

# SOCIAL SECURITY IN A CHANGING ENVIRONMENT: FINDINGS FROM THE RETIREMENT RESEARCH CENTER AT THE NATIONAL BUREAU OF ECONOMIC RESEARCH

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## **Introduction**

Social Security is the foundation of retirement and disability income support in the United States, paying out \$615 billion in benefits in 2008 to nearly 51 million beneficiaries. Although the core functions of Social Security remain largely unchanged, the system now faces an exceptional challenge: It is not financially sustainable in its current form. In the coming years, efforts to meet this challenge will be staged in a changing environment. That environment is in part responsible for the solvency crisis, but it also presents policy reform opportunities to address the financial challenge. More generally, any reforms to the system should be informed by the changing, and uncertain, environment in which the Social Security program will operate in the coming years.

With funding from the Social Security Administration, the National Bureau of Economic Research (NBER) Retirement Research Center has embarked on a coordinated series of investigations on Social Security in a changing environment, and the potential routes to sustainable solvency. The Center is designed to support a critical mass of projects that provide the basis for collaborative interaction over a multi-year horizon. The extensive interaction among the research team and the compilation of independent but related research topics is designed to achieve a more fully integrated understanding of the issues. This article is an overview of the first 45 studies completed since the Center's inception in September 2003. The complete studies, along with policy abstracts and executive summaries, can be found at the Center's Web site (<http://www.nber.org/programs/ag/rrc/rrchome.html>).

The article is organized in three topical sections. The first covers Social Security sustainability and reform. It focuses on the long-term financial imbalances in the Social Security system, the financial implications of uncertainty in demographic and economic forecasts, and the characteristics of reform that could provide sustainable solvency. The second section covers resources and needs of older people. The mix of resources available to retirees is changing, most notably through increased participation in 401(k) and similar retirement saving programs. The resources needed in retirement are also changing, influenced importantly by increasing health care costs and the continuing advancement of available health care services. The third section is on Social Security, labor markets, and the macroeconomy. It highlights research on work and retirement behavior, the influence of Social Security and other public policy on employment decisions, and the potential for delayed retirement to facilitate the social and economic transition to an older population demographic, both in the United States and around the world.

## ***Social Security Sustainability and Reform***

Over the next 30 years, Social Security benefits are projected to grow from 4.3 percent of gross domestic

### **Selected Abbreviations**

DB	defined benefit
DC	defined contribution
NBER	National Bureau of Economic Research
NDC	notional defined contribution
PRA	personal retirement account

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product (GDP) to 6.1 percent, while revenues are expected to equal only 4.7 percent of GDP (Board of Trustees 2008). When the challenge of financing the retirement consumption of the elderly is viewed more broadly, the gap between income and costs is even wider. In particular, Medicare and Social Security costs together are projected to increase from about 7 percent of GDP today to about 13 percent by 2035 and to nearly 17 percent by 2082. The challenge of rebalancing Social Security finances for the future is well known. Also important to Social Security reform is the resiliency of the system to future uncertainties. The demographic and economic factors that will determine Social Security's future finances are projections only. A reformed system that cannot adapt to unforeseen circumstances is unlikely to provide sustainable solvency. Thus, resiliency must be a critical component of the evaluation of alternative reform options.

The changes required to restore Social Security to sustainable financial footing are sizable, and numerous reform proposals have been put forward. Many involve "parametric" reforms, by which basic parameters of the existing Social Security system (such as tax rates, tax base, benefit formula, and eligibility) are altered. Other proposals involve more fundamental changes to the program, such as establishing personal retirement accounts (PRAs) to supplement or partially replace Social Security's current defined benefit. This section explores the challenges and uncertainties facing the Social Security system, and the implications of reform for the system and also for the broader economic and policy environment.

### ***Understanding Uncertainty and Its Implications***

In the Center's first year, Lee, Miller, and Anderson (2005) developed methods that quantify the uncertainty in long-term projections of Social Security finances. The study involved extensive and detailed modeling of the many uncertain variables that will influence Social Security finances in the future, such as birth rates, death rates, and the growth of wages and the economy. By analyzing trends, variations, correlations, long-range expectations, and professional opinions about these underlying influences, the authors compute a probability distribution of Social Security's future financial situation. In the median scenario, the payroll tax would need to increase by 5.1 percentage points to sustain Social Security permanently (exceeding the 3.5 percentage point deficit projected

by the 2004 Trustees Report). This divergence is most likely caused by differing mortality projections across estimation models.

The uncertainty in mortality projections inspired a two-phase project by Cutler, Glaeser, and Rosen on U.S. health risk trends. The first phase (2006) compares the risk factor profile of the population in the early 1970s with that of the population in the early 2000s, using data from National Health and Nutrition Examination Surveys (NHANES). The investigators estimate the impact of medical risk factors (smoking, drinking, obesity, high blood pressure, and cholesterol) and demographic characteristics (age, gender, race, and education) on 10-year mortality rates, and compare predicted 10-year mortality rates in the two time periods. For the population aged 20–74, they find the 10-year probability of death fell from 9.8 percent in 1971–1975 to 8.4 percent in 1999–2002. The largest contributors to these changes are reductions in smoking and better control of blood pressure.

The second phase (2009) projects risk factors and behaviors and their health implications over the next 20 years. Smoking and obesity are found to be the most important, and offsetting, components of the forecast. Based on an isolated forecast of continued reductions in smoking, 10-year mortality risk for those aged 25 or older would *decline* by 0.7 percentage points (from 8.4 percent) over the next 20 years. A continuation of current trends and treatment rates in obesity, however, would lead to increased hypertension and high cholesterol—and a 1.1 percentage point *increase* in mortality risk for those aged 25 or older. Of course there is substantial uncertainty in these projections. Although future changes in obesity could overwhelm the benefits of reduced smoking, better control and treatment of hypertension and high cholesterol among those who are overweight and obese are also possible.

