

This PDF is a selection from a published volume from the National Bureau of Economic Research

Volume Title: Social Security Policy in a Changing Environment

Volume Author/Editor: Jeffrey Brown, Jeffrey Liebman and David A. Wise, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 978-0-226-07648-5

Volume URL: <http://www.nber.org/books/brow08-1>

Conference Date: October 19-22, 2006

Publication Date: June 2009

Chapter Title: Introduction to "Social Security Policy in a Changing Environment"

Chapter Author: Jeffrey R. Brown, Jeffrey Liebman, David A. Wise

Chapter URL: <http://www.nber.org/chapters/c4530>

Chapter pages in book: (1 - 17)

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# Introduction

Jeffrey R. Brown, Jeffrey Liebman, and David A. Wise

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This volume compiles selected studies conducted through the National Bureau of Economic Research (NBER) Center for Retirement Research. The center was created in 2003 with funding from the U.S. Social Security Administration and is structured to provide analysis that can inform Social Security policy. In setting our research agenda, we have been guided by three principles. First, reform must recognize the changing and uncertain environment in which the Social Security system will operate. Second, several alternative routes to sustainable solvency should be explored. Third, the potential routes to solvency should be evaluated for “resiliency” to future uncertain demographic, economic, and social trends.

While some of the center’s research focuses directly on Social Security reform, other research aims to inform Social Security policy by analyzing the changing economic environment in which future Social Security beneficiaries will live. For example, several of our center’s projects have studied trends in private-sector retirement saving—particularly the shift from defined benefit (DB) to defined contribution (DC) pension plans—because the “optimal” Social Security replacement rate may evolve as the structure of private retirement savings changes over time. We have also studied trends in health care costs because decisions about Social Security benefits, and indeed how much of society’s resources to devote to So-

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cial Security, may depend in part on health care costs. And we have studied the uncertain nature of future demographic, economic, and social trends—such as the age structure of the population, marriage and divorce rates, women’s labor force participation, productivity, market rates of return, and the like.

The volume is organized into five parts. Part I introduces several innovative approaches to Social Security reform. Part II examines individual behavior in making retirement saving decisions, such as how much to save or how to allocate savings among alternative investment options. Part III analyzes different approaches to reducing the financial market risk faced by individuals who invest in personal retirement accounts. Part IV looks at aggregate trends in retirement asset flows and their effect on macroeconomic markets. Part V considers health trends and their projected effects on future mortality. This introduction summarizes each of the chapters, drawing heavily on the authors’ own summaries.

### **Innovative Approaches to Social Security Reform**

In recent years, the debate about Social Security reform in the United States has focused on a limited range of proposals, a fact which may have contributed to the partisan nature of reform discussions. An important aim of our center is to expand the range of approaches considered and to assess the resiliency of alternative proposals to uncertain future demographic, financial, and other trends. The first three chapters in this volume analyze new ideas for Social Security reform. The first considers reforms that would remove the disincentive in Social Security for long careers. The second analyzes notional defined contribution social security systems and evaluates their ability to self-adjust to uncertain future circumstances, and thus to retain their financial stability over the long term. The third develops a reform proposal based on progressive personal accounts, which blend characteristics of funded personal accounts with some of the core objectives of traditional social security policy.

In chapter 1, “Removing the Disincentives in Social Security for Long Careers,” Gopi Shah Goda, John B. Shoven, and Sita Nataraj Slavov explore the relationship between Social Security policy and labor market behavior at older ages. Since Social Security was instituted in 1935, life expectancy at age twenty has increased from sixty-six to seventy-six for men and from sixty-nine to eighty for women. Health at older ages has also improved. Such dramatic advances in health and longevity mean that people have the physical and mental capability to work until older ages. Yet people are retiring younger, even as they live longer and healthier lives. Indeed, the duration of retirement has grown by even more than the increase in life expectancy at retirement.

Godi, Shoven, and Slavov consider the role of Social Security policy in

influencing—or, more precisely, distorting—the work and retirement decisions of older workers. They highlight the features of Social Security that discourage long careers, discourage work at older ages, and increase the number of years in retirement. The main finding of the chapter is that Social Security imposes high implicit tax rates on workers late in their careers. As a result of this distortion, the duration of retirement is suboptimally long, compounding the financial stress on public and private retirement support systems.

