk of a general fall in stock and bond prices, reducing the rate of return for both defined benefit and defined contribution plans. Social Security also carries risks of low returns.

Social Security Returns versus Lifecycle Investing. Government

bonds are considered risk-free investments, since they are backed by the full faith and credit of the United States. As the safest investment, they earn a lower rate of return than the shares or bonds of corporations. From the inception of Social Security in 1935 until about 2000, each new cohort of retirees received more in benefits than they would have received had they invested their payroll taxes in government bonds. However, as the Social Security system has matured, tax rates have risen, an increasing proportion of earnings are taxable, and workers have paid the higher taxes over their

entire work lives. Consequently, current new retirees receive returns below what they could have received by investing in government bonds. Future retirees will receive even lower returns, even absent any legislative changes like tax increases or benefit cuts that would reduce the program's unfunded obligation. If the revenues that are necessary to pay future benefits are raised in the form of taxes, the returns for future workers will deteriorate further.

This study evaluates the relative riskiness of 401(k)s and Social Security by comparing the retirement

benefits provided by a hypothetical defined contribution account to Social Security benefits for a 1 percent representative sample of all 2004 beneficiaries — 473,366 individuals.⁶ Data on these retirees include their entire history of past annual earnings subject to the Social Security payroll tax. Earnings histories across the entire earnings distribution were paired with historical equity and government bond returns compiled by economist Robert Shiller.⁷ Our approach allows us to pair actual earnings histories across the entire lifetime earnings distribution with historical stock and bond returns. The hypothetical account is funded by an amount equal to the portion of the payroll tax that is necessary to pay retirement benefits. Taxes used to pay disability, survivors or spousal benefits were excluded.

Three investment strategies for a defined contribution account are used to illustrate the range of potential market outcomes: 1) the percentage of the account invested in equities (stocks) each year is equal to 100 less the worker’s age, with the remainder invested in government bonds, 2) 100 percent of the account is invested in equities and 3) 100 percent is invested in government bonds.

When the worker reaches retirement age the accumulated account balance is used to buy a lifetime annuity at prevailing real interest rates. The annuities are thus comparable to Social Security’s inflation-indexed benefits. However, unlike an annuity, the proportion of workers’ wages that are replaced by Social Security varies with income. This is due to the Social Security benefit formula, which replaces a

greater percentage of the wages of low- and median-wage workers than high-income workers. Therefore, the replacement rates of the three portfolios are compared to Social Security for low-, median- and high-wage workers. The comparisons were made for men who retired at age 65 between 1984 and 2003 (born from 1919 to 1938). The evaluations were only made for male workers given that the composition of the low-, median- and high-wage workers would change as we move up the income distribution if women were included.

“New retirees get returns on Social Security that are comparable to investing in government bonds.”

Social Security Returns for Low-Wage Workers. As Figure III shows, for male earners at the 10th percentile (earning less than 90 percent of workers):

- Social Security replaced about 120 percent of earnings for men who retired in 1984, declining to about 100 percent for those who retired in 2003.⁸
- Social Security replaced more of their income than an account invested solely in bonds.
- However, the 100 percent equity account outperformed Social Security for workers who retired in 1992 and subsequent years,

while the lifecycle account outperformed Social Security for workers who retired in 1999 and thereafter.

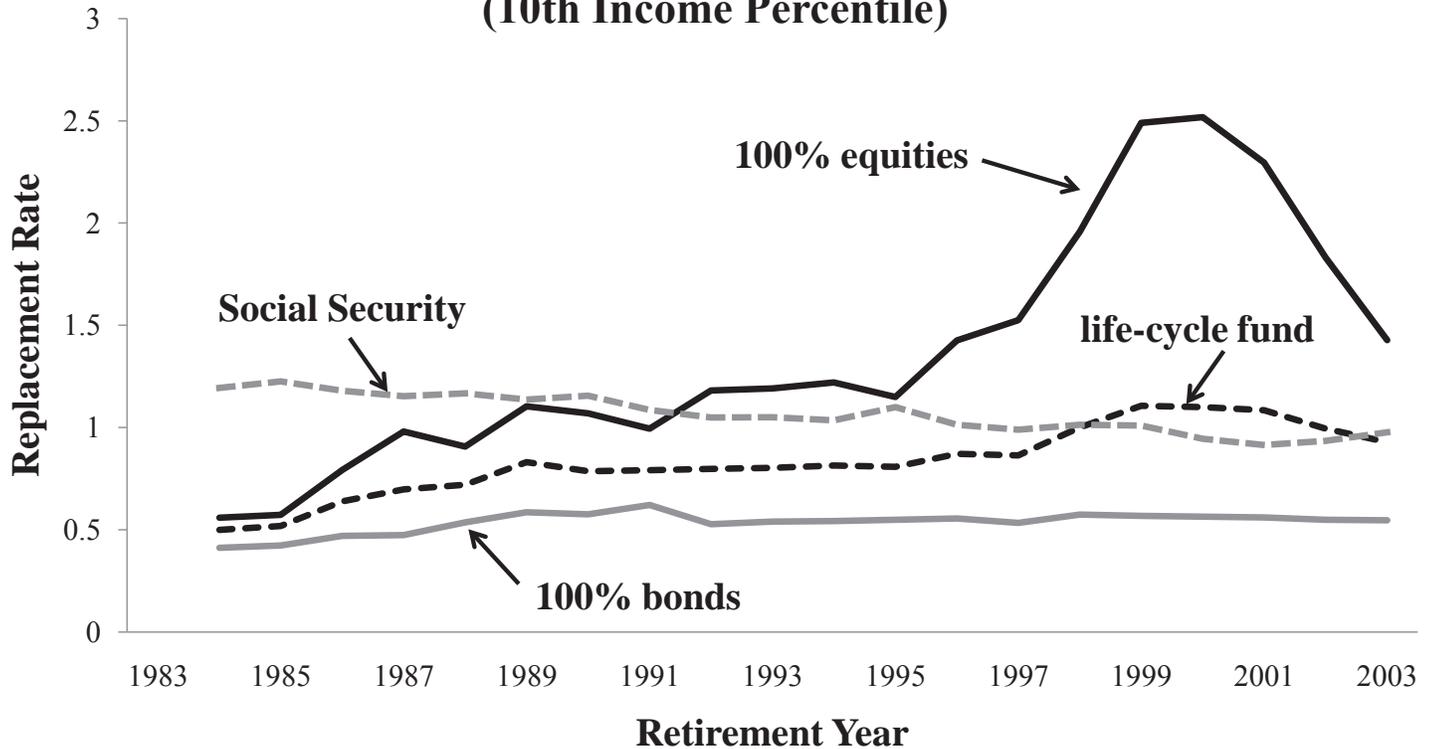
Social Security Returns for Median-Wage Workers. Moving up the earnings distribution, the Social Security replacement rate dropped and the retirement year when market investments exhibit superior performance occurred sooner than for low-wage workers. For median-wage workers [see Figure IV]:

