SIMULATING THE DISTRIBUTIONAL CONSEQUENCES OF PERSONAL ACCOUNTS: SENSITIVITY TO ANNUITIZATION OPTIONS

Cori E. Uccello*
Melissa A. Favreault
Karen E. Smith
Lawrence H. Thompson

Center for Retirement Research at Boston College
550 Fulton Hall
140 Commonwealth Ave.
Chestnut Hill, MA 02467
Tel: 617-552-1762   Fax: 617-552-1750
http://www.bc.edu/crr

About the Center for Retirement Research

The *Center for Retirement Research at Boston College*, part of a consortium that includes a parallel center at the University of Michigan, was established in 1998 through a 5-year grant from the Social Security Administration. The goals of the Center are to promote research on retirement issues, to transmit new findings to the policy community and the public, to help train new scholars, and to broaden access to valuable data sources. Through these initiatives, the Center hopes to forge a strong link between the academic and policy communities around an issue of critical importance to the nation's future.

Center for Retirement Research at Boston College
550 Fulton Hall
140 Commonwealth Ave.
Chestnut Hill, MA 02467
phone: 617-552-1762 fax: 617-552-1750
e-mail: crr@bc.edu
http://www.bc.edu/crr

Affiliated Institutions:

Massachusetts Institute of Technology
Syracuse University
The Brookings Institution
Urban Institute

1.   Introduction

Recent Social Security reform efforts focus predominantly on the establishment of personal retirement accounts either to supplement or partially replace the current Social Security program. Unlike the traditional Social Security system, which is based on a defined benefit model, the personal accounts created under these proposals would function like defined contribution plans. Contributions would be made to the accounts during working years, and balances would accumulate until retirement.

An important issue related to these personal accounts is whether they will redistribute income and how any redistribution compares to that under the current Social Security system. The answer depends in part on how personal accounts are dispersed upon retirement. In particular, it depends on how mandatory annuitization would impact different groups, especially those with shorter life spans, and whether certain annuity features would offset the drawbacks associated with forcing even those with short life expectancies to annuitize.

In this paper, we present a first step toward answering these questions. We use the Urban Institute's Dynamic Simulation of Income Model (DYNASIM), which projects Social Security outcomes through 2050, to examine model 1 of the President's Commission to Strengthen Social Security. We first examine how that system of personal accounts would affect groups differently by comparing the distributional impacts of a personal accounts system to those under the current system. We then examine how different strategies for annuitizing personal account balances might change these distributional impacts. Of particular interest is whether certain annuity features can benefit workers with shorter life spans. We also examine how different annuitization features can affect post-retirement income and poverty rates.

Under current law, women and less educated and lower income persons tend to gain relative to men and more educated and higher income persons. We find that personal accounts would reduce some aspects of this redistribution by tying benefits more closely to work histories. Any program that pays benefits in the form of life annuities, including the current Social Security program, transfers resources from those with shorter life expectancies to those with longer life expectancies. We find, however, that certain annuity features, such as joint and survivor annuities, period certain annuities, and cash

2

refunds, can reduce the size of these transfers. Annuitizing balances only up to the point that they produce a poverty level income can also benefit individuals with shorter life spans.

Although the choice of a particular annuitization strategy will change the distribution of benefits, we find that the total amount of Social Security benefits, including both the traditional benefit and the annuitized benefit, do not vary a great deal from one strategy to another. As long as the offsets made to the traditional benefits are calculated using the same features as the personal account annuities, the pattern of these offsets will help reduce the differences in annuity benefits received.

In section 2 below, we provide background on Social Security personal account proposals. This is followed by a discussion of redistribution in the current Social Security system and the potential impact of personal accounts on redistribution. Section 4 provides background information on annuities, including the redistributive aspects of annuitization. Section 5 outlines our analysis methods, and section 6 presents the results. We provide our concluding remarks in section 7.

2. Background on Personal Account Proposals

In December 2001, the President's Commission to Strengthen Social Security released its report outlining three alternative models for Social Security reform. Each of the models includes personal accounts as a central feature. Under Model 1, workers can voluntarily invest 2 percent of their taxable wages in a personal account. In exchange, their Social Security benefits would be reduced by the account contributions accumulated at 3.5 percent above inflation. No other changes would be made to traditional Social Security benefits. Under Model 2, workers can voluntarily redirect 4 percent of their payroll taxes up to $1000 to a personal account. In exchange, their Social Security benefits would be reduced by the account contributions accumulated at 2 percent above inflation. Other changes to Social Security benefits would be made, including providing enhanced benefits for low earners.[1] Under Model 3, workers can voluntarily redirect 2.5 percent of their payroll taxes up to $1000 to a personal account if they also contribute an

---

[1] Model 2 also contains provisions for CPI-indexed benefits and increased benefits for widow(er)s.

3

additional 1 percent of taxable earnings to the account. The 1 percent additional contribution would be partially subsidized through a refundable tax credit. Other changes to Social Security benefits would be made, including the implementation of longevity-indexed benefits and enhanced benefits to low earners.[2]

In terms of how the new personal accounts will be dispersed at retirement, the Commission's plans would make annuitization voluntary. Two-thirds joint and survivor annuities would be the default option for married couples, however, other options would be allowed upon agreement of both spouses. For instance, retirees could choose to instead make gradual withdrawals, and lump sum payments would be allowable to the extent that the traditional Social Security benefit plus any annuitized portion provide income above the poverty level.

Although the Bush Commission's personal account proposals would not mandate annuitization, other reform proposals would. For instance, the Individual Account plan put forth as part of the 1994-1996 Advisory Council on Social Security would divert 1.6 percentage points of the payroll tax to establish personal accounts and would mandate annuitization upon retirement. Accumulated personal account funds would be converted by the government to single or joint minimum guarantee indexed annuities, which would assure that some portion of the purchase price of the annuity would be payable in all cases. Similar to private pension plans, married workers would have the choice of either a single life annuity or a joint and survivor annuity. In contrast, however, the Advisory Council's Personal Savings Account (PSA) plan, which would set up personal accounts financed by reallocating 5 percentage points of the employee's share of the payroll tax, would not require annuitization.

The 21st Century Retirement Security Plan, developed by the National Commission on Retirement Policy, would divert two percentage points of the current payroll tax toward the establishment of personal accounts. Upon retirement, workers would be required to annuitize that portion of their balances that, when added to their traditional Social Security benefit, would be necessary to provide an income comfortably

---

[2] Model 3 also contains provisions for benefit reductions for high earners, changes to the early retirement factors and delayed retirement credits, increased benefits for widow(er)s, and dedicated transfers from general revenues.

above the poverty level. Individuals would have the choice between life and joint and survivor annuities. In addition, individuals could choose a life annuity, period certain annuity, or a refund annuity. This plan formed the basis of legislative proposals sponsored by Representatives Kolbe and Stenholm and Senators Gregg and Breaux during the 106th Congress.

3.   Redistribution in the Current Social Security System

To properly assess the potential distributional impacts of Social Security personal accounts, it is important to understand the distributional impacts of the current Social Security system. Many researchers have tried to characterize Social Security's redistributive effects. Until recently, research in this area focused on redistribution across cohorts, with fairly unambiguous findings. Those cohorts that reached retirement age early in the system's history experienced huge windfalls, in part as a consequence of making contributions (at relatively low tax rates) for less than a full career but collecting benefits for a full retirement, while those that have reached or will reach retirement under the more mature system can expect to receive benefits that are more closely related to their contributions. Moffitt (1984) points out that this relationship is not perfectly linear. Indeed, cohorts retiring through at least 1977 had increasing absolute transfers from the program (as measured by net Social Security wealth). This was possible because of steadily increasing payroll tax and coverage rates, coupled with the entrance of baby boom cohorts into the workforce. However, the rate of growth of Social Security wealth slowed immediately after the first retirement cohorts.

Not all elements of current law and demographic trends favor early cohorts, however. Some aspects of the system tend to mitigate the potential losses for later cohorts. Wage indexing, for example, serves to increase benefits relative to prices across cohorts. Increased life expectancy across cohorts (when not accompanied by retirement age increases and their associated benefit reductions) increases the duration of benefit receipt.