One example of the distortion in Social Security is how benefits are calculated based on the highest thirty-five years of earnings. This means that the thirty-third, thirty-fourth, and thirty-fifth years of work noticeably improve retirement benefits by replacing a “zero” in the benefit calculation formula. The thirty-sixth year of work, on the other hand, may or may not count, and if it does, it will replace a lower year of earnings and not a zero in the calculation. Thus, the benefit formula discourages careers of more than thirty-five years. Another aspect of the benefit formula offers disproportionately higher benefits to workers with short careers, treating them with the same redistributive advantages as if they were lower earners. Both characteristics of the benefit formula lead to high implicit tax rates at older ages and for longer careers.

The authors suggest three reforms that would reduce the distortionary impact of Social Security at older ages. First, they propose using forty years, rather than thirty-five, in benefit computation. Second, they propose disentangling career length and progressivity in the benefit formula. And third, they propose to establish a “paid-up” category of workers who have more than forty years of contributions, who would no longer be subject to the payroll tax. The study finds that these proposed changes would eliminate most of the large positive tax rates for older workers. They would also reduce the association between age and tax rate and move tax rates closer to zero for most workers in most years of their lives. With these changes, the implicit tax rates associated with Social Security remain roughly constant over a worker’s life, resulting in less distortion of career length choices. The authors find, in addition, that the proposed reforms need not affect the overall progressivity of the Social Security system. However, by reallocating benefits from those with shorter careers to those with longer careers, the reforms would result in less insurance against adverse shocks that cause people to work for fewer years.

The study concludes that by eliminating the disincentives against working longer careers, we can capitalize on the good fortunes of increasing life expectancy and favorable health status by paving the way for those in good health to stay in the labor force longer.

In chapter 2, “Notional Defined Contribution Pension Systems in a Stochastic Context: Design and Stability,” Alan J. Auerbach and Ronald Lee explore a new approach to Social Security reform that is known as “No-

tional Defined Contribution” or “Nonfinancial Defined Contribution” (NDC). Sweden was the first country to introduce an NDC system. A number of other countries have introduced NDC plans, including Italy, Poland, Latvia, Mongolia, and the Kyrgyz Republic, and proposed plans for France and Germany have NDC aspects.

The NDC programs differ in detail, but the basic principle is that they mimic defined contribution plans without actually setting aside financial assets. Thus, some of the benefits of fully funded defined contribution plans can be achieved—particularly the improved labor supply incentives from a more transparent link between current taxes and future retirement benefits—while avoiding the transitional difficulties of converting from an unfunded pay-as-you-go (PAYGO) 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 this account are made over the entire life history to mirror actual taxes or contributions by plan participants. After a designated age such as sixty-two, a participant can begin to draw benefits, which is done by using the account to purchase an annuity from the pension plan. The terms of the annuity will depend on mortality risk at that time and on a rate of return stipulated by the pension plan.

While NDC plans are seen as having various potential advantages over traditional PAYGO systems, the focus of this chapter is on their financial stability over the long term. The stability results from three factors. First, the rate of return in the notional accounts reflects the underlying PAYGO nature of the program and is based on what is expected to be affordable over time. Second, the annuity structure should buffer the system from the uncertain costs of rising longevity. And third, in the event that the program’s finances move toward imbalance, a braking mechanism can be incorporated that automatically modifies the rate of return to help restore the plan to financial health. Given the political difficulties of making frequent changes in PAYGO pension programs, the attractiveness of an inherently stable and self-adjusting system is clear.

In this chapter, Auerbach and Lee use a stochastic macroeconomic model for forecasting and simulating the long-term finances of NDC-type public pension programs in the context of demographic and economic trends in the United States. Because future patterns of demographic and economic change are uncertain, the model generates a probability distribution of outcomes (benefit flows and rates of return) for generations of plan participants for the NDC program, as well as for the overall financial stability of the NDC system.

The study finds that an NDC system similar to that currently in use in Sweden, which bases rates of return on the growth rate of average wages and utilizes a brake to adjust the rate of return during periods of financial stress, effectively eliminates the accumulation of debt in the Social Security

system, even under the most adverse demographic and economic circumstances. Thus, the system is effective in preventing inadequate funding of Social Security obligations over the long term.

What this version of an NDC system does not do is adjust automatically to situations when there is excess money accumulating in the system. Put differently, the braking mechanism is asymmetric, automatically making corrections when the financial balances of the system move toward increased debt, but without correction when the financial balances move toward asset accumulation. Only a symmetric brake, which raises rates of return during periods of financial strength, avoids large accumulations of financial assets.

Other findings from the simulations are first, that the brake can be more gradual than under the Swedish system and still provide a stable distribution of outcomes; second, that an NDC system in which rates of return are based on total rather than per capita economic growth is inherently more stable; and third, that a considerable share of the volatility in the financial performance of NDC systems is attributable to economic uncertainty, rather than demographic uncertainty.