- The 100 percent equity investment outperformed Social Security beginning with 1986 retirees and the lifecycle account outperformed Social Security for retirees in 1989 to 2003.
- For workers retiring in 1998 and subsequent years, Social Security’s replacement rate was comparable to the return on government bonds.

Social Security Returns for High-Wage Workers. For workers at the threshold of the top 10 percent of lifetime wages (the 90th percentile) [see Figure V]:

- The market outperformed Social Security because the benefit formula replaced a smaller percentage of high-income workers’ earnings.
- The 100 percent equity portfolio outperformed Social Security for workers who retired in 1986 and later.
- The lifecycle account did better than Social Security beginning in 1987, and beginning in 1990 the all-bond account did better.

FIGURE III
Low-Income Earners
(10th Income Percentile)



Source: Authors' calculations.

For workers born later than those considered here, the performance of Social Security will likely decline further relative to the market alternatives, due to the increasing taxes necessary to support Social Security. The comparable market account contributions would also rise and the higher account balances would produce larger annuities. Additionally, the rising full retirement age for Social Security will reduce the program's replacement rates at all retirement ages.

The Effects of Recent Market Volatility.

The data analyzed for

this section of the study do not include individualized earnings beyond 2003, but they do include the 2000-2003 stock market drop. The experience of individuals retiring in the 2000-2003 period suggests the probable effects of the 2008 stock market fall on older workers' retirements. Note that:

- For median-income earners, the wage replacement rate from the all-equity portfolio peaked for retirees in 2000 at 246 percent of their average earnings, but dropped to 129 percent for individuals who retired in 2003.

- This drop is equal to more than 100 percent of average earnings, but the replacement rate is still well above the alternatives.
- The lifecycle account is less volatile, but would have provided a lower replacement rate — 107 percent in 2000 and 85 percent for new retirees in 2003.
- The all-bond portfolio performs more poorly than the alternatives.

Earnings data at the individual level after 2003 (which was not available in the data used for this

part of the study) will likely show that equities outperform Social Security and alternative investments, even with the 2008 stock market crash. Individuals reaching retirement age in 2009 may regret that they did not liquidate their stock holdings at the peak, but even so, they will still have more than if they followed the other investment strategies.

Static and Dynamic Lifecycle Investing

Studies based on historical stock and bond returns have found that “all-stock” portfolios typically outperform “all-bond” or “mixed” portfolios regardless of the year the investor retires. However, those studies compared investment strategies that maintained a constant mix of stocks and bonds throughout one’s working life, whereas both conventional wisdom and economic theory suggest that the optimal retirement investment strategy is to reduce the share of equities in one’s portfolio as one ages.

This section presents an alternative to the conventional, static methods of allocating an investment portfolio over time and the simple lifecycle portfolio allocation method discussed in the last section. Specifically, we use a dynamic lifecycle model to determine the allocation between equities and bonds at each age. The model takes into account the current balance in a worker’s retirement account, future earnings and expected Social Security income in determining the portfolio allocation between equities and bonds each year.

During one’s working years, future labor earnings and anticipated Social Security benefits are a form of insurance against the risk of inadequate financial resources at retirement. Thus, the higher the capitalized value of future labor earnings and Social Security benefits is relative to the accumulated financial wealth in one’s retirement account, the greater the portion of the financial wealth will be invested in stock. Due to the fact that the financial wealth in the retirement account increases with age and the capitalized value of future earnings decreases with age, this strategy implies a lifecycle investment portfolio that includes a smaller equity allocation as one ages.⁹

“Lifecycle strategies allocate the portfolio between equities and bonds over a worker’s lifetime.”

Based on this theory, two general categories of lifecycle investment strategies are compared to three portfolios of 100 percent stocks, 100 percent bonds and a constant mix of 60 percent stocks and 40 percent bonds. The first category of lifecycle strategies updates the portfolio based on age. The two age-based lifecycle strategies are borrowed from Robert J. Shiller.¹⁰ They are:

- *Static baseline lifecycle strategy.* This portfolio is invested 85 percent in equities through age 29

and then falls linearly to 15 percent in equities by age 60.

- *Static aggressive lifecycle strategy.* This portfolio is invested 90 percent in equities through age 29 and then falls linearly to 40 percent in equities by age 60.