More recently, research has focused on Social Security redistribution within cohorts, with somewhat less consensus. Within cohorts, a number of offsetting factors influence OASDI redistribution. These include a regressive tax (with a flat rate, but

5

capped at the taxable maximum), a progressive benefit formula (which has higher replacement rates for lower-income workers), and spouse and survivor benefits. These three factors interact with differences in life-course patterns (especially marriage and divorce, work, disability, and mortality) across groups. For example, higher-income couples are more likely to marry and less likely to divorce than those with lower incomes; people with less education are more likely to experience disability than their more educated peers; and women live longer than men.[3]

Unambiguously, the system transfers income from never married people to people who marry because of the presence of spouse and survivor benefits at no additional cost to workers. Among those who do marry, those in high-wage, single-earner couples tend to gain the most in absolute terms from participating in Social Security. The system generally redistributes income from men toward women because of women's longer life expectancies, lower lifetime incomes, and greater likelihood of qualifying for spouse and survivor benefits.[4]

Questions about Social Security progressivity, defined in terms of lifetime earnings, are more contentious. Differences in estimates of the system's progressivity arise depending on the outcome measures used (absolute transfers versus relative returns), on whether the calculations include DI benefits (for a discussion, see Cohen, Steuerle, and Carasso, 2002), and on how earnings are measured (individual or family, and, within a married couple, shared or individual). Most researchers find that the system generally redistributes from higher lifetime earners to lower lifetime earners, though differential mortality and spouse and survivor benefits reduce and can even eliminate this redistribution (Gustman and Steinmeier, 1999; Coronado, Fullerton and Glass, 2000; Garrett, 1995; Panis and Lillard, 1996). Of course, the declining significance of spouse and survivor benefits should tip the system toward greater progressivity in later cohorts (Smith, Toder, and Iams, forthcoming).

---

[3] For a detailed discussion of these competing life course patterns, see Favreault (1998) or Favreault and Caldwell (2000). Aaron (1977) was one of the first to explore systematically the effects of these differences on Social Security redistribution. Thompson (1976) conducted one of the first dynamic microsimulation studies of this question.
[4] Note that even though women benefit most from Social Security redistribution, they still face substantial risk, with much higher poverty rates in old age than men.

3.1   Potential Impact of Personal Accounts on Redistribution

How redistribution might change with a system of personal accounts carved out from the OASDI system would vary greatly depending upon the organization of the new system. For example, systems with highly progressive matching of account contributions or with earnings sharing for married persons would clearly have different impacts than a system based purely on worker contributions. Likewise, plans that finance the transition to a new system using general revenues would have different effects than plans that place a disproportionate burden on "transition" cohorts who work under both the old and new systems or that place the burden on cohorts yet unborn.

Whatever the parameterization specifics for directing contributions into personal accounts, timing of earnings, behavioral responses, bequests, and our key interest, annuitization policies, are all likely to play increasingly pivotal roles in retirement income redistribution. Further, transaction costs, now estimated at just 0.6 percent of benefits paid for the Social Security retirement and survivors program, would no doubt increase under a system of personal accounts.[5] How transaction costs are levied could be distributionally important.

One key difference under a system with a personal account carve-out would be an increased importance of the *timing* of earnings, not just their levels. Under current law, having earnings equal to the average wage at age 25 counts the same as having earnings at this relative level at age 55.[6] Because interest would compound on personal accounts, however, those with front-loaded earnings would, all else equal, expect to do better than those with more back-loaded earnings of the same amount (see, for example, discussion in Burtless, Bosworth, and Steuerle, 1999).[7]

Generally, groups that gain the most (i.e., receive the largest intracohort transfers) from Social Security under current law stand to lose the most through transition to a new system. These include women, especially those who have no or low lifetime earnings,

---

[5] Current Disability Insurance program administrative costs are estimated to be much higher, about 3 percent of total benefits paid.

[6] As a form of work incentive, earnings are not indexed after age 60.

[7] How a system would treat the disabled would be another important issue, which we do not address here, but it would be analogous to extreme front-loading of earnings. The President's Commission, in a small section of its report, essentially says that its models would affect disabled workers the same way as they affect retirees.

and married persons in single-earner couples more generally. Likewise, groups that have the most to gain are those who receive smaller transfers under current law, for example high-earner persons, whether they are single or part of a dual-income couple.

While some groups are more likely to see a reduction in redistribution under personal accounts, it is important to recognize that there is considerable heterogeneity within groups. For example, unmarried people (both men and women) with steadily high earnings would likely benefit greatly from a system with personal accounts. Some women who did not have access to spouse and survivor benefits (because they never married or their marriage ended in divorce after less than 10 years) might also see an improvement.

The ability to leave assets to an estate upon death represents another key departure of personal accounts from the current system. Social Security now provides survivor benefit protection for spouses and children. Personal account balances could be more or less valuable than survivor benefits depending upon a worker's career earnings, the timing of his or her death, and the ages of any survivors. Never married persons without minor children cannot entitle a beneficiary to survivor protection under Social Security, but could leave a bequest of retirement benefits under the new system. Those who benefit most from current law survivor benefits, in contrast, especially survivors of those who died young, could be much worse off if a carve-out proportionately reduced traditional survivor benefits.

3.2   Savings Offsets

The eventual impact of a program of Social Security personal accounts on retirement incomes also depends on the other changes, if any, that the program causes in household financial holdings. To the extent that participants reduce other forms of saving by their expected gain from participating in Social Security personal accounts, any gains to their eventual retirement income will be mitigated.

An extensive literature has emerged since the introduction first of Individual Retirement Accounts (IRAs), and later of 401(k) accounts, that explores whether money held in these accounts represents new personal saving and or merely a reshuffling of individual financial portfolios. It has proven to be a difficult question to answer.

Estimates of the net new savings vary from as little as 20 percent of the money added to the accounts to as much as 80 percent, or even more.[8] Estimating the impact of Social Security personal accounts is further complicated by possible differences between the impact of these accounts and that of 401(k) and IRA accounts.

Workers' financial situations, savings motivations and financial sophistication vary widely. These differences are likely to lead to differences in savings responses to personal Social Security accounts in ways that are now difficult to anticipate.[9] Lower-income workers with few other financial assets have little room for the portfolio adjustments necessary to offset savings in Social Security personal accounts, particularly if they do not own their own homes. To the extent they participate in the program, net additions to their personal account balances are likely to represent net new savings. Higher-income workers have more opportunities to adjust their financial holdings either by reducing their holdings of other financial assets or by increasing borrowing, particularly in the form of home mortgages.

Participants in 401(k) and IRA plans tend to have higher than average incomes and be older than the average worker, in part because 401(k) plans are less likely to be offered by employers of lower wage and younger workers. Lower-wage earners may be more likely to participate in Social Security personal accounts, even if they are voluntary, than in 401(k) plans, simply because the option is available universally. If so, the greater likelihood that their account balances represent additional savings would increase the likelihood of positive effects on retirement incomes.

Worker behavior is also likely to vary depending on different workers' motivations for saving, which further complicates the task of predicting the impact of Social Security personal accounts. Plausible arguments can be developed suggesting that retirement saving will increase by more than the net increase in Social Security savings, by some fraction of the increase, or that retirement incomes will actually fall.

Far-sighted workers with well established retirement income targets may be more likely to offset any gains from participating in Social Security personal accounts.

---

[8] Engen and Gale (2000) find little additional savings while Poterba, Venti, and Wise (1997) find a great deal. Hubbard and Skinner (1996) provide a summary of the debate and a flavor for the technical problems in developing these estimates.
[9] For a more extensive discussion of these issues see Engen and Gale (1997).

Whether current 401(k) participants are more likely to be such target retirement savers is not now known.

The reaction of those whose savings behavior is motivated, at least in part, by precautionary motives is less easy to predict. Because of the link to financial market performance, the future benefits produced under Social Security personal accounts will be more difficult to predict than are benefits under the traditional program. Some may increase their precautionary savings in reaction to the reduced benefit predictability, producing additional retirement savings. Others may believe that personal accounts increase the likelihood that promised Social Security benefits will actually materialize. They may reduce their precautionary savings in reaction to their increased confidence in the program.