The Center also initiated work on fertility and immigration patterns, and their implications for Social Security finances. The fertility rate, a principal determinant of future age distribution, has fallen below the replacement level of 2.08 children per woman in all developed countries. It is higher in the United States than in many countries, remaining between 1.98 and 2.08 since 1989. Preston and Hartnett (forthcoming) identify several demographic variables associated with fertility that are changing in predictable ways. For instance, shifts in ethnicity would suggest an increase in future fertility rates. Other shifts involving educational attainment would suggest a decrease. In each

case, however, the projected impact is modest and the combined impact is offsetting. The clearest finding of the study is that fertility in the United States is relatively high, even for its lowest-fertility groups. Compared with most countries in Europe and East Asia, U.S. fertility is high—even for white non-Hispanics, for states with the lowest fertility, and for college graduates. Until the source of this divergence is better understood, the authors conclude that fertility projections remain substantially uncertain.

Immigration is another aspect of demographic uncertainty in the future. The age distribution of immigrants, their earnings, the Social Security taxes they pay, the timing of their retirements, and the benefits they receive can have important implications for system solvency. Borjas (2007) looks at the labor market behavior of older immigrants, as compared with nonimmigrants. He finds that the primary difference between immigrants and nonimmigrants can be expressed in terms of a “crossover” age which occurs in the late 50s or early 60s. Before the crossover age, natives tend to have higher employment rates than immigrants. After the crossover age, natives have lower employment rates than immigrants. The greater reluctance of immigrants to leave the labor market as they near retirement age arises partly because of the eligibility requirements for Social Security benefits. A person needs to have worked in the United States for at least 10 years to qualify for retirement benefits. Immigrants in their 50s who have not yet accumulated the required employment credits have much greater employment rates than otherwise comparable persons. Once the 10-year work rule is satisfied, the probability that an elderly immigrant receives retirement benefits rises significantly and the probability of employment drops by 7 to 11 percentage points. Continuing research is looking at how immigration affects the broader labor market for older workers.

Geanakoplos and Zeldes (forthcoming) develop a market-based approach to estimating Social Security liabilities in the current system, taking account of future risks and uncertainties the way investors would if they regarded Social Security payments as dividends on assets or liabilities of their own business. The key uncertainty incorporated in their approach is the future growth in economy-wide wage rates, the variable by which an individual’s salary history is indexed when determining the Social Security benefit at retirement. Geanakoplos and Zeldes find that the difference between the risk-adjusted “market” valuation of Social Security liabilities and the risk-neutral

“actuarial” valuation is large, especially when valuing the benefits of younger cohorts for whom uncertain future wage growth plays out over a longer period. Aggregating across all Social Security participants, the risk-adjusted valuation is about three-quarters of the risk-neutral valuation.

Although projections are important, and NBER research has provided a stronger foundation for analyzing future trends, these investigations reinforce the idea that it is hard to know what the future will bring. This makes “parametric” reforms to Social Security—such as a fixed increase in the payroll tax, or a fixed reduction in benefits, or a fixed change in the age structure of benefits—only partial solutions. They could be effective in achieving financial balance, based on an expected future scenario or an “intermediate” projection, but they are not responsive to the unexpected. Other types of reform might make the system more resilient to unexpected developments, adjusting automatically to a range of demographic and economic futures.

### ***Investment-Based Social Security Reform***

For several years, the possibility of adding an investment-based component to Social Security received widespread attention. The idea was that some portion of Social Security contributions could be redirected to PRAs, maintained individually for each Social Security beneficiary. A number of Center projects have explored the potential benefits and complications of an investment-based component to Social Security. To the extent that an investment-based approach insulates the government from an uncertain future benefit liability (by transferring some of its financial obligation to the present rather than an uncertain future), the approach may improve the financial resiliency of the Social Security system as demographic and economic changes unfold over time. However, it introduces “investment risk” to Social Security participants. The Center has focused on methods that could moderate the investment risk to participants, while retaining the advantages of a PRA.

Two background studies help frame the issue. The first (Geanakoplos and Zeldes 2009) develops a methodology for comparing the current system with a PRA system. The authors note the strong differences in emphasis among those on either side of the debate. Advocates of retaining the current system argue that Social Security should redistribute wealth from those who have earned more over their working lives to those who have earned less, and different

generations should share in the risks and benefits of macroeconomic growth. PRA advocates support individual ownership of tangible assets that cannot be revoked by a future government, with market valuation of those assets as they accrue as an additional financial planning tool outside of Social Security. The study demonstrates how both the redistributive characteristics of the current system and its intergenerational risk-sharing properties could be incorporated in an investment-based approach. Redistribution, for example, is accomplished using a variable government match (or tax) on contributions, based on lifetime earnings. Risk sharing across generations is accomplished through a new kind of derivative security whose future payoff depends on future earnings.

The second background study (Shoven and Slavov 2006) illustrates the risk in both traditional Social Security and in an investment-based system. This study develops the concept of “political risk” as the possibility that a future legislature will change the tax and benefit provisions of pay-as-you-go social security programs when there are changes in the demographic and macroeconomic variables that support it. Thus, there is a “political risk” to participants that might be compared with the “market risk” in a PRA scheme. Shoven and Slavov present a detailed quantitative analysis of political risk in the U.S. Social Security system, as well as an overview of policy reforms in several European countries that demonstrate political risk more broadly across social security systems. They find that adjustments to restore Social Security solvency in 1983 and 1994 led participants to experience significant declines in the internal rate of return on contributions, and would do so again if the system were brought into actuarial balance now. For example, estimated lifetime internal rates of return for younger cohorts would decline by about 0.8 percent if actuarial balances were restored. Shoven and Slavov argue that the debate over personal accounts is therefore not one of “safe” versus “risky” benefits, but one of alternative risk characteristics.

The balance of NBER research on investment-based Social Security reform has focused on how to moderate the investment risk associated with PRAs. For example, Feldstein (2009) develops a flexible risk-reduction method that could be tailored to individual risk preferences. A key feature of the approach is a guarantee that the individual would not lose any of the real value of each year’s PRA savings and might be guaranteed to earn at least some minimum real rate of return. In one example of such a plan, the current

12.4 percent pay-as-you-go tax is compared with a plan that combines a 6.2 percent pay-as-you-go tax with saving 6.2 percent of annual earnings in a PRA. This mixed plan, when fully phased in, would have the following desirable characteristics: (1) the median value of the combined retirement income (that is, the sum of the pay-as-you-go benefit and the PRA annuity) would be 147 percent of the traditional pay-as-you-go benefit; (2) there would be a 95 percent probability that the combined retirement income exceeds the traditional pay-as-you-go benefit; (3) there would be less than one chance in 100 that the combined retirement income would be less than 96 percent of the traditional pay-as-you-go benefit; and (4) PRA savings would earn a guaranteed real rate of return of at least 1 percent (and generally substantially more) each year until the account holder reaches age 66. The study considers a range of “no lose” options with varying trade-offs between the guaranteed minimum return and the distribution of possible higher returns.