In chapter 3, “Reforming Social Security with Progressive Personal Accounts,” John Geanakoplos and Stephen P. Zeldes develop yet another approach to Social Security reform. Their reform plan is designed to preserve the core objectives of the current Social Security system and, at the same time, gain the benefits of personal accounts.

Advocates for retaining the current system argue that Social Security should redistribute wealth from those who have earned more over their whole working lives to those who have earned less. They also suggest that different generations should share in the risks and benefits of macroeconomic growth. So if real wages go up over time, retirees should get some benefit from those macroeconomic gains, even though they are no longer working. Advocates for personal accounts, on the other hand, support ownership by individuals of tangible assets that cannot be revoked by a future government. They also like the idea that people know the current market valuation of their retirement resources, as they are accrued over time, so that rational planning for retirement can take place outside of Social Security.

Geanakoplos and Zeldes seek to find a common ground between these two approaches and to develop a plan that preserves the core goals of each one. They demonstrate that it is possible to convert Social Security into a system of personal accounts with irrevocable ownership of market priced assets, while at the same time redistributing benefits based on lifetime income and sharing macroeconomic gains across generations. They refer to the plan as *progressive personal accounts*.

The proposed system uses the payroll tax to buy assets in a personal retirement account for each Social Security recipient. Income-based redis-

tribution is accomplished through a variable government match (or tax) on these Social Security contributions. High lifetime earners receive lower matches (or a tax) on contributions to their personal account, while low lifetime earners receive a higher government match. Risk sharing across generations is accomplished through the creation of a new kind of derivative security whose payoffs depend on the average earnings of those working at a specific point in time. So if younger workers are doing well and receiving high wages, the old will get higher payoffs from their investment in the derivative security. Every year a worker would pay the Old-Age and Survivors Insurance (OASI) payroll tax and receive a certain number of these securities in the worker's account.

According to the authors, it is possible to create a system of progressive personal accounts that exactly mimics the promised taxes and payouts of the current Social Security system. The resulting system would preserve some of the core goals of Social Security, as it is structured today, but would also improve upon it due to the increased transparency, enhanced property rights, and lower political risk (of legislation removing benefits) that naturally come with individual accounts. Chapter 3 lays out the mechanics of such a system in detail.

### **Retirement Plan Choice**

With the growth of 401(k)-type plans, retirement saving is becoming an increasingly important complement to Social Security as a component of financial support in retirement. In addition, some Social Security reform proposals would supplement the defined benefits provided by the current U.S. Social Security system with either voluntary or mandatory personal retirement accounts (PRAs). The increasing importance of individually-owned retirement savings accounts, whether integrated within the Social Security system or outside the system, will make decision making by individuals a more important aspect of retirement planning in the future. The next two chapters in the volume look at how people make decisions about retirement plans when individual decisions need to be made.

In chapter 4, "Who Chooses Defined Contribution Plans?," Jeffrey R. Brown and Scott J. Weisbenner analyze the decisions made by a group of 50,000 workers who currently have a choice between a defined benefit (DB) and a defined contribution (DC) pension system. Their study is based on the experience of employees in the State Universities Retirement System (SURS) of Illinois, where workers make a one-time, lifetime, irrevocable choice among three retirement plans: (1) a traditional formula-based DB plan; (2) a "portable DB plan," which is slightly less generous than the traditional DB program if one retires from the system, but more generous if the worker takes an early lump-sum distribution; and (3) a completely self-managed DC plan. Individuals who fail to make an active choice within the

first six months of employment are automatically defaulted into the traditional DB plan.

Other aspects of the SURS experience are also relevant to the study. First, the wages of individuals earned from SURS-covered employment are not also covered by Social Security. So for most, the decision made is a decision about people's primary source of income in retirement. Second, the combined employer/employee retirement contributions to the SURS system are at least 14.6 percent of annual salary, which is larger than the payroll tax paid by those in the Social Security system. Therefore, the SURS system looms large as part of a participant's lifetime financial plan. And third, the choice of retirement programs is available to employees with diverse job characteristics and earnings, including campus administrators, faculty members, clerical staff, university police and fire protection workers, and others.

There are two major findings from the study. First, despite initial projections that a majority of new employees would actively select the self-managed DC plan or portable DB plan, the evidence is that a majority of new employees never makes an active pension choice and, thus, are defaulted into the traditional DB plan. The proportion of new employees not making a choice among plans, and hence defaulting into the traditional DB plan, has been roughly three-fifths over the period 2001 to 2004.