More perverse results are possible if unsophisticated workers fail to understand fully how their traditional Social Security benefit will be reduced as a result of their participation or if they overestimate the size of the equity premium. In either case, such workers risk overestimating the net gain from participating in the Social Security personal accounts program. If they also reduce other forms of savings in conjunction with their participation, they may end up with lower retirement incomes than they would otherwise have had.

4.   Annuities

4.1   Life Annuity Basics

Before examining the potential distributional impact of Social Security personal account annuitization, it is useful to review some annuity basics. Life annuities are contracts that exchange a sum of money (i.e., premium) for periodic payments guaranteed for life. In the absence of annuities, individuals confront two competing risks as they allocate retirement wealth. Retirees who consume aggressively risk depleting their resources before they die. On the other hand, those who consume conservatively risk dying with substantial assets that could have been used to increase consumption while alive, although their heirs benefit from the large bequest. Annuities solve the consumption problem in retirement by insuring individuals against the risk of outliving their assets while also setting a consumption level that their savings can support.

Annuities can come in several forms. *Single life annuities* guarantee that benefits are paid throughout the lifetime of the individual. No payments are made to survivors upon the individual's death. *Joint and survivor annuities* also guarantee that benefits are paid throughout the lifetime of the individual. Upon the death of that individual, however, all or a portion of the initial benefits continue to be paid to a designated beneficiary, throughout that individual's lifetime. Joint and survivor annuities can protect surviving spouses against suffering a dramatic decline in income upon the death of the primary annuitant. However, in exchange for this protection, benefits payable while both spouses are alive are lower than they would be under a single life annuity.

Two annuity features can help increase the value of annuities to individuals with shorter life expectancies. *Life annuities with a period certain* feature guarantee that benefits are payable for a specified number of years or the lifetime of the individual, whichever is longer. *Life annuities with a cash refund* feature guarantee that if an individual dies before receiving an amount equal to all of the premiums paid, the beneficiary will receive a refund equal to the portion not yet received. Similar to joint and survivor annuities, initial benefits are lower when period certain or cash refund features are included.

Annuities can provide varying degrees of inflation protection. With *fixed income annuities*, payments remain fixed over the life of the annuity, thereby offering no inflation protection. *Graded annuities* provide payments that increase each year by a specified percentage. Because future inflation rates are unknown, benefit increases may exceed or fall short of actual inflation. Annuity payments for *variable annuities* vary according to the investment earnings of the underlying assets. There is no guarantee, however, that investment earnings will equal or exceed inflation rates. *Indexed annuities*, a type of variable annuities, provide payments that increase each year according to an index, which could be tied to the rate of inflation. Inflation-indexed annuities are the only annuities that guarantee purchasing power will not decrease over time.

4.2   The Current Market for Annuities

Currently, retirees have access to annuity income through several sources. Most notably, the current Social Security system provides benefits in the form of a life annuity,

and about 90 percent of individuals age 65 and older receive Social Security benefits (SSA 2002). Benefits are indexed to the CPI, thereby preserving purchasing power, and reduced benefits are paid to surviving spouses.

Government employee pensions, private pensions through either a defined benefit (DB) or defined contribution (DC) plan, and private annuities purchased in the individual market provide other potential sources of annuity income. In 2000, about one-third of individuals age 65 and older received annuitized income from these sources (SSA 2002). Most of these individuals received their annuitized income through DB plans. DB pension income is typically paid in the form of a life annuity, although about one quarter of workers with DB pensions also have the option of taking their benefits in the form of a lump sum distribution (BLS 1999).[10]

Similar to Social Security, the default DB payout option is a joint and survivor annuity for married couples. DB pension recipients, however, can elect a single life option as long as they get the written consent of their spouse. Unlike Social Security benefits, DB pensions are typically not automatically indexed with inflation, and purchasing power can erode over time.

DC benefits, in contrast to DB benefits, are not typically paid out as an annuity. In fact, only about one-quarter of 401(k) participants are given the option of converting their account balance to an annuity upon retirement (BLS 1999). Instead, they must either withdraw their balance as a lump sum distribution (which can be rolled over to an IRA and/or used to purchase an annuity in the private market) or schedule periodic withdrawals. As a result, few DC participants directly annuitize their balances. The trend in employment-based pensions from DB to DC plans suggests that over time, fewer retirees will receive annuitized private pension income.

DC participants without access to an annuity option through their plan can turn to the individual annuities market, as can those who wish to convert their IRAs and/or other retirement savings into an annuity. However, the U.S. individual annuities market is quite underdeveloped and few Americans purchase life annuities (CBO 1998).

---

[10] Employers can, however, require that departing employees with pension assets of less than $5,000 take a lump sum distribution.

4.3   Redistributive Aspects of Annuitization and the Money's Worth of Annuities

By their nature, annuities transfer income from individuals with shorter than expected life spans to those with longer than expected life spans. (Because of the correlation between income and longevity, these transfers also result in a transfer from low-income groups to high-income groups). In a voluntary annuities market, individuals who expect to live longer purchase annuities, because they are more at risk for depleting their assets during their lifetimes. Insurance companies take this adverse selection into account when determining the annuity payout per dollar of annuity premium. In particular, lower monthly payments are available when the annuitant population is expected to live longer on average than would be available if the annuitant population is expected to have average or shorter than average life spans. Consequently, the lower payout rates available through annuities make them less attractive to those with shorter expected life spans. This in part explains the low degree of annuitization among seniors.

Money's worth analyses are often used to examine the value of annuities in the private market and the impact of adverse selection.[11] Specifically, these analyses compare the expected present discounted value of annuity payouts to the annuity premium. A money's worth ratio of 1.00 implies that the present value of the annuity payments received are expected to exactly equal the premium paid in. A money's worth ratio greater than 1.00 implies that the annuity payments will exceed the premium, whereas a money's worth ratio below 1.00 implies that annuity payments will fall below the premium.

Jeffrey Brown (2000) uses a money's worth analysis to examine the impact of adverse selection on annuity values. To do this, he compares money's worth ratios calculated using the expected mortality experience of the general population to ratios calculated using the expected mortality experience of individual annuity purchasers. The difference between these two sets of ratios can be attributed to adverse selection. He finds that adverse selection reduced the value of an annuity to an average 65 year old man in 1999 by about 10 percentage points. In other words, a 65 year old man with an average expected lifespan would expect to receive 10 cents less per every annuity premium dollar than would the average 65 year old female annuitant.

---

[11] See, for example, Mitchell et al. (1999), Brown (2000), Brown (2002).

Even using the expected mortality experience of the annuitant population, however, money's worth ratios fall below 1.00. The difference, ranging from about 5 to 10 percentage points, reflects the insurer's administrative costs. Therefore, even annuitants with long life expectancies should not necessarily expect to receive annuity payments that exceed their annuity premiums. Nonetheless, even money's worth ratios below 1.00 may be attractive to those who value the insurance aspects of annuities, that is the protection they provide against outliving one's assets.

Brown (2002) expands his money's worth analysis to examine more directly the impact of annuities under a Social Security personal accounts program. In particular, he compares money's worth ratios by gender, race/ethnicity, and education to examine the redistributive impact of annuitization. He finds that single life annuities will lead to transfers from men, blacks, and lower educated groups to women, whites, Hispanics, and higher educated groups. Although he also finds that certain annuity features, such as joint and survivor annuities, period certain, and refund options can reduce the redistributive effects, these features typically come at the cost of lower monthly income.

These previous analyses provide valuable insights into how vulnerable groups would be affected by personal account annuitization. Because they are performed using prototypical individuals only, however, they cannot indicate how annuitization would affect a representative sample of future retirees. Also, they do not provide any information regarding how different annuitization options can affect post-retirement income and poverty rates.

5.0 Methods

In this study, we use the Urban Institute's DYNASIM model (version 3) to compare the distribution of benefits under the current Social Security system to the distribution of benefits under a system of personal accounts. To help assess retirement well-being under the two systems, we will also compare projected post-retirement income and poverty rates. These overall comparisons assume that individuals annuitize their entire personal accounts upon retirement, and that the annuity features will mimic those in the current Social Security system. That is, annual benefits are indexed to the CPI and married beneficiaries receive a two-thirds joint and survivor annuity.