The market value of a rate-of-return guarantee is estimated by Biggs, Burdick, and Smetters (2009). They point out that policy discussions have focused on the “expected” cost of such guarantees. Expected values are based on a pure probability distribution of expected market returns; they do not incorporate any risk premium. Investors in financial markets, however, would need to be compensated more, based on the risk involved. The distinction is corollary to the risk-return trade-off in financial markets, as riskier assets are assigned a lower value than safer assets with the same “expected” future payout. Thus, the total “market” cost of a benefit guarantee, incorporating the risk premium, could be several times larger than its “expected” cost. Based on an illustrative policy considered in the study—an investment-based Social Security reform proposal put forward by former Senator John Sununu (R-NH) and Representative Paul Ryan (R-WI)—the “expected cost” valuation of the proposed guarantee is calculated to be about 11 percent of total benefits to new retirees in 2050, while the “market value” cost is calculated to be 28 percent of benefits.

Using a very different approach, Samwick (2009) analyzes the potential for changes in the progressivity of the Social Security benefit formula to lessen the risk in investment-based reform. In each simulation, Samwick reduces the overall cost of traditional Social Security by 40 percent (to restore actuarial balance and to fund a PRA component), but distributes the benefits in a way that is more heavily weighted toward

lower-income participants. In his “most progressive” scenario, a flat benefit that is independent of earnings, the bottom 30 percent of earners achieve a higher expected utility even with no PRA investments in equity. An additional 30 percent of earners can lessen their exposure to equity risk without a loss of welfare. Similarly, by using progressive benefit reductions (reducing the benefits of higher earners by more than the benefits for lower income workers), about half of the equity risk can be eliminated for the lowest earnings decile.

Finally, the Center has viewed the 401(k) experience as a laboratory for studying the operational features that might be incorporated in investment-based Social Security reform, and the issues surrounding investor behavior in individually controlled retirement accounts. These are described below in sections on “Determinants of Retirement Saving” and “Portfolio Allocation and Asset Accumulations.” These studies are relevant not just for the design of a PRA system, but also for understanding the transition in retirement resources under way in the private sector, and how that transition relates to Social Security.

### **Notional Defined Contribution Plans**

Another type of reform explored in Center research is notional defined contribution (NDC) systems. NDC programs mimic characteristics of fully-funded defined contribution (DC) plans without actually setting aside assets. Thus, they can be designed with many of the same incentives, automatic adjustment features, and financial resiliency of DC plans, while avoiding the costs of moving to a fully-funded DC system. Under an NDC program, a notional capital account is maintained for each participant. Balances in this account earn a rate of return that is declared by the pension plan each year, and notional payments into the account are made over a working career. Sweden has developed and implemented an NDC system and other countries have followed, including Italy, Poland, Latvia, Mongolia and the Kyrgyz Republic. Germany has recently adopted pension reforms that reflect some of the NDC principles, and France is considering NDC-type reforms.

Two studies by Auerbach and Lee consider the financial properties of NDC plans, as compared with other types of social security reform. One (2009a) focuses on the financial stability of NDC systems over time. Using different versions of the system recently adopted in Sweden, and calibrating them to U.S. demographic and economic parameters, this study

finds that the basic NDC scheme effectively prevents excessive debt accumulation, providing substantial financial stability. In some future scenarios, however, the plans accumulate significant fund balances. The study draws attention to an important distinction between one-sided and two-sided automatic adjustment features. One-sided plans automatically adjust the rate of return in the accounts in response to adverse financial and demographic conditions, preventing imbalanced accumulation of debt in the system. Two-sided plans, on the other hand, adjust to both adverse *and beneficial* financial conditions. They lower account returns in response to adverse financial pressures, but also distribute gains to the NDC accounts in response to financially beneficial trends.

The second study (2009b) analyzes the generational uncertainty and risk-sharing properties of NDC systems, as compared with automatic adjustment features in a traditional Social Security design. In this study, Auerbach and Lee consider a number of actual and hypothetical pay-as-you-go pension structures. These include versions of the U.S. Social Security system in which taxes or benefits are adjusted annually to maintain fiscal balance, with zero debt or assets in every period; the actual Swedish NDC system; several modifications to the Swedish system; and the actual reformed German system. A specific goal of the NDC systems is to deliver a rate of return to contributors that is warranted by the macroeconomic and demographic environment, while maintaining financial stability. Important features of NDC system design are the rate of return paid in the notional accounts and the use of a brake mechanism if the financial stability of the program is jeopardized. Differences in these design features lead to different outcomes in terms of stability of returns, horizontal equity, and mean rates of return. NDC plans are shown to be very effective, however, in providing financial stability in the face of demographic and economic uncertainty.

### **Changing Resources and Needs at Older Ages**

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The landscape of financial resources available in retirement is in transition, and so are the likely financial needs of future retirees. Most notable are the increases in retirement saving in the private sector and increases in out-of-pocket medical spending. Along with demographic trends, these changes in resources and needs are important aspects of the changing environment in which Social Security operates.

NBER research on changing resources and needs is in five areas. The first analyzes trends in retirement saving and projects the private sector assets that are likely to be available to older Americans in the future. The second explores the determinants of saving behavior, which are directly applicable to 401(k) plans and other retirement accounts in the private sector, but could also apply to a national saving program such as a PRA component of Social Security. The third considers issues of retirement plan portfolio allocation and financial market returns. The fourth looks at payout streams, including the annuitization (or nonannuitization) of assets later in life. The fifth considers changing financial needs in retirement, benefit adequacy, and the increasing cost of medical care. Together, these studies provide context for how Social Security and private saving may fit together in providing financial security for future retirees.