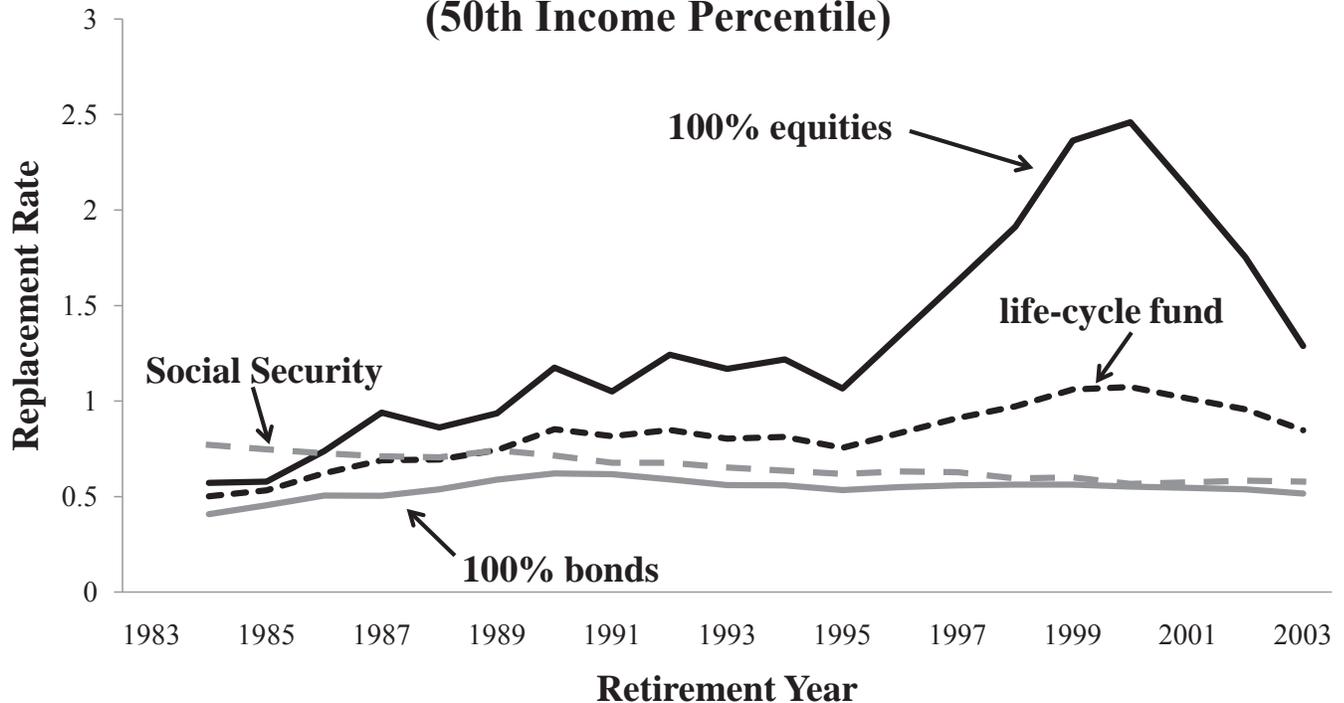
These portfolios are static because equities and bonds in these portfolios are allocated based simply on age with no influence from other factors, such as stock market performance.

The dynamic lifecycle strategy, by contrast, allocates the portfolio between equities and bonds over a worker’s lifetime. This strategy updates the allocation based on the ratio of (capitalized) future income flows to the accumulated balance in a retirement account (financial wealth) at each age. These are dynamic portfolios because stock and bond allocations are based on factors that are not constant over time. (To see how the lifecycle strategies are determined, refer to Appendix A.)

Actual labor earnings are treated as given and the retirement age as predetermined. Our estimates are based on the scaled medium earnings profiles underlying the estimates of Social Security replacement rates presented in the Trustees Reports.¹¹ It is assumed that a constant 10 percent of each year’s labor income is saved in a retirement account, another percentage is used to pay Social Security taxes and the rest is consumed.

As in the previous section, only the portion of Social Security taxes used to support retirement benefits are netted out of income. Social Security benefits are calculated

FIGURE IV
**Median-Income Earners
 (50th Income Percentile)**



Source: Authors' calculations.

based on the earnings history and the current-law benefit formula, and are obtained from the 2009 Trustees Report. Within this context, a person's welfare depends only on the wealth value of his or her defined contribution account at retirement. What is notable here is how to allocate the wealth accumulated in the account between stocks and bonds, and how alternative allocation rules perform based on actual asset market outcomes.

Portfolio decision-making for retirement savings is a long-horizon investment problem in which high-risk and high-return stocks tend to do better than more conservative bonds in terms of accumulated wealth at retirement.

At any given point of time, total individual wealth consists of the capitalized value of future labor earnings (net of future Social Security taxes), the capitalized value of Social Security benefits, and the wealth accumulated in one's defined contribution retirement account (also referred to as financial wealth). Assuming that future labor earnings and Social Security benefits are fixed and uncorrelated to equity returns, they provide a form of insurance for the individual making a portfolio decision regarding the allocation of his financial wealth.¹²

Dynamic and Static Lifecycle Portfolio Allocations for Individuals with Low Risk Tolerance. Table I depicts dynamic and static lifecycle

portfolio allocations for individuals with lower risk tolerance. Recall that those who have a lower risk tolerance are willing to give up higher returns in exchange for more certain returns (for details on how risk levels are assigned in this model, see Appendix A).

The dynamic lifecycle accounts remain almost exclusively invested in equities well into age 40 for most birth cohorts. In general, the shift to bonds in the dynamic account occurs over a shorter time span than with the static accounts. Due to market fluctuations, the percentage of stocks in an individual's portfolio depends on both age and birth year. Thus, the dynamic account allocations respond to underlying market conditions

and the variation in workers' annual earnings. Consider the portfolio allocations at age 50 for individuals born in different birth years [see Table I]:

- For workers born in 1920 (who retired in 1985), the real value of the Standard and Poor's 500 Index (S&P 500) more than tripled between the ages of 25 and 50; thus at age 50 a baseline dynamic lifecycle portfolio is allocated 69 percent to stocks.
- However, under the static baseline lifecycle portfolio, the worker would have only 38 percent invested in equities.
- Even under the static aggressive lifecycle portfolio, the percentage allocated to stocks would be only 56 percent.

In contrast, workers born in 1930 experienced only modest real stock returns between the ages of 25 and 50. Thus, the ratio of their remaining lifetime incomes to their accumulated portfolios' values was higher than for workers born in 1920. Consequently:

- At 50 years of age, the baseline dynamic lifecycle portfolio allocation of workers born in 1930 is 97 percent stocks and only 3 percent bonds.
- But under the static baseline lifecycle portfolio, the worker would have the same percentage invested in equities as the worker born in 1920 (38 percent).
- Similarly, under the static aggressive life cycle portfolio, the percentage allocated to stocks would be 56 percent.

The range of estimates suggests that the lifecycle allocation decision

at each age must take into account past market conditions, past contribution rates and projected earnings — the decision is individual specific.

Workers with a Higher Tolerance for Risk. Table I also shows the equity shares at age 50, when the tolerance for risk is higher.¹³ These portfolios are largely invested in stocks well into the cohorts' 50s.¹⁴

- For 50-year-old workers born in 1930 and 1940, the allocation to stocks is nearly 100 percent.
- Even workers born in 1950 would have 95 percent of their portfolio invested in stocks.