14

We then focus on different annuitization scenarios, and examine how different annuity features impact the distributional results. In contrast to previous studies that use a money's worth analysis approach to examine the value of annuities to prototypical sets of workers, DYNASIM allows us to perform money's worth analyses on a fully representative sample of future retirees. We also examine the impact of different annuitization scenarios on post-retirement income, because most annuity features that help increase the money's worth for annuitants with shorter life spans do so at the expense of lower monthly payments. Lower monthly income could especially impact those who live longer, and in particular women. Therefore, it is important to examine annuity income not only soon after annuity benefits begin, but also several years thereafter.

5.1 DYNASIM

DYNASIM is a dynamic, stochastic micro-simulation model that has been designed to analyze the distributional consequences of Social Security reform proposals. The model uses a representative sample of individuals based on economic and demographic information from the 1990-93 panels of the Survey of Income and Program Participation (SIPP), augmented by earnings histories from the Panel Study of Income Dynamics (PSID) and the Current Population Survey matched to the Social Security Administration Summary Earnings Records (CPS/SER) (Smith et al. 2001). The model ages these base year data in yearly increments by simulating demographic events (births, disability, deaths, marriages, and divorces) and economic events (labor force participation, wage rates, hours of work, and timing of retirement). It also simulates pension coverage, participation, and benefit payments, as well as the accumulation of wealth outside of pension plans. Finally, it simulates Social Security coverage and benefits, as well as Supplemental Security Income (SSI) benefits. See Appendix table A1 for more detailed information on the DYNASIM model.

5.2 Social Security Personal Accounts

For this analysis, Social Security personal accounts are modeled to largely follow Model 1 of the President's Commission to Strengthen Social Security. We assume that

workers invest 2 percent of their taxable wages in a personal account. Consistent with the assumptions used by the SSA Office of the Actuary, we assume that contributions grow at a real rate of 4.6 percent.[12] In exchange, monthly Social Security benefits are reduced by the annuity value of the account contributions accumulated at 3.5 percent above inflation. No other changes are made to traditional Social Security benefits, so the system remains out of long-term fiscal balance.[13] Because of the uncertainty about what might constitute a plausible estimate of the likely impact of Social Security personal accounts on total saving, we have chosen not to make an explicit adjustment for possible savings offsets in preparing these estimates.

We chose this personal account model because it is a very straightforward scenario, thereby allowing us to focus on the impact of specific annuitization scenarios. Note that the goal of this project is not to compare overall well-being under a personal account system to that under the current Social Security system. Instead, we focus our analysis on the distributional consequences of incorporating personal accounts and the relative impact of various annuitization scenarios, given a particular personal account balance at retirement.

We assume that the personal account program begins in 1992—the base year of the DYNASIM sample. This allows us to examine a fully implemented personal accounts program for more members of our sample than if we modeled the program beginning in 2002 or later. We limit our analysis to the 1940-1980 birth cohorts.[14] As a result, even the oldest members of the sample will have had at least 10 years to participate in the personal account program prior to attaining age 62.

---

[12] When modeling the proposals of the President's Commission, the SSA Office of the Actuary assumed personal-account portfolios would have an average distribution of 50 percent in equities (with an ultimate real yield of 6.5 percent), 30 percent in corporate bonds (with an ultimate real yield of 3.5 percent), and 20 percent in U.S. Treasury long-term bonds (with a real yield of 3.0 percent). Netting out administrative expenses leads to a 4.6 percent real rate of return.

[13] How far out of fiscal balance would depend upon participation rates in the personal accounts. The full participation simulated here would, according to SSA estimates, reduce the cash deficits at the end of the valuation period by approximately 36 percent (see President's Commission, 2001). Impacts on long-term actuarial balance vary based on whether the accounts are financed in part by general revenues or entirely by payroll taxes.

[14] The actual proposals of the President's Commission would not apply to cohorts born before 1948. We chose the earlier start date to enable us to see many of the important distributional effects without needing to simulate as far into the future.

For purposes of this analysis, we assume that all workers accumulate their account balances until DYNASIM simulates that they begin receiving Social Security benefits.[15] We assume universal annuitization and do not reduce annuitized benefits by administrative costs or load factors beyond the administrative expenses already netted out of the rate of return on accounts. Account balances are converted into annuities based on mortality rates that vary by age and birth year. Except for one annuitization scenario, unisex mortality rates are used.

The mortality rates used to derive the annuity payments are calculated to weight each person equally. Given the correlation between lifetime income and mortality rates, however, individuals with larger account balances likely have longer life expectancies. Therefore, unless mortality rates are weighted by account balances, annuity payments may be too high (because given the same available account balance, longer life expectancies imply lower annual payments), and the present value of all annuity payments paid through personal account conversions will be greater than aggregate account balances. To account for this potential error, we apply adjustment factors to annuity payments such that the aggregate present value of annuity payments equals aggregate account balances. This adjustment factor, in effect, re-weights mortality rates by account balances.

Annuitization Scenario 1. Scenario 1, our baseline scenario, replicates the payout rules of the current Social Security system. All workers convert their entire personal account balance into life annuities, married retirees choose a two-thirds joint and survivor annuity, annual benefits are indexed to the CPI, and unisex mortality rates are used to determine the annual benefits.

Annuitization Scenario 2. The second scenario is similar to the baseline scenario except that all retirees convert to a single life annuity, regardless of marital status.

Annuitization Scenario 3. The third scenario is similar to the baseline scenario except that it does not provide for a cost of living adjustment. In other words, nominal benefits remain constant throughout the payout period.

---

[15] Social Security claiming behavior is not altered with the introduction of the personal account in these simulations.

Annuitization Scenario 4. The fourth scenario is similar to the baseline scenario except that it contains a cash refund feature. If the retiree and any surviving spouse both die before receiving an amount equal to all of the premiums paid, the designated beneficiary (or estate) will receive a refund equal to the portion not yet received.

Annuitization Scenario 5. The fifth scenario is similar to the baseline scenario except that it contains a period certain feature that guarantees benefits are payable for at least 10 years. In other words, if the primary annuitant dies before receiving benefits for 10 years, the full benefits are payable to a surviving spouse (or the estate or any other designated beneficiary) for the remaining years in the guarantee period. The reduced survivor benefit, if applicable, then becomes payable at the end of the guarantee period.

Annuitization Scenario 6. The sixth scenario is similar to the baseline scenario except that annuity benefits are based on gender-specific mortality rates rather than unisex mortality rates.

Annuitization Scenario 7. The seventh scenario is similar to the baseline scenario except the entire balance is not necessarily annuitized. Instead, only the account balance needed to generate a poverty level income, including any traditional Social Security income, is annuitized. Table 1 summarizes the seven annuitization scenarios.

Table 1. Annuitization Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Share of balance annuitized	Entire	Entire	Entire	Entire	Entire	Entire	Up to poverty level (incl trad'l SS)
Life tables	Unisex	Unisex	Unisex	Unisex	Unisex	Gender-specific	Unisex
Survivor annuities	J&S (67%)	Single Life	J&S (67%)	J&S (67%)	J&S (67%)	J&S (67%)	J&S (67%)
Indexation	CPI	CPI	None	CPI	CPI	CPI	CPI
Death benefit	None	None	None	Cash Refund	Period Certain	None	None

6.0 Results

6.1 Distribution of Current Law Social Security Benefits and Taxes Paid

Our first table of results shows the distributions of initial benefits and OASDI taxes paid under the current system (table 2). We present results for all workers born between 1940 and 1980 who are simulated to accumulate personal account balances and survive to the date they are simulated to begin Social Security receipt. We make comparisons by gender, marital status, race and ethnicity, education, years in the labor force, and lifetime income. Our lifetime income measure, "shared AIME," reflects per capita indexed household earnings.[16] The earnings stream used to calculate shared AIME includes a worker's entire earnings in years he or she is single and half of the earnings of both the worker and the worker's spouse in years he or she is married.