### ***Trends in Retirement Saving***

The most important trend affecting the financial resources of future retirees is the transition from employer-provided defined benefit (DB) plans to 401(k) and other DC personal retirement plans. Approximately 85 percent of contributions to private retirement saving programs are now to accounts in which individuals decide how much to contribute to the plan, how to invest plan assets, and how and when to withdraw money from the plans. Largely as a result of the conversion to personal accounts, people attaining retirement age three decades from now will likely have, on average, several times the retirement assets of current retirees.

A series of studies by Poterba, Venti, and Wise has focused on the transition from DB to 401(k) and similar plans in the private sector, and projected accumulations in various asset categories. One study (2005) presents historical and projected trends in 401(k) plan eligibility by cohort and year, participation rates by cohort and year, participation among those eligible, and contribution amounts. Among the findings: the percentage of 40-year-olds eligible for a 401(k) plan increased from 18 percent in 1984 to 34 percent in 1989 and to 65 percent in 1999; and average 401(k) assets (in constant 2000 dollars) are projected to increase from about \$14,000 in 2000 to \$86,000 in 2020 and to \$273,000 in 2040. The dramatic increase is a result of increased eligibility, increased participation, an increasing average period of participation, and the compounding of savings among those who will have started saving at younger ages. Aggregating

the individual cohort projections, total equity assets in 401(k) plans are projected to grow from about \$1.1 trillion in 2000 to about \$27 trillion in 2040. Though these projections may need to be updated in light of recent financial market declines, the character of the trend would not change.

Poterba, Venti, and Wise have conducted parallel studies on asset accumulations in DB pension plans (2009) and in housing equity (2007). For DB plans, the projections suggest that the average present value of real DB benefits at age 65 (for all people regardless of DB plan participation) peaked in 2003, and as the proportion of new retirees covered by DB plans decreases over time, that value will continually decline. The study concludes that the increase in 401(k)-type saving offsets and will eventually dominate DB asset flows. The value of 401(k) assets at age 65 is projected to surpass the average present value of DB benefits in about 2010, and increase rapidly thereafter. The specific timing of this crossover may need to be updated, but again, the direction and character of the transition in saving remains, and is profound.

The housing study analyzes trends in homeownership, housing equity, housing value, and, in particular, how the accumulation of wealth in the form of housing equity has changed over time. The study finds that homeownership rates by age have changed little over the past two decades. This stability suggests that one can predict with some confidence how demographic trends will affect the number of homeowners. On the other hand, there has been substantial recent volatility in housing markets, with an extended period of rising prices followed by sharp declines. In the years the study was completed (before the most recent declines), new retirees had both more home equity and more mortgage debt than past retirees. Cohort data also show that over a 20-year period marked by very large increases in home equity, the ratio of home equity to total nonpension wealth remained remarkably stable. This empirical regularity raises the question of whether home equity projections for future retirees might parallel forecasts of wealth more generally. The recent turmoil in the housing market adds interest to such projections but also draws attention to the large changes in home value and home equity that can occur over a short period.

A final study in the series (Poterba, Venti, and Wise, forthcoming) examines retirement saving and asset accumulation across the earnings distribution. It looks at how Social Security, 401(k) participation, and other assets will fit together for households with

different lifetime earnings and different Social Security wealth accumulations. Although 401(k) participation varies substantially by income, broader measures of retirement assets show a “retirement replacement rate” (inclusive of both Social Security and retirement saving) and a “total saving rate” (including dedicated retirement resources, other financial wealth, and home equity) that varies only moderately by lifetime earnings and by Social Security wealth. The projected growth rate of combined 401(k) assets and Social Security wealth is surprisingly similar across the top eight earnings deciles, and translates to at least a doubling of retirement resources in most earnings and Social Security wealth deciles over the period from 2000 to 2040. The growth rate is lower in the bottom two deciles of lifetime earnings: close to zero growth in the lowest earnings decile, and about 50 percent growth in the second earnings decile. Although the use of 401(k) plans is not universal, these various results indicate a very dramatic shift in the landscape of financial resources available to retirees in the future.

### ***Determinants of Retirement Saving***

The Center has conducted a number of studies, discussed here and in the next section, on the determinants of saving in 401(k) plans and the factors that influence asset accumulations over time. These influences are already important in understanding retirement saving in the private sector, and in improving the design of 401(k)-type programs. The private sector experience can also inform the evaluation of certain reforms in the public sector, including proposals for an investment-based component in the Social Security system. The experience of 401(k) plans is particularly useful for this research, because there is substantial design variation from one 401(k) plan to another and within plans over time. This enables researchers to relate plan design features to the saving decisions of those who are eligible.

A series of studies has explored from multiple dimensions the effect of plan design on saving behavior in 401(k) plans. An initial study by Choi, Laibson, and others (2006) explores the influence of such features as automatic enrollment, employer matching, the default contribution rate, the investment options available, and the default allocation of savings among these options. Underlying the findings is the key behavioral principle that people tend to follow the “path of least resistance,” accepting the plan’s default provisions rather than actively overriding them. As a result, plan

administrators can manipulate the defaults to powerfully influence the savings and investment decisions that people make. Whether in 401(k) plans or in a Social Security system that includes private accounts, it seems possible to influence passive decisionmakers to make reasonable saving decisions by default without encroaching on the freedom of active decisionmakers to choose for themselves.

One default option explored in greater detail is automatic enrollment (Beshears and others, forthcoming). Although automatic enrollment is known to strongly influence plan participation, previous research had looked only at firms that combine automatic enrollment with an employer match of employee contributions to the plan. Would automatic enrollment have the same impact in the absence of an employer match? The results suggest that the match has only a modest impact on opt-out rates. The investigators estimate that moving from a typical matching structure—50 percent on contributions up to 6 percent of pay—to no match would reduce participation under automatic enrollment at 6 months after plan eligibility by 5 to 11 percentage points. In one company, for example, the authors found that 89.1 percent of match cohort employees were participating in the savings plan at 6 months of tenure, while the 6-month participation rate for the no-match cohort was 80.7 percent. Thus, companies with automatic enrollment need not offer a match in order to achieve broad-based participation.