“The dynamic lifecycle allocation at each age takes into account market conditions, contribution rates and projected earnings.”

Allocations at Age 65. The dynamic lifecycle allocations at age 65 are all higher than the allocation based on the static aggressive lifecycle account. [See Table II.]

- For lower-risk tolerant individuals, the dynamic lifecycle strategy allocates a lower percentage of the portfolio to equities for 65-year-olds born in 1920, 1930 and 1940.
- However, for higher-risk tolerant individuals, the dynamic lifecycle strategy allocates from 53 percent to almost 71 percent of savings to equities, compared to only 3.7 percent for the static baseline lifecycle portfolio and about 32

percent for the static aggressive lifecycle portfolio.

Volatility and Wage Replacement Rates. Table III and Figure VI illustrate how well the dynamic and static lifecycle accounts fare relative to portfolios that maintain a constant allocation. The outcomes are based on the following assumptions:

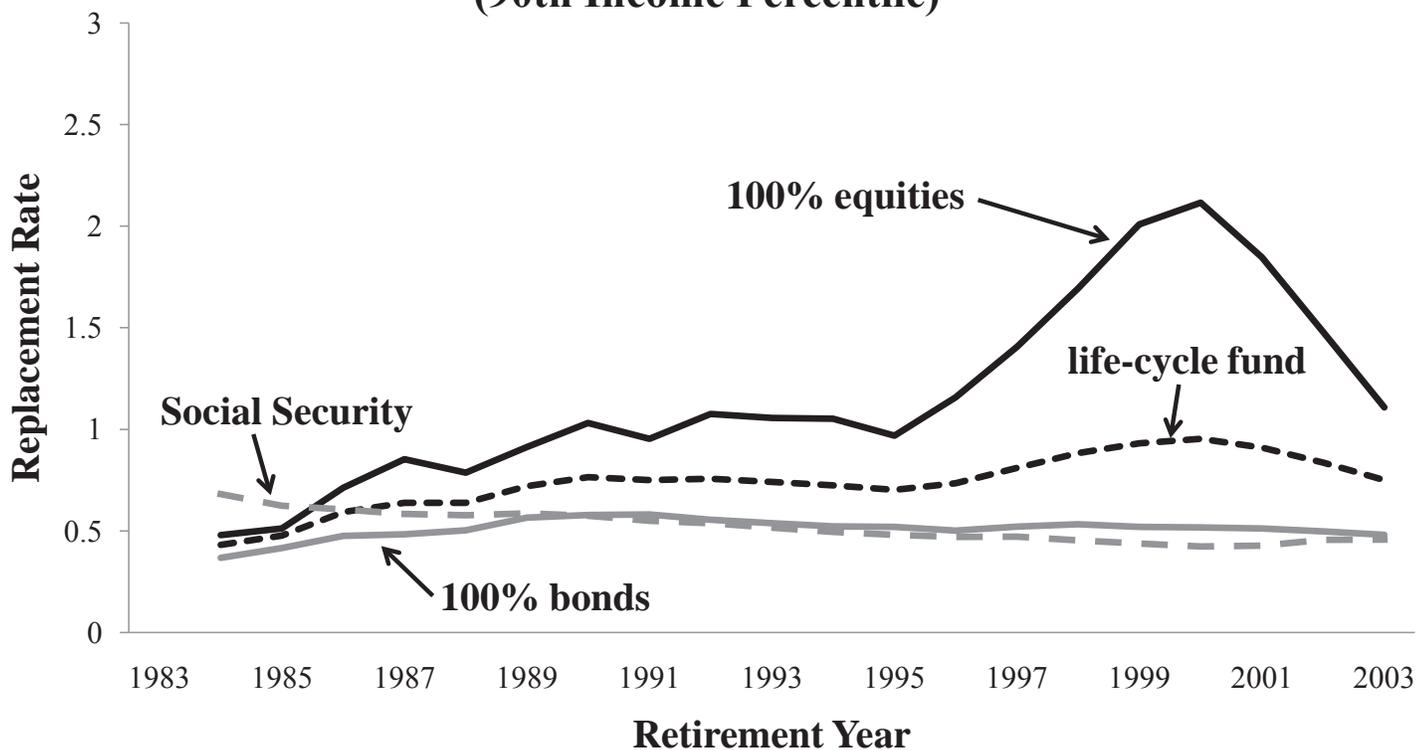
- Earnings profiles are for scaled medium workers.
- A constant contribution rate of 10 percent of earnings are added to the savings account each year, and replacement rates equal the ratio of the annuitized value of the accumulated account balance at age 65 divided by average real lifetime earnings.

For the dynamic and static lifecycle accounts the equity allocations follow the profiles calculated based on the ratio that is described in the appendix. The outcomes reflect the replacement rates for 25 cohorts of retirees born between 1919 and 1943 who retire at age 65 in the years from 1984 to 2008, respectively. [See Figure VI.]

Of the constant allocation portfolios (100 percent bond, 100 percent stock and the 60/40 stock/bond mix):

- The all-bond portfolio has the poorest performance and the least variability, and the all-equity portfolio produces the highest replacement rates but varies the most from birth year to birth year.
- The outcomes based on the constant 60 percent equity 40 percent bond allocation lie between these two extremes.

FIGURE V
**High-Income Earners
 (90th Income Percentile)**



Source: Authors' calculations.

These outcomes provide a backdrop for the four lifecycle accounts. The two static lifecycle accounts from Shiller (static baseline and static aggressive) produce relatively stable outcomes for retirees born in later birth years and outperform the all-bond account.

- The static baseline lifecycle account exhibits less variation from year to year than does the all-bond portfolio, but with a 50 percent higher average income replacement rate.
- The static aggressive account performs better than the 60/40 account for almost one-third of the birth years and exhibits less variation.

However, the two dynamic lifecycle accounts perform better than the static lifecycle accounts in terms of income replacement rates.

- The baseline dynamic account produces a 21 percent higher average replacement rate than the static aggressive lifecycle account, but exhibits only slightly higher relative variation.¹⁵
- Also, the baseline average replacement rate is 14 percent higher — and its relative variation lower — than the constant 60/40 account.
- The higher risk tolerance dynamic account produces an average replacement rate that is only 8

percent lower than the 100 percent equity portfolio, but its measure of relative variation is 31 percent lower.