The first column of table 2 shows the distribution of retired workers across various characteristics. The second and third columns show annual initial benefits under current law Social Security and the share of these benefits that go to different groups, respectively. The fourth and fifth columns show the level and share, respectively, of aggregate OASDI contributions paid by each subgroup. For instance, although men make up only 47 percent of the sample, at retirement they receive 52 percent of current law Social Security benefits. Nevertheless, the current law situation can be characterized as redistributive toward women, as men had paid approximately 60 percent of the OASDI contributions.[17]

Relative to lifetime OASDI taxes paid, the current system also redistributes to those with lower educational attainment, fewer years in the labor force, and lower lifetime earnings. For example, individuals with less than a high school education receive about 8 percent of total initial benefits under current law, although they paid only about 6 percent of total OASDI taxes. Workers in the lowest shared lifetime earnings

---

[16] This measure is not the same as Average Indexed Monthly Earnings (AIME) for Social Security purposes, as the Social Security measure includes "dropout years," but our measure does not.

[17] This assumes that workers are credited with their own worker contributions. If we were to use a shared measure of household earnings and payroll tax burden (for example, husbands and wives each receive credit for half of the payroll contributions they have made while married), the share of taxes that men pay would decline considerably. In addition, the redistribution discussion reflects comparisons of initial benefits payments, not lifetime benefits, and is restricted to individuals who survive to first benefit receipt. Differences in mortality rates among subgroups can increase or decrease redistributive effects when measured on a lifetime basis.

quintile receive 10 percent of the total initial benefits, yet paid 6 percent of total OASDI taxes, whereas workers in the highest shared lifetime earnings quintile receive 27 percent of the total initial benefits, yet paid 36 percent of total OASDI taxes.

6.2   Distribution of Annual Income Streams

In table 3, we display the average initial benefits paid under the current system and initial personal account annuitized benefits under our baseline scenario of CPI-indexed joint and survivor annuities. In addition to presenting benefit levels, we also present estimates of the share of total benefits going to various groups. Annuitized personal accounts represent about 28 percent of total initial Social Security benefits under this personal accounts option. Projected total benefits are higher than under the current system using the assumption adopted from the SSA Office of the Actuary that personal accounts would yield a real rate of return of 4.6 percent per year but current-law Social Security benefits would be reduced by the annuity value of the account contributions accumulated at 3.5 percent.

Because our baseline annuitization closely resembles current law (by offering indexed annual benefits and survivor protection), the differences in the distribution of benefits between the option and current law are fairly minimal. For example, women's total benefits comprise 48.2 percent of the aggregate option benefits, compared with 48.4 percent under the current system. The most significant departures from current law occur among later cohorts. Those in the 1970 to 1974 cohort, for example, would receive 14.3 percent of total benefits compared with 13.8 percent of the total under current law. Those in earlier cohorts receive a reduced fraction (for example, from 7.5 percent under current law to 7.1 percent under the option for the 1941 to 1944 cohorts), though their absolute benefits increase (again because the option assumes a higher real rate of return in the personal accounts than in the contributions that offset traditional Social Security benefits).

6.3   Poverty and Relative Well-Being With and Without Annuitization

Analysts often express concern that without annuitization, a reform with personal accounts could place retirees at substantial risk of poverty or near poverty in retirement.

In table 4, we present projected poverty rates at three separate ages under two polar assumptions about annuitization.   The first is our baseline assumption, discussed above, and the second assumes no annuitization. The option without annuitization treats personal account balances like other wealth and assumes that individuals spend them down similarly to patterns observed for retired Americans with similar characteristics in the Health and Retirement Study.

One of the most noteworthy features of table 4 is how low poverty rates are projected to be under current law. While at present about 10 percent of aged persons have incomes below the poverty threshold, DYNASIM projects that poverty rates will decrease to just 2.3 to 2.4 percent at the normal retirement age, age 75, and age 85 for members of the 1940 cohort onward. Wage growth is perhaps the most important factor in explaining the dramatic projected reduction in aged poverty. As initial Social Security benefits are indexed to wages, while the poverty threshold is indexed to prices, we should expect that poverty would decline, all else equal. Compounding wage growth over lengthy horizons leads to the very dramatic reductions.

While overall poverty is projected to be quite low, certain subgroups of the population are particularly vulnerable to poverty under current law. These include divorced and never married women, those with less than a high school education, especially nonwhites, and those who do not have substantial experience in the labor force. At age 85, for example, never married women are projected to have poverty rates of over 12 percent. Blacks with less than a high school education (not shown) have rates ranging from 14 percent at the normal retirement age to 17 percent at age 85.

With our baseline annuitization assumptions, poverty rates generally decline modestly under the personal accounts option. With personal accounts and no annuitization, poverty rates stay the same for many groups, decline for some, and increase for others. For women, increases in poverty under personal accounts with no annuitization could be quite substantial, especially at older ages. Widows and divorced women are especially likely to see increases in poverty. For example, widows see a poverty increase of 8 percent at the normal retirement age, 18 percent at age 75, and 41 percent at age 85. Recall that the poverty level is low for these groups under current law (ranging from 2 to 3 percent), so the absolute changes are less than a percentage point in

each of these cases.[18] These results occur because women have longer life spans and thus benefit from annuitization.

Those with little work experience could also see substantial increases in poverty. Under current law, about 8.6 percent of persons at ages 75 and 85 with less than 20 years of work experience are projected to be in poverty. Assuming personal accounts with no annuitization, this fraction climbs to 9.4 percent at age 75 and 9.6 percent at age 85. These workers will have contributed to personal accounts for fewer years and lose relative to the current system that redistributes a relatively higher share of benefits to them.

6.4.   Money's Worth Analysis of Annuitization Scenarios

Table 5 presents the money's worth ratios for each of the annuitization scenarios. These reflect the ratio of the present value of annuity payments to the personal account balance at age 62. The present value of annuity payments includes any benefits paid to the primary annuitant as well as those paid to a surviving spouse (or other designated beneficiary or estate) through a joint and survivor annuity, cash refund, or period certain guarantee.

Recall that a money's worth ratio greater than 1.00 implies that the present value of the annuity payments exceeds the account balance, whereas a money's worth ratio below 1.00 implies that the present value of the annuity payments falls below the account balance. Because annuities, in effect, transfer benefits from those with short expectancies to those with long life expectancies, we expect that subgroups with longer lives (e.g. women, more highly educated workers, higher earners) will tend to have higher money's worth ratios than subgroups with short life expectancies. Some annuitization scenarios, however, contain features that have the potential to offset these distributional aspects.

The baseline annuitization scenario, which most closely resembles the payout features of the current Social Security system (CPI-indexed joint and survivor annuities), would favor subgroups with longer life expectancies—women, college graduates, and

---

[18] Because of the importance of wage growth and its impact on poverty, it is useful to use relative, rather than absolute, measures of well-being in old age as well. We have examined additional outcomes, for example the fraction of the population with income of less than half of the median for aged persons, under

higher earners. Although the survivor component could help to mitigate any transfers from individuals with shorter life expectancies by continuing to provide income to a surviving spouse, redistribution among subgroups remains.

For instance, for every dollar of account balance converted into an annuity, women would receive $1.03 compared with $0.98 for men. In addition, money's worth ratios increase with educational attainment. For every dollar of account balance converted, non-high school graduates receive $0.95 in annuity benefits, high school graduates receive $0.98, and college graduates receive $1.02. Money's worth ratios also increase with lifetime earnings, and range from 0.97 among individuals in the lowest lifetime earnings quintile to 1.01 among those in the highest quintile. That is, individuals in the highest earnings quintile receive 4 cents more in benefits for each dollar of account balance converted to an annuity, relative to individuals in the lowest earnings quintile.

There are some differences in money's worth ratios by race. Overall, whites have money's worth ratios of 0.99, and blacks have slightly lower ratios of 0.98.[19] In contrast, both Hispanics and the other race category (comprised mostly of Asians) have ratios of 1.03 and 1.07 respectively.[20]

Women who are widowed or divorced have higher money's worth ratios than married women (1.05, 1.03, and 1.02, respectively). This is perhaps surprising, given that married women live longer than non-married women. However, this result arises because annuity payments are calculated using unisex mortality rates. Women with joint

---

current law and the personal accounts with and without annuitization at the same three ages. The findings are generally consistent with those from the poverty analyses.