Choi, Laibson, and Madrian (2005) have also looked in greater detail at people who choose not to participate in a 401(k) plan. They focus on a group of workers who are at least age 59½, who are eligible to contribute to a 401(k) plan, who would have their contributions matched by their employer, and who could immediately withdraw the funds penalty-free. In other words, there is no cost to participate, no penalty for early withdrawal, and a clear financial gain from contributing. The researchers find that roughly half of employees in this situation still choose to make either no contributions, or a contribution below the employer’s matching limit. The average annual loss among these employees is about 1.3 percent of their yearly salary. At one firm in the sample, the average loss was 2.2 percent of salary. In a combined survey/field experiment, these losses were clearly explained to some employees, yet the resulting change in contributions was infinitesimal. The results indicate there are definitive limits on what can be achieved by plan design, interventions, and information.

## **Portfolio Allocation and Asset Accumulations**

Center research on portfolio allocation and asset accumulations has addressed two fundamental questions. First, how do people allocate their retirement savings among alternative investment options? Second, what are the implications of portfolio decisions for asset accumulations?

Two studies consider how investment decisions are affected by the options made available in a 401(k) plan. The first study (Brown, Liang, and Weisbenner 2007; Brown and Weisbenner 2004) finds that the amount workers invest in different asset classes (such as company stock, equities, and bonds) is influenced by the number of investment options offered in each class. When there are proportionately more equity options in a 401(k) program, for example, participants allocate more of their 401(k) contributions to equities. Workers also appear to interpret investment limitations (such as a limit on investing in company stock) as being, in part, investment advice, leading to a bigger impact on portfolio allocation than the limitations require. A third finding is that investors actively respond to past asset returns, for instance by allocating a higher fraction of contributions to equities when recent returns on equities have been higher. Finally, the authors find substantial inertia in investment behavior, as it takes several years for participant contributions to fully adjust to the addition of a new fund.

The second study (Brown and Weisbenner 2005) provides evidence that a wider choice of funds could actually decrease average asset accumulations. The authors first document the rapid growth in the average number of fund options, and show that this growth is dominated by actively managed equity funds. They then show that the resulting change in the mix of fund options leads to a higher average allocation of plan assets into actively managed equity funds, partly at the expense of lower-cost passively managed equity funds. As the number of actively managed equity funds in a plan increases, asset-weighted average expenses of the 401(k) plan equity portfolios rise, while asset-weighted average returns fall.

The issue of management fees was also the subject of an experimental study (Choi, Laibson, and Madrian forthcoming; Choi, Gabaix, and others 2005) in which subjects were asked to review four S&P 500 index fund prospectuses and then allocate \$10,000 across those funds. Because the four funds invested in the same portfolio of stocks, their returns were nearly identical except for the mutual fund fee. Some of the

subjects were given only the fund prospectuses (with fee information imbedded in a very long document). Others were given a one-page summary of fund fees, along with the prospectuses. A third group was given a summary sheet showing each index fund's annualized return since inception—a largely irrelevant document, because of the different dates of inception. Those receiving the fee summary sheet chose lower-cost index funds on average; but even with the summary sheet, over 80 percent still failed to minimize the fees on their investment. Those receiving the return-since-inception summary sheet chose funds with inception dates suggesting a higher historical return. In fact, in chasing the historical returns, the subjects were choosing the higher-fee funds which would have done worse (after fees) over any common historical time period.

These results support a growing body of evidence that individual investors' portfolio allocation decisions may not always be in their best long-term interests, and that policymakers should carefully evaluate how to select the fund options in any retirement saving program. Follow-up work is looking at how simplified information about mutual fund options might aid individual investment management.

Three studies have explored the potential impact of portfolio choice on the accumulation of retirement assets, and the implications of investment risk. Poterba, Rauh, and others (2009) examine the effect of different PRA asset allocation strategies over the course of a worker's career on the distribution of retirement wealth and the expected utility of wealth at retirement. They consider DC plan asset allocation rules that assign a constant fraction to various assets at all ages, as well as "life-cycle" rules that vary the mix of portfolio assets as the worker ages. They find that the desirability of these various options is sensitive to four factors: the return on corporate stock, the worker's relative risk aversion, the amount of non-PRA wealth that the worker will have available at retirement, and the expense ratios charged for the investment. At modest levels of risk aversion, or in the presence of substantial non-PRA wealth at retirement, the historical pattern of stock and bond returns implies that the expected utility of investing completely in diversified stocks is greater than that from any of the more conservative strategies. Higher risk aversion or lower expected returns on stocks raises the expected utility of portfolios that include less risky assets. There often exists a fixed-proportions portfolio of stocks and inflation-indexed government bonds that yields expected utility at retirement that at least equals

expected utility from typical life-cycle investment strategies. Once an asset allocation approaches its highest expected utility, expense ratio variations affect retirement utility more than further asset allocation variations.

Campbell, Sunderam, and Viceira (2007) investigate the riskiness of bond investments in a retirement saving portfolio. Are bonds risky investments, which investors must be rewarded to hold? Or are they safe investments, whose price movements are either inconsequential or possibly even beneficial to investors as a hedge against other risks? The authors find that in some periods, notably the late 1970s and early 1980s, bond and stock returns move closely together, implying that bonds are relatively risky. In other periods, notably the late 1990s and early 2000s, bond and stock returns are negatively correlated, implying that bonds have lower risk and can be used as a hedge against stock market variations. The study models the term structure of interest rates in a new way that helps to explain the changes in bond market risk over time.

### ***Payout Streams and Annuitization***

Under DB pension systems, retirees receive annuitized payouts, providing a form of insurance against outliving their retirement resources. Conversely, 401(k) plan participants typically withdraw assets on their own schedule, only rarely converting their savings to annuities. This raises two questions. First, do people draw down 401(k) assets too quickly after retirement, or do they tend to conserve these assets, perhaps longer than they should? The second question is based in part on the answer to the first: Would greater use of annuities improve retiree well-being? Some initial work on this topic has focused on how people evaluate DB versus DC pension systems, how much they value annuitized payment streams, and the operational characteristics of private annuity markets.

One study examines pension decisions of people given a choice between a nonannuitized DC-style plan and an annuitized DB plan (Brown and Weisbenner 2009). In the study, 50,000 public university workers in Illinois are offered a one-time, irrevocable choice between a traditional DB plan, a portable DB plan, and an entirely self-managed DC plan. The majority of participants fails to make an active decision, and is defaulted into the traditional DB plan after 6 months. Interestingly, financially sophisticated employees are more likely than others to choose the self-managed DC plan, even though the portable DB plan is worth more,

under reasonable assumptions about future financial market returns.