Which Investment Strategy Is Better? The dynamic lifecycle accounts can produce outcomes that fare well against the 100 percent equity strategy. But is investing 100 percent in equities every year until retirement a relevant benchmark? It is expected that investors will opt out of the risky assets as they get closer to retirement and the dynamic adjustments are outlined for two such paths. For each birth year (cohort), the retirement wealth under each investment strategy was obtained for

the realized historical capital market returns during that cohort’s working life. That retirement wealth is higher under one strategy than another implies that a particular birth year would be better off under the former strategy given the realized market returns, but it does not necessarily imply that the former strategy is preferred to the latter.

Policy Considerations

Defined contribution retirement plans are often criticized for exposing employees to the risk of uncertain asset returns, even though the alternatives — pensions and Social Security — carry risks of their own. Appropriately chosen lifecycle investment strategies can, by investing heavily in high-return stocks during the early years in the labor force and gradually switching to lower risk bonds near retirement, take advantage of the average higher returns offered by the stock market and avoid the associated risks.

Compared to constant-over-time portfolios, such as all-stocks, all-bonds or a 60/40 stock/bond mix, lifecycle investment strategies provide sufficiently high and stable returns. Therefore, introducing lifecycle investment strategies significantly enhances the attractiveness of defined contribution retirement plans. In particular, using lifecycle funds as the default for 401(k) plans is a great improvement over the old practice of using overly conservative principal preservation funds. Indeed, lifecycle investment strategies generally dominate the all-bonds strategy both in terms of risk and returns. In contrast, the Social Security investment tends to

fare worse than the all-bond option except for early generations. These findings could help reduce the doubt some have about individual Social Security retirement accounts.

A potential criticism of the lifecycle investment strategy is that it requires the active participation and financial sophistication of the decision maker. When individuals are presented with complicated choices, they have the tendency to do nothing and go with the default. As a result, requiring an employee to frequently rebalance his retirement portfolio over time may seem to be an

“The market is volatile, but it provides higher income than Social Security for all groups.”

unrealistic expectation. However, the same “action inertia” and “analysis paralysis” by employees that makes default options so powerful may also help in integrating lifecycle investment strategies into 401(k) plans. As long as a professionally designed lifecycle investment strategy is the default choice — along with plan participation and periodic contributions — individual employees can benefit from lifecycle funds without understanding the underlying mechanism or making any explicit choices.

Indeed, since the Pension Protection Act of 2006 encouraged adoption of automatic 401(k)s, their use is steadily increasing. The automatic

401(k) makes the lifecycle investment strategies studied here realistic, and the proposed lifecycle strategies can help enhance the investment package of the automatic 401(k). Automatic 401(k)s can include automatic contributions into a dynamic lifecycle account. The financial reports received by the investor can be enhanced so that they provide expected income replacement rates based on current account accumulations and expected contribution rates and earnings.

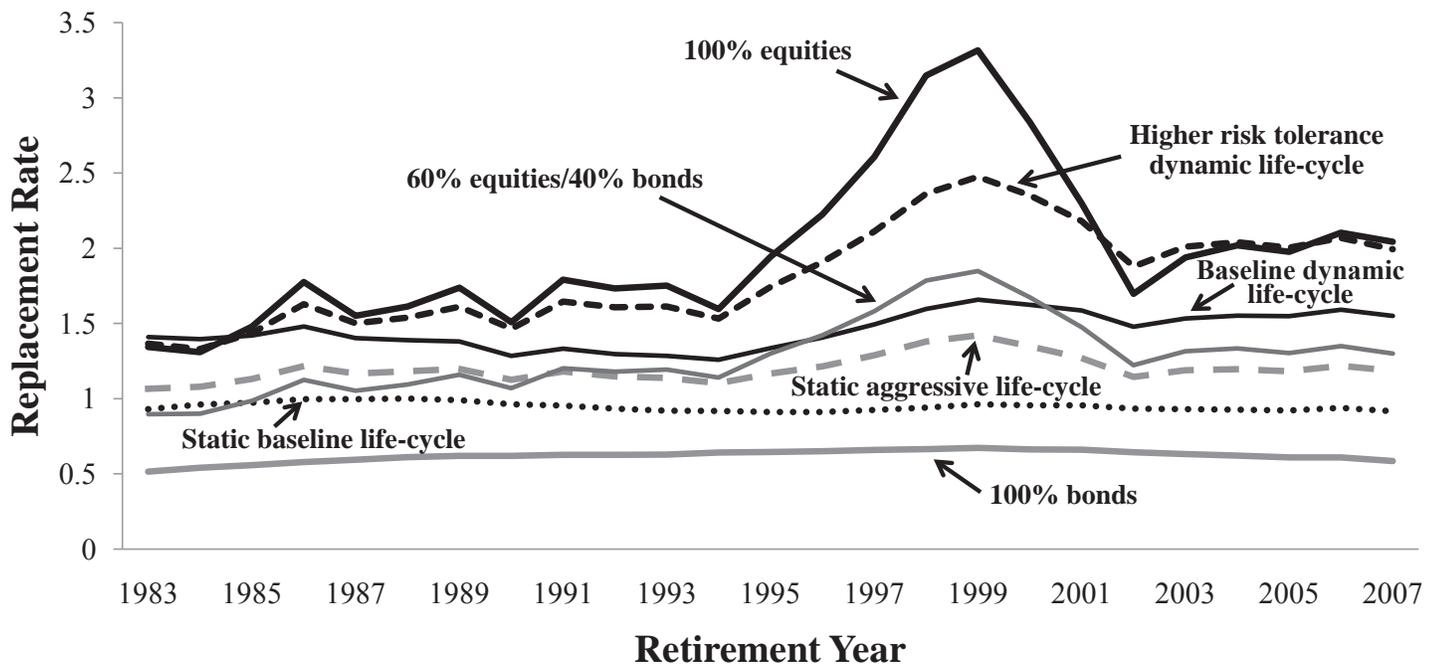
Conclusion

It has long been understood Social Security gives recent new retirees below market returns and that future workers’ returns will be even lower. Social Security has been justified by the stability of rates of return for consecutive birth years and its redistribution to low income retirees. However, the social goal of redistributing to lower-income retirees can be accomplished separately and needn’t be part of the retirement program.