Second, approximately 15 percent of new employees choose the self-managed DC plan, despite the fact that the DC plan is likely inferior to the portable DB plan, given the financial features of the various plans and reasonable assumptions about future financial market returns. Interestingly, individuals are more likely than average to choose the self-managed DC plan if they are more highly educated, have higher earnings, are married, and work in a location where a higher fraction of other employees also chose the self-managed plan. The findings suggest that these "educated, high earning, young professionals" have a strong preference for DC plans, even when the financial terms are unfavorable. For example, among the 650 individuals in the sample who are full-time, aged thirty to thirty-nine, academics at a university, married, have earnings in excess of \$50,000, and are still active employees as of spring 2006, 52 percent of them chose the self-managed DC plan, compared with 15 percent in the sample as a whole.

The analysis raises the question of why some individuals appear to make suboptimal choices. The authors speculate that there are at least five reasons why they may do so. First, participants may simply have difficulty processing the complex information that they are provided when making this choice, due either to time constraints or some form of bounded rationality. Second, the information provided by SURS may not be optimally designed to facilitate meaningful comparisons between the self-managed DC plan and the portable benefits package. Third, individuals may understand the rules, but may overestimate their investment abilities, or the expected mar-

ket return of the DC plan. Fourth, individuals may believe there is political risk in the traditional or portable benefit plans, arising from the chronic underfunding of the SURS system. Fifth, individuals may place a high value on choice for its own sake. In continuing research, the authors are exploring these alternative hypotheses using a survey of current SURS participants.

In chapter 5, “The Importance of Default Options for Retirement Saving Outcomes: Evidence from the United States,” John Beshears, James J. Choi, David Laibson, and Brigitte C. Madrian look at a very similar issue in the context of 401(k) plans. In this case, the worker’s decision is about whether to enroll in the 401(k) plan, what portion of their income to allocate to the plan, and how to invest it among the various investment options offered in the plan. Much like the previous chapter, a core finding is that defaults matter a lot. Many people avoid making an active decision about their retirement saving, and so the default provisions of their 401(k) plan are what people end up doing “by default.”

The chapter summarizes a breadth of empirical evidence on how the default provisions of retirement saving plans impact savings behavior along multiple dimensions, such as savings plan participation, savings rates, asset allocation, and postretirement savings distributions. The findings are that defaults impact savings outcomes at every step along the way. For example, some 401(k) plans have automatic enrollment, requiring employees to explicitly “opt-out” of the plan. Others require eligible employees to actively enroll in the plan, or “opt-in.” Automatic enrollment is found to dramatically raise participation rates.

When the 401(k) plan has a default savings rate and a default investment allocation, employees are much more likely to choose those defaults, rather than to specify an alternative. As a result, the higher the default contribution rate, the higher the savings rate among those participating. Defaults even matter when employees leave their jobs, and their 401(k) balances may be left in the account, or they may be distributed to employees with the option to roll over the funds to another retirement plan. When the funds are distributed (which happens automatically in most smaller accounts), they are much more likely to be removed permanently from retirement saving, while undistributed funds tend to be left in the plans.

The findings of this study are relevant not only to the design of a company’s 401(k) plan, but also to how one would structure a personal account system within Social Security. For example, a voluntary PRA system within Social Security would lead to higher participation and higher saving if it has automatic enrollment (rather than requiring active enrollment) and if the default savings rate is higher. The findings on asset allocation are also relevant and suggest careful attention to the investment options made available to participants as well as to the default allocations among them. A clear conclusion of this research is that defaults are not neutral—they

can either facilitate or hinder better savings outcomes. The authors emphasize that current public policies toward saving include examples of both.

### **Reducing Financial Market Risk in Personal Retirement Accounts**

The next section of the volume also relates to the increasing importance of individual retirement saving and, particularly, to the potential implications of a PRA component in Social Security. A significant concern, particularly if PRAs were to become part of Social Security, is with the imposition of investment risk on plan participants. The concern is that the economic well-being of some retirees could be undermined by poor investment returns. There is, therefore, great interest in strategies that could reduce the riskiness of PRAs while preserving the other features of PRAs. While the chapters in this section are focused on reducing the risk of PRAs, the results are also relevant to retirement saving taking place in 401(k) plans and other financial accounts that are separate from Social Security.

The first chapter in this section considers financial market products that cap downside market risk. The second analyzes an approach in which the government would guarantee a minimum investment return. The third studies the extent to which life-cycle investment strategies could reduce the variance in retirement income levels. The fourth investigates the extent to which increased progressivity in the traditional Social Security system could be used to buffer lower-income retirees against PRA market risk.