[19] Differences between blacks and whites are less significant at age 62 than they would be if computed at earlier ages given that black-white mortality differentials decline with age and are believed to reverse (so that black mortality is actually lower than white mortality) later in life.

[20] These results may be affected by measurement error in the micro-level data from the National Longitudinal Mortality Study (NLMS) calibrated to aggregate data from Vital Statistics that underlie the DYNASIM mortality model. These data reveal that at older ages, Hispanics and especially Asians have much lower mortality rates than non-Hispanics and members of other racial groups. These findings are consistent with others from the literature, including both Census Bureau and Vital Statistics rates and other scholarly sources (Sorlie, et al. 1993, Lauderdale and Kestenbaum 2002). However, some studies have suggested that data problems may limit the ability to use the NLMS and Vital Statistics data to determine mortality rates among Hispanics and Asians. In particular, deaths among these groups may be underrepresented in Vital Statistics if race is not reported consistently across sources (e.g., death certificates, censuses, surveys, and administrative records), if census undercounts differ across racial and ethnic groups, or if, in the case of the NLMS, emigration leads to non-registration of deaths in the United States (Sorlie et al 1992, Rosenberg et al. 1999).

and survivor annuities have their initial benefits reduced to reflect the value of the survivor protection. But, because the value of that survivor protection is calculated using unisex mortality rates instead of the higher mortality rates applicable to men, it is overstated. As a result, initial benefits are reduced too much relative to the non-married women who receive single life annuities. Differences in money's worth ratios by gender and marital status virtually disappear in scenario 6, which calculates annuities using gender-specific mortality rates.

Scenario 2, which substitutes single life annuities for joint and survivor annuities, would increase somewhat the transfers between subgroups. For instance, the gap between men and women increases from 5 cents per dollar of account balance annuitized in the baseline scenario to 7 cents per dollar converted with single life annuities. Similarly, the gap between non-high school graduates and college graduates increases from 7 cents to 11 cents, and the gap between the lowest and highest earners increases from 4 cents to 6 cents. Whereas joint and survivor annuities can continue to provide benefits to a spouse after the death of the primary annuitant, single life annuities cease upon the death of the annuitant. As a result, single life annuities can be less beneficial to groups with shorter than average life spans. Looked at another way, the joint and survivor annuities help reduce the redistribution from groups with shorter life spans to those with longer life spans.

Annuitization scenario 3 provides joint and survivor annuities, but it does not provide annual cost of living adjustments. As a result, initial benefits are larger than in the baseline scenario, but their purchasing power will erode over time. The larger benefits relative to the baseline scenario in the early years leads to higher money's worth ratios among those with shorter life spans. Consequently, the differences in money's worth ratios by subgroup narrow slightly under scenario 3 relative to the baseline scenario. In particular, the gap between men and women and the gap between high school dropouts and college graduates decreases by 1 cent per dollar of account balance annuitized. Nevertheless, eliminating the COLA can have negative ramifications for retirement income adequacy for those with longer life spans, due to the erosion of purchasing power. The impact of the various annuitization scenarios on post-retirement income will be examined more closely below.

Scenarios 4 and 5 offer two features aimed at benefiting those with shorter life spans. Scenario 4 includes a cash refund feature, and scenario 5 guarantees that benefits are payable for at least 10 years.[21] Compared with the single life annuitization scenario, both of these options reduce the transfers from men to women, from non-high school graduates to college graduates, and from low earners to high earners. However, only the 10-year period certain annuity also reduces these transfers compared to the baseline joint and survivor scenario. In other words, in general, a two-thirds survivor option is more beneficial to individuals with shorter than average life spans than a cash refund. But, a 10-year period certain annuity is even more beneficial. Because the value of annuities with a period-certain feature is less dependent on life expectancies, they can be almost as valuable to individuals with short life expectancies as to individuals with long life expectancies. As the number of years that are guaranteed in a period certain annuity increase, the more similar the money's worth ratios will be across subgroups with different life expectancies. But longer guarantees will come at the cost of lower initial benefits.

All of the scenarios to this point have used unisex mortality tables to determine the level of annuity benefits payable. Scenario 6, however, uses gender-specific mortality rates. The use of gender-specific mortality rates greatly reduces the differences in money's worth ratios by gender and marital status, but differences by education and income remain. This is because life expectancies differ by education and income, even after controlling for gender.

Scenario 7 is identical to the baseline scenario, except that the share of the account balance annuitized is only that share needed to generate a poverty level income, when combined with traditional Social Security benefits. When all of the balances are converted, more weight is given to the larger balances, which are more likely to be held by those with higher incomes, which in turn are more likely to have longer life expectancies. Under a poverty level annuitization scenario, less weight is given to those with very large balances, because they are less likely to need to annuitize much, if any, of their balances.

---

[21] Recall that in both of these scenarios, joint and survivor benefits are also paid when applicable. For married beneficiaries, any cash refunds are payable after the death of the surviving spouse, whereas period certain guarantees apply after the death of the primary annuitant, after which reduced survivor benefits are payable.

As a result, annuity rates become more favorable to those with low balances, which are more likely to be held by those with shorter life expectancies.

Indeed, compared to the baseline scenario, money's worth ratios increase for subgroups with lower life expectancies—men, non-high school graduates, and individuals in the lowest income quintile. Money's worth ratios also increase for college graduates and for individuals in the highest income quintile. Although fewer individuals in these subgroups are forced to annuitize, those that do benefit from the combination of longer life expectancies and favorable annuity rates which increase annual payments.

6.5   Post-Retirement Income, by Annuitization Scenario

Although it is important to examine how money's worth ratios vary across subgroups with different life expectancies, it is also important to examine how benefit payments vary under different annuitization scenarios. Table 6 reports the benefits paid at ages 67 and 85 for five annuitization scenarios—the baseline joint and survivor, single life, no COLA, cash refund, and 10-year period certain scenarios—to illustrate the range of benefit payments, and displays the results by gender and marital status to better isolate the impact of survivor benefits. We limit this table to individuals born between 1940 and 1965 because they will have reached age 85 by 2050, the last year simulated by DYNASIM.

The top two panels show the annual benefits derived from the annuitized personal accounts at ages 67 and 85, respectively. Overall, average annuity payments at age 67 are largest under scenario 3, the option that does not provide a COLA. But the lack of CPI-indexing means that purchasing power will erode over time and indeed, by age 85, this option provides the lowest annuity payments. The single life scenario also provides relatively high payments at age 67 among married beneficiaries.[22] In contrast, the baseline joint and survivor, cash refund, and 10-year period certain scenarios provide lower benefit payments at age 67 because these features come at the cost of lower initial benefits. These features aim to benefit survivors in particular, and indeed, at age 85,

---

[22] Annuity payments for non-married beneficiaries differ between the baseline joint and survivor scenario and the single life scenario for two reasons. First, some of the widowed beneficiaries may be receiving survivor benefits under the baseline scenario, but not under the single life scenario. Second, benefits will

widows receive larger benefits under these three annuitization scenarios than under the single life scenario. Interestingly, the payments at age 85 under the 10-year period certain scenario are slightly lower than those under the baseline scenario. This is because the 10-year guarantee period will have expired by age 85, and survivors will have reverted to the two-thirds survivor benefit. Because the cost of the period certain feature (in addition to the joint and survivor feature) reduces the initial benefits by more than that for the joint and survivor feature alone, the survivor annuity will also be lower.

The lower two panels of table 6 show total Social Security benefits, including both the traditional benefits and the annuitized benefits from the personal accounts, at ages 67 and 85, respectively. There is much less variation in total benefits by annuitization scenario than there is in the annuitized benefits. This is due to the offset to traditional Social Security benefits—the annuitized value of the account balance grown at a 3.5 percent real interest rate. We assumed that this offset would be calculated using the same features as those used to calculate the personal account annuity.[23] In other words, in the baseline scenario, both the offset and the personal account annuity are calculated according to a CPI-indexed, two-thirds joint and survivor annuity. In annuitization scenario 2, both the offset and the personal account annuity are calculated according to a single life annuity. The only difference between the offset to the traditional benefit and the personal account annuity payment is the difference in interest rates used. The offset is calculated using a 3.5 percent real interest rate and the personal account annuity is calculated using a 4.6 percent real interest rate, the rate at which the account balances are assumed to grow. Therefore, the offset will be somewhat lower than the annuity payment, and total benefits will vary only slightly by annuitization scenario.