To learn more about the decisionmaking process, Brown and Weisbenner (2007) survey a subsample of workers in this retirement system. They find that individuals who value “control” over their investments are more likely to choose the DC option; that workers consider political risk (individuals lacking confidence that the legislature will retain the DB benefits are significantly more likely to choose the DC option); and that workers who rate themselves as average or better-than-average investors are more likely to choose the DC plan. As with the earlier study, a significant minority of participants appears to make decisions based on mistaken beliefs.

Brown, Casey, and Mitchell (2007) explore the desirability of an annuitized benefit by analyzing people’s willingness to exchange part of the Social Security annuity for an immediate lump-sum payment. Based on responses from an experimental module in the 2004 Health and Retirement Study, they find that nearly 3 out of 5 respondents favor the lump-sum payment option if it is approximately actuarially fair. The desirability of the lump-sum option is evident in virtually every demographic subgroup in the sample. The relative price of the annuity matters: When the amount of the lump-sum option is reduced, fewer people are willing to trade away their Social Security annuity. Individual health and longevity expectations also matter, as those reporting poor health are more likely to want the lump sum, while those with optimistic longevity expectations are more likely to choose the annuity. After controlling for education, more financially literate individuals prefer the annuity. Finally, people anticipating future Social Security benefit reductions are more likely to choose the lump sum, suggesting that political risk matters. Other factors such as gender, marital status, income, wealth, or having children are not associated with respondents’ relative preferences for the annuity versus the lump sum.

Einav, Finkelstein, and Schripf (2007) aim to quantify the welfare costs of adverse selection in annuity markets. Adverse selection exists if the group of individuals voluntarily purchasing annuities is healthier and longer-lived, on average, than the general population. With adverse selection, financial institutions selling annuities in the private market must charge higher prices, since the annuity payout lasts longer on average than it would for the population as a whole. Using the example of the U.K. annuity market,

the study focuses on the guarantee period selected by people who are required to buy an annuity. These selections involve asymmetric information, in that people have some knowledge about their own mortality risk that other parties do not, and choose a guarantee period based on that knowledge. Relative to a first-best, symmetric-information benchmark, welfare is reduced by about £127 million per year, or about 2 percent of annual premiums. However, government mandates do not necessarily reduce the welfare loss because of the difficulty of determining the best contract mandate.

The Center's preliminary research on annuitization and the drawdown of assets at older ages raises many questions for future research. The tendency of individuals to prefer lump-sum over annuitized distributions has profound implications, as people may outlive their resources or, alternatively, die before using them. Ongoing research is exploring the patterns of withdrawal from retirement saving plans among current retirees.

### ***Benefit Adequacy***

Seeking the “optimal” rate at which Social Security benefits replace preretirement income should be informed not only by projected increases in the retirement resources of older Americans but by projected increases in financial need as well. What does benefit adequacy mean in current and future contexts? It could refer to ensuring that all retired and disabled Americans are able to maintain a standard-of-living target—avoiding poverty, for example. Alternatively, benefit adequacy could imply minimizing the extent to which people's standards of living decline upon retirement or disability onset. Perhaps the most important trend affecting standards of living for the elderly is the continuing increase in spending on medical care. Advancing technology has provided better but also more expensive medical care. The aim of NBER research in this area is to understand the implications of this rising cost, and its relationship with benefit adequacy.

Meyer and Sullivan (2007), for example, estimate a broad range of poverty measures for individuals aged 65 or older, focusing on income-based and consumption-based measures. The distinction is important because income and consumption diverge more significantly at older ages as accumulated assets can be used to maintain consumption even when income is low. Consumption-based measures of

poverty indicate greater improvements in well-being than are evident in income-based measures. Between 1980 and 2004, consumption poverty for those aged 65 or older fell by 12 percentage points, almost double the reduction in poverty based on income measures. Ongoing research explores changes in Social Security rules that could eliminate poverty among the elderly.

Brown, Coronado, and Fullerton (2006) have studied the evolution of Social Security progressivity. They find that the Social Security system exhibits less overall progressivity when it is measured using more comprehensive concepts of income than when it is evaluated using narrower definitions. Indeed, when evaluated using potential labor earnings at the household level (rather than actual earnings at the individual level), the system exhibits virtually no overall progressivity. Even when there is redistribution, it is found to be targeted inefficiently, with many high-income households receiving net transfers and many low-income households subject to net taxes.

The Center has also conducted research on the rising costs of health care and its implications for future financial needs in retirement. McGarry and Skinner (2008) focus on the important financial obligation and risk to retirees associated with out-of-pocket health care costs. Their primary finding is that out-of-pocket health care expenditures exceed previous estimates, are growing over time, and represent a substantial financial burden for a surprisingly large fraction of older people in the United States.

### ***Social Security, Labor Markets, and the Macroeconomy***

Changes in the labor market could potentially moderate the financial pressure that the Social Security system will face in the future. Specifically, some of the bounty of longer and healthier lives may be allocated to prolonging the labor force participation of older workers, particularly if the Social Security incentives to leave the labor force at younger ages are removed. Longer working lives could increase economic output, increase tax payments, and help to pay for Social Security benefits. Thus, continued labor force participation at older ages could fundamentally ease the transition to an older population in the United States and around the world. This prospect has motivated Center research on the complex relationships between Social Security policy provisions, health trends, labor market behavior, and macroeconomic outcomes.

## **Health Improvement and Retirement**

The prevalence of disabling health conditions has declined significantly over the past two decades. This suggests that people have the physical capacity to work longer and retire later, if they so choose. On the other hand, the number of people receiving disability benefits has increased.

Many Social Security reform proposals recommend increasing the age at which people become eligible for retirement benefits in order to reduce future expenditures, maintain benefit adequacy, increase labor supply, and compensate for increasing longevity over time. However, these reform plans rarely use the principles of social science in selecting a revised benefit eligibility age. Cutler, Liebman, and Smyth (2006) develop two models for determining an “optimal” early retirement age. In the first model, the retirement age stems from a paternalistic concern that some people will mistakenly retire too early if left to make decisions on their own. In the second model, the retirement age is that at which it no longer makes sense to require a disability screening to receive retirement benefits.