Social Security is financed with contemporaneous taxes rather than being prepaid. This comparison of market investments to Social Security illustrates that though the market is volatile, it produces superior retirement flows across the entire distribution of lifetime earnings. In addition, Social Security’s ability to provide stable retirement benefits implies that taxpayers are providing a hefty amount of downside risk protection. The costs of this insurance function are seldom mentioned in policy discussion and consequently the insurance is assumed to be free.

Preparing for Retirement in an Uncertain World

FIGURE VI
Medium Earners



Source: Authors' calculations.

There is no denying that the market is risky, but its risks are explicit.

This study has also shown that defined contribution plans compare favorably relative to the alternatives, including defined benefit pensions. The ability of private defined benefit plans to pay steady pensions is contingent on the viability of the sponsoring firm and/or the viability of the underwriting agency. Likewise the ability of government defined benefit pension plans to pay benefits depends on how well the plans are funded and the willingness of taxpayers to insure the plans.

Among the lessons of the past decade: Workers should invest for the

long haul, expect volatility, continue to invest even when their portfolio balloons or crashes, and should not prematurely reduce their work effort in response to rising balances in their stock funds. The individualized lifecycle allocation method provides one way to automatically rebalance portfolios through time.

The ability of defined contribution plans to provide secure retirement income also depends on public policies that ensure that the rules of the game under which workers plan for their retirements don't change once they are retired. It is critical to ensure that defined contribution plans are protected from future taxes other than those that are

expected based on the particular nature of the retirement account. In particular, workers who saved more, or invested wisely, or happen to have benefited from higher returns during their working years should not be penalized by policies that target their retirement accounts.

Finally, this study also showed that labor earnings are a critical component of older Americans' retirement income. Earnings at higher ages can be increased by reforms to Social Security that reduce incentives to exit the labor force. These reforms include dropping the earnings test for beneficiaries between the ages of 62 and 64, and reducing or phasing out payroll tax payments after workers reach the retirement age.

TABLE I

**Equity Allocations for 50-Year-Old Workers
(medium earners)**

	Born in 1920	Born in 1930	Born in 1940	Born in 1950
Static Baseline Lifecycle	37.6%	37.6%	37.6%	37.6%
Static Aggressive Lifecycle	56.1%	56.1%	56.1%	56.1%
Baseline Dynamic Lifecycle (Lower Risk Tolerance)	69.4%	97.7%	91.6 %	60%
Dynamic Lifecycle (Higher Risk Tolerance)	98.6%	100%	100%	95.1%

Source: Authors' calculations.

TABLE II

**Equity Allocations for 65-Year-Old Workers
(medium earners)**

	Born in 1920	Born in 1930	Born in 1940
Static Baseline Lifecycle	3.7%	3.7%	3.7%
Static Aggressive Lifecycle	31.9%	31.9%	31.9%
Baseline Dynamic Lifecycle (Lower Risk Tolerance)	27.3%	29%	24.9%
Dynamic Lifecycle (Higher Risk Tolerance)	70.5%	61.2%	53.2%

Source: Authors' calculations.

TABLE III
**Average Earnings Replacement Rates and Coefficients of Variation
 for Workers Retiring in 1984 to 2008 by Portfolio**

Portfolio	Average Replacement Rate	Coefficient of Variation in Replacement Rates
Baseline Dynamic	145%	0.081
Higher Risk Dynamic	182%	0.182
Baseline Static	95%	0.030
Baseline Aggressive	120%	0.073
All-Stock	198%	0.266
All-Bond	62%	0.064
60/40	128%	0.195

Source: Authors' calculations.

Appendix A: Dynamic Lifecycle Portfolio Allocation Strategies

Ratio-Based Dynamic Lifecycle Strategies

We propose a category of ratio-based lifecycle strategies that is tailored to the individual and begins with the ratio of the present value at each age of future labor earnings net of Social Security taxes and Social Security benefit payments to financial wealth at each age.

$$R_{ia} = \frac{\text{present value at age } a \text{ of remaining lifetime (earnings--Social Security taxes+Social Security benefit payments)}}{\text{accumulated value at age } a \text{ of past contributions to defined contribution account}}$$

R_{ia} is the ratio for worker i at age a . At very young ages λ_{ia} approaches infinity, but as workers age the numerator declines as the denominator rises.¹⁶ The ratio is used to determine the share of assets in a worker's defined contribution account at each age that is invested in equities based on the following formula.

$$\lambda_{ia} = \frac{1 - e^{-\delta R_{ia}}}{1 + e^{-\delta R_{ia}}}$$

Where λ_{ia} is the equity share in the portfolio for individual i at age a and δ is a parameter which we initially set to be 1. Specifying the underlying value of the parameter δ is difficult but crucial. In general its value depends on the relative attractiveness of stocks and bonds and the investor's attitude towards risk. The more attractive stocks are relative to bonds or the higher the investor's tolerance of risk the larger will be the value of δ . In the following estimates we also consider the portfolio weights when δ is set to 3.