In chapter 6, “Reducing the Risk of Investment-Based Social Security Reform,” Martin Feldstein presents a market-based approach to reducing the risk of investment-based Social Security that could be tailored to individual risk preferences. With this new form of risk reduction, substituting an investment-based PRA for the traditional pure PAYGO plan could achieve both a significantly higher expected retirement income and a very high probability that the investment-based annuity would be at least as large as the PAYGO benefit. A key feature of the approach developed in the chapter 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 PAYGO tax is compared with a mixed plan that has a 6.2 percent PAYGO tax and 6.2 percent annual PRA savings. This new mixed plan, when fully phased in, would have the following desirable characteristics: (1) The median value of the combined retirement income (i.e., the sum of the PAYGO benefit and the PRA annuity) would be 147 percent of the traditional PAYGO benefit. (2) There would be a 95 percent probability that the combined retirement income (the PAYGO benefit and the PRA annuity) exceeds the traditional PAYGO 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 PAYGO benefit. (4) Each year's PRA saving would be guaranteed to earn at least a 1 percent real rate of return between the time that it is saved and its value at age sixty-six. It is, therefore, referred to in the chapter as a "No Lose" plan. (5) The variable annuity purchased at age sixty-six would have a similar "No Lose" feature, that is, a guaranteed real rate of return of at least 1 percent.

The "No Lose" concepts developed in the chapter rely on financial instruments already available in the marketplace. The idea is that the amount saved in a PRA each year would be guaranteed to retain at least its real value by age sixty-six. The simplest way to achieve such a No Lose PRA account would be to combine Treasury Inflation-Protected Securities (TIPS, which have a guaranteed real return) with equities. The fraction of the annual PRA saving that would have to be invested in TIPS to guarantee that the annual PRA saving would retain its real value by age sixty-six depends on the age of the saver and the rate of return on the TIPS of the relevant maturity. For example, if the saver is twenty-one years old and the real return on TIPS is 2 percent, a \$1,000 PRA saving would be divided between \$410 in TIPS and the remaining \$590 in equities. The 2 percent real return and the forty-five-year investment period imply that the \$410 would accumulate to \$1,000 at the initial price level by age sixty-six. Even if the equity portion became completely worthless, the PRA account would be worth the initial \$1,000 real dollars.

At older working ages, there are fewer years for the TIPS to accumulate and, therefore, a larger fraction of the initial saving must be invested in TIPS. For example, a forty-year-old would have to invest \$598 out of each \$1,000 of new saving in TIPS to guarantee the \$1,000 value of the account at age sixty-six with the remaining \$402 invested in equities. In practice, of course, the value at age sixty-six of the annual PRA saving would be worth substantially more than the guaranteed amount because the equity portion of the account would add additional value. Indeed, the likelihood (based on past market returns) is that the equity portion would add very substantial additional value.

The chapter considers a range of "No Lose" options with varying trade-offs between the guaranteed minimum return and the distribution of possible higher returns. For example, the approach can be easily modified to increase the guarantee from a zero real return (No Lose) to a 1 percent real rate of return. Indeed, different trade-offs might be more or less desirable to different individuals, based on their particular risk preferences. These options are then evaluated relative to the baseline values that would be provided through a traditional PAYGO Social Security system. Simulations are used to derive the probability distributions of retirement incomes relative to the "benchmark" benefits specified in current law. Calculations of expected utility show that the risk reduction techniques developed in the

chapter can raise expected utility relative to investment-based plans with no guarantees. Finally, the chapter shows how these approaches might be applied to deal with the aging of the population without the large rise in the payroll tax that would otherwise be required.

In closely related work reported in chapter 7, “Pricing Personal Account Benefit Guarantees: A Simplified Approach,” Andrew Biggs, Clark Burdick, and Kent Smetters develop a methodology for estimating the market cost of return guarantees. Given the size of Social Security benefit entitlements and the market risks inherent in personal account investing, guarantees constitute a significant contingent liability to the guarantee provider.

Most of the existing research on guarantees has estimated their cost, based on a probability distribution of possible investment outcomes, and then used the distribution to calculate an “expected” cost of the minimum guarantee. According to the authors, however, this approach does not reflect fully how guarantees would be priced in the financial marketplace. In particular, it ignores the greater valuation placed by the market on losses relative to the expected value of the losses. Indeed, the total “market cost” of a benefit guarantee, including the associated cost of market risk, could be several times larger than its “expected cost.” This chapter demonstrates how a model for calculating the expected cost of a benefit guarantee can be modified to present the market price of personal account guarantees as a supplement to expected cost valuations. The simplified method for estimating the market price of a guarantee is shown to produce results equivalent to the Black-Scholes model.