Cutler, Liebman, Shepard, and Smyth (2007) update the models and use higher-quality data to evaluate how health improvements may affect the determination of an optimal entitlement age for Social Security benefits. The authors ask at which age a person today has the same health status a 62-year-old had in 1960. For example, a 62-year-old man in 1960 had about a 6 percent likelihood of dying in the next 2 years. In 2000, a man did not face a 6 percent likelihood of dying within 2 years until age 68. Thus, “comparable health status” is 6 years older in 2000, compared with 1960, if one uses mortality risk as a measure of health. Over roughly similar time frames, comparable health status is estimated to be 10 years older, when comparing self-reported health; and possibly more than 10 years, when comparing direct physical measures and some functional limitations. Considering all the evidence, it is clear that health near traditional retirement ages has improved markedly over time. This should translate in our models to an older optimal age of eligibility for Social Security, although rising incomes and productivity could partly offset the effects of improving health.

Given these health trends, it is surprising that the number of people receiving disability insurance benefits is rising in the United States. The Center is now initiating research on disability insurance and its implications.

## **Social Security, Labor Supply, and Economic Efficiency**

NBER has studied the determinants of work and retirement behavior, and the influence of Social Security policy on the labor market and the broader economy. The studies are in two categories. The first analyzes the retirement incentives inherent in the current provisions of Social Security and Medicare. These studies also introduce characteristics of reform that would make the policies more neutral with respect to retirement age. The second looks at the effects of Social Security taxes on labor market behavior more generally and at all ages.

Goda, Shoven, and Slavov (2009) highlight features of Social Security that discourage long careers, discourage work at older ages, and increase the number of years in retirement. For example, Social Security benefits are calculated using the worker’s highest 35 years of earnings. This means that the 33rd, 34th, and 35th years of work noticeably improve retirement benefits by replacing a “zero” in the benefit calculation formula. A 36th year of work, on the other hand, may or may not count, and if it does, it will only replace a year of lower earnings (and not a zero) in the calculation. Thus, the benefit formula encourages careers of 35 years or less. Another distortionary aspect of the benefit formula offers disproportionately higher benefits to workers with short careers, treating them with the same redistributive advantages as lower earners. Both characteristics of the benefit formula lead to large discontinuities and high implicit tax rates for those at older ages and with longer careers.

In another study, Liebman, Luttmer, and Seif (2006) estimate the effect of these incentives on actual work and retirement decisions. They focus on how the marginal Social Security benefits that accrue with additional earnings affect three measures of labor supply: hours, labor earnings, and retirement. The study finds that retirement increases at 35 years of service, when the current year’s earnings crowd out a prior year’s earnings in the Social Security benefit formula. This result is consistent with individuals responding to incentives implicit in the Social Security benefit formula, but further analysis is needed to determine whether the Social Security rules cause this result.

Follow-up research by Goda, Shoven, and Slavov (2007b) considers similar work disincentives in the Medicare program. Medicare as a Secondary Payer (MSP) legislation requires employer-sponsored health insurance to be a primary payer for Medicare-

eligible workers at firms with 20 or more employees. Although the legislation was developed to better target Medicare services to individuals without access to employer-sponsored insurance, MSP creates a significant implicit tax on work beyond age 65. This implicit tax is 15–20 percent at age 65 and increases to 45–70 percent by age 80. Eliminating this implicit tax by making Medicare a primary payer for all Medicare-eligible individuals could significantly increase lifetime labor supply because of the high labor supply elasticities of older workers. The extra income tax receipts from such a policy would likely offset a large percentage of the estimated costs of making Medicare a primary payer.

Liebman and Saez (2006) explore a similar issue, but in the context of Social Security reform. Among the policy options for improving the system's financial sustainability are proposals to raise the maximum earnings on which Social Security payroll taxes are imposed. Liebman and Saez consider the likely impacts of raising the taxable maximum on worker behavior, earnings, and tax revenues. Their methodology identifies variations in the marginal tax rate paid by people in similar circumstances, and evaluates the extent to which earnings appear to be affected by those variations. For example, the marginal tax rate for individuals with earnings just below the Social Security payroll tax threshold is 12.4 percentage points higher than that for individuals just above the threshold. Despite this discontinuity in tax rates, the distribution of taxpayers around the taxable maximum is quite smooth, revealing little earnings responsiveness to these taxes. Liebman and Saez find this to be true not only for the entire population but also for the self-employed—presumably a group with more control over their earnings. The authors also examine earnings responses to the 1986 and 1993 tax reforms that changed marginal tax rates for high-income taxpayers. Again, the earnings trends that existed before the reforms seemed to continue smoothly leading into, through, and after the periods the reforms took effect. The absence of behavioral responses to these various situations could result either from a low elasticity of earnings to tax rate changes, or from a perceived link between incremental taxes paid now and benefit entitlements later.

Kotlikoff, Smetters, and Walliser (2007) consider similar issues of economic efficiency by estimating the impact of several proposals to restore financial balance to the system. They look first at the payroll tax, finding that raising payroll taxes would result in

less national saving, less capital accumulation, and lower real wages. As a result, macroeconomic conditions exacerbate rather than mitigate Social Security's fiscal problems. The authors also consider reforms that would reduce Social Security benefits as needed or raise the eligibility age for Social Security. They find that these types of reforms have more beneficial macroeconomic implications in the long term, but they impose major welfare losses on those close to retirement, who would absorb the loss of reduced Social Security benefits without the longer-term rewards of lower taxes, higher real wages, and capital-driven growth. Finally, they consider the impact of prefunding Social Security through consumption taxes. This spreads the welfare losses more evenly across generations, and helps future generations by stimulating capital formation.

### ***Population Aging and Financial Market Returns***

Some analysts have hypothesized that financial markets will fall when the baby-boom generation retires, causing a shift from inflows to outflows of resources in the equity market. The most intensive Center research on this issue was conducted through a series of studies using a sophisticated macroeconomic model of international capital markets. The model incorporates variations in demographic trends across countries, the moderating impact of international capital flows on financial markets, and their effects on labor, capital, and economic productivity. There are three studies completed to date in this series.