An exception to this is the cash refund scenario, which has much higher total benefits than the other scenarios. This results from a mismatch between the final benefit payments and the offset. With a cash refund feature, any difference in the account balance annuitized and the payments made to date is paid upon the death of the retired

---

differ slightly due to the adjustment factors that ensure the aggregate present value of annuity payments equals the total of all account balances converted.

[23] We considered using a uniform offset, regardless of annuitization scenario. However, we felt that a uniform offset would lead to some impractical results. For instance, under the single life annuitization scenario, a widow would receive no survivor annuity payments. However, she would receive survivor

worker (or any surviving spouse). This balloon-type payment is made to the estate. The cash refund offset, however, cannot adequately incorporate this balloon payment—there are no Social Security payments made after the beneficiary's death, so there is no payment to offset. In this scenario, therefore, it may be appropriate to offset the traditional Social Security benefits using a joint and survivor annuity, without a cash refund feature.

7.   Conclusion

One of the selling points of personal accounts is that workers' benefits will be more closely related to their contributions. Our findings support this claim. With our baseline annuitization assumptions, workers with more experience in the labor force, higher wages, and more education will receive a larger share of total Social Security benefits at retirement than they receive under current law. At the same time, current law transfers to some subgroups, such as women and those with low lifetime family earnings, will be reduced. Also certain groups (like widows) could experience fairly sizable percentage increases in poverty rates unless annuitization is required, though the absolute changes are fairly modest.

Annuities, by their nature, transfer income from individuals with shorter than expected life spans to those with longer than expected life spans. Similar to previous studies, we find that certain annuity features, such as joint and survivor annuities, period certain annuities, and cash refunds, can benefit workers with shorter life spans, by reducing, although not eliminating entirely, the transfers from individuals with short life spans to those with long life spans. Annuitizing balances only up to the point that they produce a poverty level income can also benefit individuals with shorter life spans. These results are due to the more favorable annuity rates that can be obtained when those with high account balances (and long life expectancies) are eliminated from the risk pool.

The type of annuitization will also impact the level of annuity benefits received, both initially and many years thereafter. Nevertheless, total benefits, including both the traditional Social Security benefits and the personal account annuity benefits, will vary

---

benefits under the traditional plan. If the offset were calculated using a joint and survivor annuity, her traditional benefits would be offset, even though she would not be receiving a survivor annuity payment.

only slightly across annuitization scenarios. The offsets made to the traditional benefits will mitigate most of the differences in annuity benefits received, as long as the offsets are calculated using the same features as the personal account annuities.

The results reported here are applicable primarily to a personal accounts plan with universal annuitization. Results could differ substantially for a personal accounts system with voluntary annuitization. Differences in the money's worth values of the annuities between individuals with short and long life spans will be exacerbated if individuals who choose to annuitize tend to be those with long life expectancies.   In addition, the results assume that everyone annuitizes using the same annuity features. Giving annuitants a choice between annuity features could negate the potential advantages of some features (e.g. joint and survivor, cash refund, and period certain features) for individuals with shorter life spans.

This analysis focused on how features in the payout phase can impact the distribution of Social Security benefits. However, features in the accumulation phase (e.g. contribution matches based on income) could offset redistribution in the annuitization phase. Indeed, Jeffrey Liebman (2002) finds that moderate redistribution in the accumulation phase can more than offset redistribution resulting from mortality differences between subgroups. Enhancements in traditional Social Security benefits for low income workers, such as those proposed in Models 2 and 3 of the President's Commission report, would also impact distribution.

Our results also depend critically on the real rate of return assumptions that were modeled after the SSA Office of the Actuary in their analysis of the President's Commission proposals. Their analysis assumed that personal accounts with allowable investments in the stock market would yield a real rate of return 1.1 percent higher than would be required to offset the loss in contributions to the Social Security basic benefit system. Obviously, higher or lower differences would affect the distributional results, projected benefit levels, and poverty rates of future retirees. Moreover, stock market and interest rate volatility mean that the timing of contributions and retirement will impact these results as well (Burtless 2000). Future work should examine the sensitivity of the results to different assumptions about the rates of return on personal accounts.

Finally, our analyses do not require that the Social Security system attain long-term fiscal balance. The Social Security Trustees estimate that bringing the system into 75-year balance would require an immediate and permanent benefit cut of 13 percent or a payroll tax increase of 15 percent, or some combination of the two (Board of Trustees 2003). As Model 1 would improve the financing situation of Social Security over the very long-term, any benefit cuts would not need to be quite as steep, but they would still be very large. If benefit cuts were to be enacted, our projections of the fraction of the older population in poverty could increase substantially, as could the distributional effects of the various annuitization options.

8.   References

1994-1996 Advisory Council on Social Security. 1997. *Report of the 1994-1996 Advisory Council on Social Security, Volume 1: Findings and Recommendations*. Washington, DC: GPO.

Aaron, Henry J. with the assistance of Philip Spevak. 1977. Demographic Effects on the Equity of Social Security Benefits." In Martin S. Feldstein and Robert P. Inman, Editors. *The Economics of Public Services: Proceedings of a Conference Held by the International Economic Association at Turin, Italy*. London: MacMillan.

Board of Trustees [OASDI]. 2003. 2003 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds. Washington, DC: Author.

Brown, Jeffrey R. 2000. "How Should We Insure Longevity Risk in Pensions and Social Security?" Issue in Brief No. 4. Boston: Center for Retirement Research at Boston College.

Brown, Jeffrey R. 2002. "Differential Mortality and the Value of Individual Account Retirement Annuities." in *The Distributional Effects of Social Security Reform*, edited by Martin Feldstein and Jeffrey B. Liebman. Chicago: University of Chicago Press.

Burtless, Gary. 2000. "How Would Financial Risk Affect Retirement Income Under Individual Accounts?" Issue in Brief No. 5. Boston: Center for Retirement Research at Boston College.

Burtless, Gary, Barry Bosworth, and C. Eugene Steuerle. 1999. "Changing Patterns of Lifetime Earnings: What do They Tell Us about Winners and Losers from Privatization?" Paper presented at "New Developments in Retirement Research," First Annual Joint Conference for the Retirement Research Consortium. May 20-21.

Cohen, Lee, C. Eugene Steuerle, and Adam Carasso. 2002. Social Security (OASDI) Redistribution by Education, Race, and Income: How Much and Why. Presented at the Third Annual Conference of the Retirement Research Consortium, May, Washington, DC.

Coronado, Julia L., Don Fullerton and Thomas Glass. 2000. "The Progressivity of Social Security." National Bureau of Economic Research Working Paper No. W7520. Washington, D.C.: National Bureau of Economic Research, February.

Engen, Eric M. and William G. Gale. 1997. "The Effects of Social Security Reform on Private and National Saving" in Steven A. Sass and Robert K. Triest, eds*. Social Security Reform: Links to Saving, Investment, and Growth.* Boston. Federal Reserve Bank of Boston. pp103-42.

Engen, Eric M. and William G. Gale. 2000. "The Effects of 401(k) Plans on Household Wealth: Differences Across Earnings Groups." NBER Working Paper w8032. Cambridge, MA: National Bureau of Economic Research.

Favreault, Melissa M. 1998. *Whose Safety Net? Social Security, Life-Course Processes, and Inequality in the United States*. Ithaca, NY: Cornell University Ph.D. Dissertation.

Favreault, Melissa M. and Steven B. Caldwell. 2000. "Assessing Distributional Impacts of Social Security Using Dynamic Microsimulation." In Anil Gupta and Vishnu

Kapur, editors, *Microsimulation in Government Policy and Forecasting*. Amsterdam: North Holland Press, Contributions to Economic Analysis Series.