The approach is illustrated using a Social Security reform proposal from Senator John Sununu (R-NH) and Representative Paul Ryan (R-WI). This proposal would introduce personal accounts investing from 5 to 10 percent of wages, depending upon the worker’s earnings level. At retirement, individuals would receive either the proceeds of their personal account or their currently scheduled benefit, whichever is greater. Thus, this plan effectively guarantees that accounts would produce benefits no lower than those scheduled for the current program. In the illustrative policy, the “expected cost” valuation of the proposed guarantee is calculated to be 11.3 percent of total benefits to new retirees in 2050, while the “market value” cost is calculated to be 28.2 percent of benefits.

In chapter 8, “Reducing Social Security PRA Risk at the Individual Level: Life-Cycle Funds and No-Loss Strategies,” James M. Poterba, Joshua Rauh, Steven F. Venti, and David A. Wise explore the implications for asset accumulation of different investment strategies. In a Social Security system with a personal retirement account (PRA) component, retirement savers would have to decide how to allocate their PRA portfolios across a broad range of asset classes and financial products. Asset allocation decisions have important consequences for retirement wealth accu-

mulation because they affect the expenses of investing as well as the risk of low returns. The goal of this study is to assess the relative risk associated with alternative asset allocation strategies in PRAs, though it also offers insight on the consequences of different asset allocation rules in 401(k)-type plans.

The approach used in the study is to simulate the distribution of balances in PRA retirement saving accounts under various assumptions about the asset allocation strategies that investors may choose. In addition to a range of age-invariant strategies, such as an all-bond and an all-stock strategy, the chapter considers several different “life-cycle funds” that automatically alter the investor’s mix of assets as he or she ages. These funds allocate a higher fraction of an investor’s portfolio to stocks at the beginning of a working career and then gradually decrease the equity fraction as the worker approaches retirement. The authors also consider a “no lose” allocation strategy for retirement saving, in which households purchase enough riskless bonds at each age to ensure that they will have no less than their nominal contribution when they reach retirement age and then invest the balance in corporate stock. This strategy combines a riskless floor for retirement income with some upside investment potential, along the lines of what is described in chapter 6.

The best asset allocation strategy—the one with the highest expected utility to the investor—is found to depend on the relative importance of four issues: the expected return on stocks, the risk aversion of the investing household, the amount of financial wealth held outside the PRA, and the expenses associated with different investment options. At modest levels of risk aversion, or when the household has access to substantial non-PRA wealth at retirement, the historical pattern of stock and bond returns implies that an all-stock investment strategy brings higher expected utility than any of the more conservative strategies. When the expected return on stocks is reduced, however, other strategies may dominate the all-equity allocation for investors with high levels of relative risk aversion. In these circumstances, the value of a mix of stocks and inflation-indexed bonds (TIPS) or an inexpensive life-cycle product may be higher than an all-stocks strategy.

The findings also underscore the importance of avoiding high expense ratios. Many of the available life-cycle products have higher expense ratios than could be achieved by the household simply holding a stock index fund and some TIPS (or bonds) and either holding them in fixed proportions throughout their lifetime or rebalancing toward TIPS (or bonds) as they get older. Households who are unable to do this on their own will not do terribly in life-cycle funds, but they will lose money relative to what they could get if they executed very simple investing strategies on their own.

A very different approach to reducing PRA risk is explored in chapter 9, “Changing Progressivity as a Means of Risk Protection in Investment-

Based Social Security,” by Andrew A. Samwick. This chapter analyzes changes in the progressivity of the Social Security benefit formula as an alternative means of lessening the overall risk for lower-income Social Security beneficiaries. Because Social Security benefits provide a larger share of retirement income for lower-income households, Samwick argues, the most direct way to make sure that they do not fall into poverty in old age is to increase the progressivity of the benefit formula. Doing so would lessen the need to provide insurance against the possibility of low returns in the PRAs because low-income retirees would depend less on their PRAs to stay out of poverty.

In the illustrative reform plans studied by Samwick, individual PRA accounts are created with contributions of 2 percent of covered earnings per year. At the same time, traditional Social Security benefits are reduced by 40 percent. Samwick evaluates four different approaches to the 40 percent aggregate benefit cut, each with a different degree of progressivity in the benefit formula. The least progressive version would maintain the progressivity of Social Security benefits at its current level, but reduced all benefits by 40 percent. The most progressive version would provide an equal retirement benefit to everyone, regardless of past earnings. The other two scenarios are in between, offering moderate increases in benefit progressivity.