The first study (Börsch-Supan, Ludwig, and Winter 2005) enhances the macroeconomic model. Aging populations and the reform of public pension systems worldwide will affect international capital markets in several ways. First, demographic change alters the time path of aggregate savings within each country. Second, this process may be amplified when pension reform leads to more prefunding. Third, although patterns of population aging are similar in most countries, timing and initial conditions differ substantially. Hence, to the extent that capital is internationally mobile, population aging will induce capital flows between countries, which can moderate the impacts of demographic change in any single country. All three effects influence the rate of return to capital and interact with the demand for capital in production and also with labor supply. In order to quantify these effects, the investigators develop a computational general equilibrium model that incorporates detailed

long-term demographic projections for seven world regions. The initial simulations indicate that capital flows from fast-aging regions to the rest of the world will initially be substantial but that such trends will be reversed when households decumulate savings.

A second study in the series (Ludwig, Krüger, and Börsch-Supan 2009) focuses on the relationships between demographic trends, international resource flows, and macroeconomic changes across countries and across generations within countries. As the working-age population declines, for example, labor will become scarcer relative to capital, real wages will increase, and real rates of return to capital will decrease. The welfare implications of changing factor prices differ across generations, as younger generations gain from wage increases, and older generations lose from lower capital returns. For younger households with few capital assets, the simulations suggest that increases in wages will dominate the decline in rates of return on capital. For example, abstracting from social security and its reform, the cohort born in 2005 will gain 0.6–0.9 percent in terms of lifetime consumption. Older, asset-rich individuals, on the other hand, tend to lose because of the decline in interest rates on capital.

A third study in this series (Kuhle, Ludwig, and Börsch-Supan 2007) focuses on the relative return on riskier assets such as stocks, as compared with safer assets such as government bonds. This differential is typically referred to as the equity premium. The question is whether investing in stocks will become relatively more attractive or less attractive during a period of significant population aging worldwide. The paper includes both theoretical and empirical components. The theoretical analysis finds that the equity premium increases when smaller cohorts enter the labor market, as is expected in the coming decades. Thus, riskier investments such as stocks would be expected to elicit comparatively higher returns than safer investments such as government bonds. The simulations indicate that the expected decrease of the risky rate of return to capital until 2030 is in the range of 1.2 percentage points. However, the decrease in the risk-free interest rate on government bonds is slightly higher than that, so that the equity premium increases by about 0.28 percentage points. Continuing work by this research team is focusing on the financial market implications of social security reform, as an increasing number of countries move toward prefunding.

### ***Other Aspects of Social Security Policy***

In addition to its labor supply effects, Social Security can influence the economy through its effect on saving. Other characteristics of Social Security are more targeted, such as the treatment of the family, or the treatment of workers who spend only part of their careers in Social Security-covered employment.

Nataraj and Shoven (2004) look at the Social Security and Medicare trust funds and present evidence that their buildup may not help future generations as much as the balances would indicate. The 1983 Social Security reforms were designed to ease the burden on workers during the retirement of the baby-boom generation by partially prefunding those future benefits. However, the unified budget concept treats all trust fund receipts as part of “unified” revenues and payments as part of “unified” expenditures. The empirical evidence suggests that attempts to balance the unified budget while the trust funds were generating surpluses has led to increased government spending and tax cuts in other parts of the federal budget. There is no evidence of increased government saving as a result of the trust fund accumulations. Indeed the trust fund surpluses appear to be offset—perhaps completely—by increased deficit spending by the rest of government.

Separate work has explored Social Security’s treatment of the family, as family structure has evolved and two-earner households have become the norm. Social Security provides a wide range of benefits to individuals other than the insured worker, such as spouses, former spouses, widows and widowers, minor children, and disabled adult children. Goda, Shoven, and Slavov (2007a) have considered the incentive effects of the 10-year marriage requirement for spousal benefits. The spousal benefit is particularly valuable to couples with a large earnings disparity between the primary and secondary workers. This study examines whether these couples, who have more to gain from extending their marriage to 10 years, are more likely to delay divorce relative to a control group. The investigators find that vulnerable couples (those more likely to lose spousal benefits) are slightly more likely to delay divorce from year 9 to year 10; however, the effect is statistically insignificant and small in magnitude. The accrual of the entire spousal benefit at 10 years of marriage raises equity concerns between those divorcing just before and just after accruing the benefit, but it does not appear to distort in any significant way the timing of divorce.

Whether spousal benefits need to be redesigned now that two-earner families are the norm depends in part on the interactions between earnings within couples. This is the subject of ongoing research by Juhn and Potter (2007). To date, they have focused on the role of each spouse as “insurance” against adverse labor market events affecting the other. If one spouse becomes unemployed or ill, for example, the other may enter the labor force to make up for the loss in family income. The investigators find continued evidence of spouses increasing work following employment losses of the partner, but the aggregate impact is smaller than in the past, because of decreasing numbers of one-earner couples. More generally, the study finds a positive comovement of couples’ employment in recent years, which also points to a diminished role for intrafamily risk-sharing.

### **Future Agenda**

The environment in which Social Security operates is evolving in numerous ways, and the interactions between Social Security and its environment remain core motivations for our ongoing work. Last year, for example, the leading edge of the baby-boom generation reached age 62 and became eligible to receive Social Security benefits. Remaining life expectancy at age 62 is about 20 years for men and 23 years for women and is getting longer. Accounting for both the aging of the baby-boom generation and increasing life expectancy, mid-range Census projections suggest that the U.S. population aged 62 or older will grow from 45 million to 80 million in just 20 years. Social Security needs to adapt to these demographic realities.

The imbalance in Social Security finances motivates continuing research on the determinants of demographic change, the trajectory of Social Security finances, and the evaluation of Social Security reforms that can provide sustainable solvency for a future that is both challenging and uncertain. Significant long-term trends in health, disability, and retirement saving in the private sector provide a context in which prospective Social Security reforms should be evaluated. Changing health care costs and opportunities are also important to this assessment. In short, the set of issues being addressed by the Center is critical not just for the sustainability of the system itself, but for the broader economic transition that we face with an older population in the United States and around the world.

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