Endnotes

1. A couple is included in the figure if at least one individual is 62 or above, and a nonmarried individual is included if 62 or above. Income from assets, private pensions and annuities, government employee pensions, and other income comprise the excluded category.
2. As noted in the Pension Benefit Guaranty Corporation's *2008 Annual Report*, "The Corporation has sufficient liquidity to meet its obligations for a number of years; however, neither of its insurance programs at present has the resources to fully satisfy PBGC's long-term obligations to plan participants." See Pension Benefit Guaranty Corporation, *2008 Annual Report*, page 3.
3. From the *EBRI Databook on Employee Benefits*, Employee Benefit Research Institute, Tables 10.2a and 10.2b.
4. See James Poterba, Steven Venti and David A. Wise, "New Estimates of the Future Path of 401(k) Assets," in James M. Poterba, editor, *Tax Policy and the Economy*, Volume 22 (University of Chicago Press: 2008), pages 43-80.
5. See Government Accountability Office, "State and Local Government Pension Plans: Current Structure and Funded Status," Statement of Barbara D. Bovbjerg, testimony before the Joint Economic Committee of the Senate and House, July 2008.
6. The individual taxable earnings histories Social Security benefit amounts are from the Benefits and Earnings Public-Use File, 2004.
7. The data are available at <http://www.econ.yale.edu/~shiller/data.htm>.
8. Note that these replacement rates differ from those presented in the annual Social Security Trustees Reports because: 1) we use price-indexed rather than wage-indexed past earnings; 2) we average the earnings over all ages rather than only the top 35 years; and 3) our replacement rates are based on the realized distribution of earnings for the beneficiaries in the 1 percent sample. Further, the 10th, 50th and 90th percentiles in the lifetime taxable earnings distribution are not comparable to the hypothetical scaled low-, medium-, or high-earners used to develop the replacement rate estimates in the Trustees Reports. In the comparisons with the dynamic lifecycle investment strategy that follow, the Social Security Administration's scaled worker profile for medium workers are used to compare alternative investment outcomes for various birth years.
9. See Robert C. Merton, "Optimum Consumption and Portfolio Rules in a Continuous-Time Model," *Journal of Economic Theory*, Vol. 3, No. 4, 1971, pages 373-413.
10. Robert J. Shiller, "The Life-Cycle Personal Accounts Proposal for Social Security: An Evaluation," National Bureau of Economic Research, Working Paper No. 11300, April 2005.
11. The replacement rates are presented in Table VI.F10 in the 2009 Social Security Trustees Report. The scaling factors used to estimate the medium-scaled workers' profiles are from Michael Clingman and Orlo Nichols, "Scaled Factors for Hypothetical Earnings Examples Under the 2008 Trustees Report Assumptions," August 2008, Actuarial Note No. 2008.3, Social Security Administration, Office of the Actuary. We extend the scaled factors to ages 18-20 and to ages 65-70. While the scale factors are common across ages for all of the birth years considered, the factors are multiplied by the Social Security average wage to render cohort-specific profiles that vary with annual fluctuation in the economy-wide average wage.
12. Flexible labor supply (hence labor earnings) and retirement age provide additional insurance against risky equity returns. See Zvi Bodie et al., "Labor Supply Flexibility and Portfolio Choice in a Lifecycle Model," *Journal of Economic Dynamics and Control*, Vol. 16, 1992, pages 427-449.
13. The δ parameter used to determine λ_{ia} is raised to 3 from 1. To see how this parameter is used to measure risk tolerance, see Appendix A.
14. There are two notable exceptions (not shown in table): Workers born in 1940 who saw the stock market triple in value between the age 55 and 60, years 1995 to 2000, and workers born in 1945 who were 50 to 55 years of age during this period. As the stock market rose, and their remaining lifetime earnings diminished as they approached retirement, their ratios declined, and the dynamic lifecycle approach would have reduced their equity holdings in favor of bonds. For example, a 60-year-old worker born in 1940 would have only 63 percent allocated in equities, compared to 89 percent for a 60-year-old worker born in 1930.
15. The dynamic baseline account's average wage replacement rate is 1.45 while the static aggressive account's average replacement rate is 1.20. Their respective coefficients of variation are 0.081 and 0.073.
16. Note that the present values in the numerator of future earnings and Social Security benefits can be determined using different discount rates depending on how volatile future earnings are expected to be. Higher discount rates would be used for less certain earnings, implying a lower ratio and ultimately smaller holdings in the risky asset. For the estimates presented here we use a constant real 3 percent discount rate. Also note that higher past contribution rates will result in higher accumulations in the denominator and will also produce a lower ratio and a smaller percent allocation in equities.

About the Authors

Dr. Liqun Liu is a Research Scientist at the Private Enterprise Research Center at Texas A&M University. He joined the Center after earning his Ph.D. in Economics (Texas A&M University, 1998). Originally from China, he also received a B.S. and M.S. in Applied Mathematics from Huazhong University of Science and Technology.

Dr. Liu's primary research interests are elderly entitlement reform, costs of public funds, the social discount rate, and medical cost-effectiveness analysis. He has published in the *European Economic Review*, *National Tax Journal*, *Journal of Theoretical and Institutional Economics*, *Economic Inquiry*, *Southern Economic Journal*, and *Journal of Public Economics*, among other economics journals.

Dr. Andrew J. Rettenmaier is the Executive Associate Director at the Private Enterprise Research Center at Texas A&M University. His primary research areas are labor economics and public policy economics with an emphasis on Medicare and Social Security. Dr. Rettenmaier and the Center's Director, Thomas R. Saving, presented their Medicare reform proposal to U.S. Senate Subcommittees and to the National Bipartisan Commission on the Future of Medicare. Their proposal has also been featured in the *Wall Street Journal*, *New England Journal of Medicine*, *Houston Chronicle* and *Dallas Morning News*.

Dr. Rettenmaier is the co-principal investigator on several research grants and also serves as the editor of the Center's two newsletters, PERCspectives on Policy and PERCspectives. He is coauthor of a book on Medicare, *The Economics of Medicare Reform* (Kalamazoo, Mich.: W.E. Upjohn Institute for Employment Research, 2000) and an editor of *Medicare Reform: Issues and Answers* (University of Chicago Press, 1999). He is also coauthor of *Diagnosis and Treatment of Medicare* (Washington, D.C.: American Enterprise Institute Press, 2007). Dr. Rettenmaier is a senior fellow with the National Center for Policy Analysis.

Dr. Thomas R. Saving is the Director of the Private Enterprise Research Center at Texas A&M University. A University Distinguished Professor of Economics at Texas A&M, he also holds the Jeff Montgomery Professorship in Economics. Dr. Saving's research has covered the areas of antitrust and monetary economics, health economics, the theory of the banking firm and the general theory of the firm and markets. He has served as a referee or as a member of the editorial board of the major U.S. economics journals and is currently an editor of *Economic Inquiry*.

Dr. Saving has authored many articles and two influential books on monetary theory. He has been President of the Western Economics Association and President of the Southern Economics Association. After receiving his Ph.D. in Economics in 1960 from the University of Chicago, Dr. Saving served on the faculty of the University of Washington and Michigan State University. He moved to Texas A&M in 1968. Dr. Saving served as chairman of the Department of Economics at Texas A&M from 1985-1991.