A series of simulations are conducted to analyze the implications of these policy alternatives on the economic well-being of lower income households, as well as to evaluate the optimal allocation of PRA assets among different asset classes. The key finding is that under baseline parameters, a flat Social Security benefit independent of earnings (the most progressive option) allows the bottom 30 percent of the earnings distribution to achieve a higher expected utility than under the proportional reductions to the current benefit formula even with no investments in equity. An additional 30 percent of earners can lessen their equity investments without loss of welfare relative to those available under the scaled-back current formula. Under more realistic and less extreme changes to the traditional benefit, about half of the equity risk can be eliminated for the lowest earnings decile, and some equity risk can be eliminated for the bottom six deciles.

The optimal allocation to equities in the PRA is not particularly sensitive to the progressivity of the reductions in the traditional benefits—in most simulations, the optimal share in equities increases slightly for low earners and decreases slightly for higher earners with more progressive reductions in the traditional benefits.

### **Demographics, Asset Flows, and Macroeconomic Markets**

Many analysts have suggested that population aging will adversely affect the assets of baby boomers when they retire. These analysts argue that

when a large population cohort is working and accumulating resources for retirement, their demand for investments is high, thereby increasing asset prices. Conversely, when a large cohort retires, they are more likely to sell their assets to finance consumption and thereby drive down asset prices. This argument suggests that the rapidly increasing population of older people in the United States and around the world might lead to lower returns in financial markets in the decades ahead.

The extent to which these predictions will be realized is difficult to predict. It is particularly difficult in an international context, where macroeconomic markets are interrelated, and where financial capital flows freely across countries. The next two chapters in the volume consider the effects of population aging on asset markets, one focused on retirement saving in the United States and one on global financial markets.

Chapter 10 is part of a series of investigations by James M. Poterba, Steven F. Venti, and David A. Wise aimed at forecasting the flow of funds into and out of retirement-related asset holdings in the United States. In “The Decline of Defined Benefit Retirement Plans and Asset Flows,” these investigators focus on the flow of funds into and out of “traditional” defined benefit (DB) pension plans. A companion study, also referenced in the chapter, focuses on the flow of funds into and out of 401(k)-type savings plans. Together, these studies project the direction and magnitude of asset flows for a very significant portion of retirement-related investments.

These analyses provide quantitative documentation, as well as future forecasting, of a fundamental transition in saving for retirement in the United States. What we have experienced over the last twenty-five years is a massive shift from saving through employer-managed defined benefit (DB) pensions to saving in individually managed defined contribution (DC) retirement plans, particularly 401(k) plans. Thus, to understand the effect of demographic trends on the demand for retirement assets in the coming decades, it is important to evaluate the likely flows into and out of both 401(k)-type plans and DB plans.

The projections in the chapter suggest that the average (over all people) of the present value of real DB benefits at age sixty-five attained an historical maximum in 2003, when the value was about \$73,000. The present value declines after 2003, as the proportion of new retirees covered by DB plans declines. The projections also suggest that the average value of 401(k) assets at age sixty-five surpasses the average present value of DB benefits at age sixty-five in about 2010. Thereafter, the value of 401(k) assets grows rapidly, attaining levels much greater than the maximum present value of DB benefits. If equity returns between 2006 and 2040 are comparable to those observed historically, by 2040 average projected 401(k) assets will be over six times larger than the historical maximum level of DB benefits at age sixty-five, attained in 2003. Even if equity returns average 300 basis points below their historical value, the authors project that average 401(k)

assets in 2040 would be 3.7 times as large as the value of DB benefits in 2003.

The offsetting and dominating influence of 401(k)-type saving, compared with flows in DB assets, is the central conclusion of the analysis. Focusing on DB assets alone suggests that an aging population, in conjunction with a shift away from DB plans, will lead to a decline in the real value of pension assets averaged across all retirees in future cohorts. When combining projected 401(k) assets with projected DB assets, however, the study finds that real pension assets not only increase, but increase substantially, in future decades.

These results underscore the need for further analysis of the factors that determine the diffusion of 401(k) plans across corporations, especially small companies with low-wage workers, as well as the contribution behavior and withdrawal behavior of 401(k) participants. The growing role of 401(k)-type plans in the retirement landscape suggests that understanding asset accumulation and drawdown in these plans is a critical component of any analysis of the effect of demographic change on financial markets.

Chapter 11 extends the analysis of demographic change and asset markets from the United States to international financial markets. In “Demographic Change, Relative Factor Prices, International Capital Flows, and Their Differential Effects on the Welfare of Generations,” Alexander Ludwig, Dirk Krüger, and Axel Börsch-Supan develop a simulation model to analyze the impact of demographic change on macroeconomic markets around the world.

While the size, rate of growth, and age distribution of the population is changing worldwide, the magnitude of demographic changes and the timing and character of those changes differ significantly across countries and across regions of the world. There is variation in aggregate population growth rates and trends, variation in the ratio of the working-age population to the total adult population, and variation in the portion of the population at older ages. These demographic variations, and the varying paths of demographic change over time, affect international flows of capital and other resources. And these flows, in conjunction with the demographic changes themselves, affect the macroeconomic characteristics of different countries and the welfare of different generations within them.

The authors present the following intuitive explanation, which plays out in their more rigorous macroeconomic modeling. First, changes in the population structure will alter aggregate labor supply and aggregate savings that, in turn, alter the prices for labor and capital. 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. Second, as countries reform their PAYGO pension systems to partially funded systems, the additional supply of capital from those reforms

reinforces the downward pressure on the rate of return to capital. 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.

The goal of this study is to quantify these effects in an international context, accounting for international flows of resources across countries. Much of the work leading up to this study has been in developing an economic model to make these calculations.

The study finds that the rate of return to capital decreases by roughly 80 to 90 basis points if capital is allowed to flow freely across regions. The simulations indicate that capital flows from rapidly aging regions to the rest of the world will initially be substantial, but that trends are reversed subsequently. However, because long-term demographic trends are highly correlated across Organization for Economic Cooperation and Development (OECD) countries, the capital flows across countries do not affect much the long-run decrease in the rate of return on capital. In other words, the impact of open markets in moderating the macroeconomic impact of demographic change within countries is less important because of the similarities in demographic change across countries in the long term.

In terms of the generational welfare effects, the simulations suggest that for younger households with few capital assets, 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 about 0.6 to 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. However, if demographic changes necessitate reforms in Social Security, then reduced benefits or increased taxes will moderate the welfare gains to the younger generation.

### **Mortality Projections**

The financial footing of the Social Security system depends importantly on the longevity of program participants. In the past several decades, longevity in the United States has increased substantially, adding to the financial burden on the Social Security program. What the future holds is less clear and requires the consideration of multiple factors. In chapter 12, “Is the U.S. Population Behaving Healthier?” David M. Cutler, Edward L. Glaeser, and Allison B. Rosen compare the risk factor profile of the population in the early 1970s with that of the population in the early 2000s and consider the implications of recent trends for future reductions in mortality.

The first part of the chapter estimates the impact of demographics, smoking, drinking, obesity, blood pressure, and cholesterol on ten-year mortality rates, comparing the predicted ten-year mortality in the two time

periods. For the population aged twenty- to seventy-four, the ten-year probability of death fell from 9.8 percent in 1971 to 1975 to 8.4 percent in 1999 to 2002. For the population aged fifty-five to seventy-four, the ten-year risk of death falls from 25.7 percent to 21.7 percent. The largest contributors to these changes are reductions in smoking and better control of blood pressure.

While overall health has improved, not all risk factor trends have been in a positive direction. Smoking rates have fallen by more than a third since 1960, and alcohol consumption has declined by 20 percent since 1980, both leading to better health. Demographically, the population is better educated, and better-educated people live longer than less-educated people. On the other hand, obesity rates have doubled in the past two decades, and diabetes has increased as a result.

The second part of the analysis considers the impact on mortality if current trends continue. The mortality forecast integrates together several of the most important risk factors associated with mortality. Smoking and obesity are found to be the most important and offsetting components of the forecast. Based on reduced smoking, the mortality risk for the entire population aged twenty-five and older would be expected to decline by 8 percent. Increasing obesity, however, with current treatment rates—leads to increased hypertension and high cholesterol—and a 13 percent increase in mortality risk.

While suggestive, the authors emphasize that there is considerable uncertainty in making health projections for the future. For example, two-thirds of the U.S. population is overweight or obese. As a result, continued increases in weight from current levels have a bigger impact on health than did increases in weight from lower levels of body mass index (BMI). At the same time, however, the detrimental impact of BMI on health can be moderated dramatically by controlling hypertension and high cholesterol. So the question is not just whether weight will continue to increase. Also critical is the extent to which those who are overweight or obese take medications to control the health risks associated with high BMI. That, too, is highly uncertain. Understanding how to improve utilization of and adherence to recommended medications are key issues.