The NCPA is a nonprofit, nonpartisan organization established in 1983. Its aim is to examine public policies in areas that have a significant impact on the lives of all Americans — retirement, health care, education, taxes, the economy, the environment — and to propose innovative, market-driven solutions. The NCPA seeks to unleash the power of ideas for positive change by identifying, encouraging and aggressively marketing the best scholarly research.

Health Care Policy.

The NCPA is probably best known for developing the concept of Health Savings Accounts (HSAs), previously known as Medical Savings Accounts (MSAs). NCPA President John C. Goodman is widely acknowledged (*Wall Street Journal*, *WebMD* and the *National Journal*) as the “Father of HSAs.” NCPA research, public education and briefings for members of Congress and the White House staff helped lead Congress to approve a pilot MSA program for small businesses and the self-employed in 1996 and to vote in 1997 to allow Medicare beneficiaries to have MSAs. In 2003, as part of Medicare reform, Congress and the President made HSAs available to all nonseniors, potentially revolutionizing the entire health care industry. HSAs now are potentially available to 250 million nonelderly Americans.

The NCPA outlined the concept of using federal tax credits to encourage private health insurance and helped formulate bipartisan proposals in both the Senate and the House. The NCPA and BlueCross BlueShield of Texas developed a plan to use money that federal, state and local governments now spend on indigent health care to help the poor purchase health insurance. The SPN Medicaid Exchange, an initiative of the NCPA for the State Policy Network, is identifying and sharing the best ideas for health care reform with researchers and policymakers in every state.

**NCPA President
John C. Goodman is called
the “Father of HSAs” by
The Wall Street Journal, *WebMD*
and the *National Journal*.**

Taxes & Economic Growth.

The NCPA helped shape the pro-growth approach to tax policy during the 1990s. A package of tax cuts designed by the NCPA and the U.S. Chamber of Commerce in 1991 became the core of the Contract with America in 1994. Three of the five proposals (capital gains tax cut, Roth IRA and eliminating the Social Security earnings penalty) became law. A fourth proposal — rolling back the tax on Social Security benefits — passed the House of Representatives in summer 2002. The NCPA’s proposal for an across-the-board tax cut became the centerpiece of President Bush’s tax cut proposals.

NCPA research demonstrates the benefits of shifting the tax burden on work and productive investment to consumption. An NCPA study by Boston University economist Laurence Kotlikoff analyzed three versions of a consumption tax: a flat tax, a value-added tax and a national sales tax. Based on this work, Dr. Goodman wrote a full-page editorial for *Forbes* (“A Kinder, Gentler Flat Tax”) advocating a version of the flat tax that is both progressive and fair.

A major NCPA study, “Wealth, Inheritance and the Estate Tax,” completely undermines the claim by proponents of the estate tax that it prevents the concentration of wealth in the hands of financial dynasties. Actually, the contribution of inheritances to the distribution of wealth in the United States is surprisingly small. Senate Majority Leader Bill Frist (R-TN) and Senator Jon Kyl (R-AZ) distributed a letter to their colleagues about the study. In his letter, Sen. Frist said, “I hope this report will offer you a fresh perspective on the merits of this issue. Now is the time for us to do something about the death tax.”

Retirement Reform.

With a grant from the NCPA, economists at Texas A&M University developed a model to evaluate the future of Social Security and Medicare, working under the direction of Thomas R. Saving, who for years was one of two private-sector trustees of Social Security and Medicare.

The NCPA study, “Ten Steps to Baby Boomer Retirement,” shows that as 77 million baby boomers begin to retire, the nation’s institutions are totally unprepared. Promises made under Social Security, Medicare and Medicaid are completely unfunded. Private sector institutions are not doing better — millions of workers are discovering that their defined benefit pensions are unfunded and that employers are retrenching on post-retirement health care promises.

Pension Reform.

Pension reforms signed into law include ideas to improve 401(k)s developed and proposed by the NCPA and the Brookings Institution. Among the NCPA/Brookings 401(k) reforms are automatic enrollment of employees into companies’ 401(k) plans, automatic contribution rate increases so that workers’ contributions grow with their wages, and better default investment options for workers who do not make an investment choice.

The NCPA's online Social Security calculator allows visitors to discover their expected taxes and benefits and how much they would have accumulated had their taxes been invested privately.

Environment & Energy.

The NCPA's E-Team is one of the largest collections of energy and environmental policy experts and scientists who believe that sound science, economic prosperity and protecting the environment are compatible. The team seeks to correct misinformation and promote sensible solutions to energy and environment problems. A pathbreaking 2001 NCPA study showed that the costs of the Kyoto agreement to reduce carbon emissions in developed countries would far exceed any benefits.

Educating the next generation.

The NCPA's Debate Central is the most comprehensive online site for free information for 400,000 U.S. high school debaters. In 2006, the site drew more than one million hits per month. Debate Central received the prestigious Templeton Freedom Prize for Student Outreach.

Promoting Ideas.

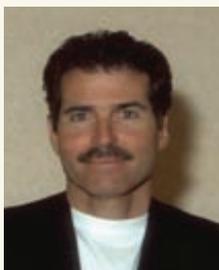
NCPA studies, ideas and experts are quoted frequently in news stories nationwide. Columns written by NCPA scholars appear regularly in national publications such as the *Wall Street Journal*, the *Washington Times*, *USA Today* and many other major-market daily newspapers, as well as on radio talk shows, on television public affairs programs, and in public policy newsletters. According to media figures from *BurrellesLuce*, more than 900,000 people daily read or hear about NCPA ideas and activities somewhere in the United States.

What Others Say About the NCPA



"The NCPA generates more analysis per dollar than any think tank in the country. It does an amazingly good job of going out and finding the right things and talking about them in intelligent ways."

Newt Gingrich, former Speaker of the U.S. House of Representatives



"We know what works. It's what the NCPA talks about: limited government, economic freedom; things like Health Savings Accounts. These things work, allowing people choices. We've seen how this created America."

John Stossel, former co-anchor ABC-TV's *20/20*



"I don't know of any organization in America that produces better ideas with less money than the NCPA."

Phil Gramm, former U.S. Senator



"Thank you . . . for advocating such radical causes as balanced budgets, limited government and tax reform, and to be able to try and bring power back to the people."

Tommy Thompson, former Secretary of Health and Human Services