Garrett, Daniel M. 1995. "The Effects of Differential Mortality Rates on the Progressivity of Social Security." *Economic Inquiry* 33(3): 457-475.

Gustman, Alan L., and Thomas L. Steinmeier. 1999. "How Effective is Redistribution Under the Social Security Benefit Formula?" Washington, D.C.: The National Bureau of Economic Research. *Program in Labor Studies and Aging*, October.

Hubbard, R. Glenn and Jonathan S. Skinner. 1996. "Assessing the Effectiveness of Saving Incentives." *Journal of Economic Perspectives* 10(4): 73-90.

Lauderdale, Diane S. and Bert Kestenbaum. 2002. "Mortality Rates of Elderly Asian American Populations Based on Medicare and Social Security Data." *Demography* 39(3): 529-540.

Liebman, Jeffrey B. 2002. "The Role of Annuities in a Reformed U.S. Social Security System." AARP Public Policy Institute Paper 2002-17. Washington, DC: AARP.

Mitchell, Olivia S., James M. Poterba, Mark J. Warshawsky, and Jeffrey R. Brown. 1999. "New Evidence on the Money's Worth of Individual Annuities." *The American Economic Review* 89(5): 1299-1318.

Moffitt, Robert A. 1984. "Trends in Social Security Wealth by Cohort." In Marilyn Moon, Editor. *Economic Transfers in the United States*. Chicago: University of Chicago Press.

Panis, Constantijn W. A. and Lee A. Lillard. 1996. "Socioeconomic Differentials in the Returns to Social Security." Santa Monica, CA: RAND Labor and Population Program Working Paper Series.

Penner, Rudolph G. and Elizabeth Cove. 2002. "Women and Individual Accounts." In Melissa M. Favreault, Frank J. Sammartino, and C. Eugene Steuerle, editors, *Social Security and the Family: Addressing Unmet Needs in an Underfunded System*. Washington, DC: Urban Institute Press.

Poterba, James M., Steven F. Venti, and David Wise. 1997. "The Effects of Special Saving Programs on Saving and Wealth." in *The Economic Effects of Aging in the United States and Japan.* Michael D. Hurd and Naohiro Yashiro, eds. Chicago: University of Chicago Press. pp. 217-240.

President's Commission to Strengthen Social Security. 2001. *Strengthening Social Security and Creating Personal Wealth for All Americans*. Report of the President's Commission.

Rosenberg, Harry M., Jeffrey D. Maurer, Paul D. Sorlie, Normal L. Johnson, Marian F. MacDorman, Donna L. Hoyert, James F. Spitler, and Chester Scott. 1999. "Quality of Death Rates by Race and Hispanic Origin: A Summary of Current Research." *Vital and Health Statistics* 2(128). Hyattsville, MD: National Center for Health Statistics.

Smith, Karen, Fritz Scheuren, and Jillian Berk. 2001. "Adding Historical Earnings to the Survey of Income and Program Participation (SIPP)." *2001 Proceedings, Statistical Computing Section, American Statistical Association* (CD-ROM).

Smith, Karen, Eric Toder, and Howard Iams. 2001. "Lifetime Distributional Effects of Social Security Retirement Benefits." Presented at the Third Annual Conference of the Retirement Research Consortium, "Making Hard Choices About Retirement" May 17-18, 2001. Also forthcoming in *Social Security Bulletin*.

Social Security Administration (SSA). 2002. Income of the Population 55 or Older, 2000. Washington, DC: Social Security Administration.

Sorlie, Paul D., Eric Backlund, Norman J. Johnson, and Eugene Rogot. 1993. "Mortality by Hispanic Status in the United States." *JAMA* 270(20): 2464-2468.

Sorlie, Paul D., Eugene Rogot, and Norman J. Johnson. 1992. "Validity of Demographic Characteristics on the Death Certificate." *Epidemiology* 3(2): 181-184.

Thompson, Lawrence H. 1976. "Intracohort Redistribution in the Social Security Retirement Program." In *1976 Proceedings of the Business and Economic Statistics Section of the American Statistical Association*. Washington, DC: The American Statistical Association.

U.S. Bureau of Labor Statistics (BLS). 1999. *Employee Benefits in Medium and Large Private Establishments, 1997*, BLS Bulletin No. 2517.

U.S. Congressional Budget Office (CBO). 1998. "Social Security Privatization and the Annuities Market." Available on-line at: http://www.cbo.gov/showdoc.cfm?index=348&sequence=0 (accessed June 2, 2003).

Table 2. Distribution of Benefits and Lifetime OASDI Taxes Under the Current Social Security System, 1940-1980 Birth Cohorts

		Initial Benefits Paid Under Current Social Security System		Lifetime OASDI Taxes Paid	
	Percent of Sample	Average Initial Benefits ($2000)	Share of Total Initial Benefits	Average OASDI Taxes Paid ($2000)	Share of Total OASDI Taxes Paid
All	100.0	11,619	100.0	639,771	100.0
Gender					
Female	53.3	10,549	48.4	477,651	39.8
Male	46.7	12,841	51.6	824,677	60.2
Marital Status					
Married	64.0	11,371	62.6	647,955	64.8
Widowed	8.0	12,963	8.9	518,319	6.4
Divorced	16.2	11,763	16.4	637,317	16.1
Never married	11.9	11,883	12.2	680,122	12.7
Gender and Marital Status					
Female: Married	32.0	9,831	27.0	450,204	22.5
Female: Widowed	6.2	12,968	6.9	430,326	4.2
Female: Divorced	9.6	10,997	9.1	525,250	7.9
Female: Never married	5.5	11,273	5.4	607,017	5.3
Male: Married	32.0	12,913	35.6	845,454	42.3
Male: Widowed	1.7	12,942	1.9	834,617	2.3
Male: Divorced	6.6	12,877	7.3	800,158	8.2
Male: Never married	6.4	12,411	6.8	743,347	7.4
Race/Ethnicity					
White	75.1	11,934	77.1	664,178	77.9
Black	10.6	9,881	9.0	530,039	8.8
Hispanic	10.3	10,938	9.7	568,454	9.2
Other	4.0	12,059	4.2	656,842	4.1
Education					
No high school degree	9.9	9,114	7.8	368,444	5.7
High school graduate	57.1	11,005	54.1	552,394	49.3
College graduate	33.0	13,421	38.1	872,134	45.0
Years in Labor Force					
<20	8.7	6,910	5.2	162,942	2.2
20-29	16.5	9,458	13.4	352,530	9.1
30-34	14.5	11,237	14.1	509,701	11.6
35+	60.3	13,124	68.1	818,692	77.1
Shared AIME Quintile					
1	15.3	7,854	10.3	256,765	6.1
2	20.0	10,022	17.2	433,693	13.5
3	21.1	11,551	21.0	582,847	19.2
4	21.6	12,940	24.0	749,474	25.3
5	22.1	14,428	27.4	1,039,358	35.9
Birth Year					
1940-1944	9.2	9,441	7.5	403,626	5.8
1945-1949	11.6	9,974	10.0	453,157	8.2
1950-1954	13.3	10,626	12.1	502,754	10.4
1955-1959	14.7	10,811	13.6	542,141	12.4
1960-1964	14.5	11,337	14.1	604,418	13.7
1965-1969	13.0	12,603	14.1	720,693	14.7
1970-1974	11.7	13,628	13.8	883,563	16.2
1975-1979	10.1	14,408	12.5	981,989	15.5
1980-1984	1.9	14,651	2.4	1,019,511	3.0

Source: Authors' projections using DYNASIM3.
Note: Initial benefits and OASDI paid reflect values as of the age of first Social Security receipt. See the text for more details c
the projection methods.

Table 3. Initial Social Security Benefits Under Current System and Commission Plan 1, 1940-1980 Birth Cohorts

| | Average Initial Benefit ($2002) | | | | Share of Total Benefits Paid | | | |
| | Current Social Security System | Bush Commission Plan 1--Baseline Annuitization Scenario | | | Current Social Security System | Bush Commission Plan 1--Baseline Annuitization Scenario | | |
		Total Benefits	Traditional Bfts	Annuitized Benefits		Total Benefits	Traditional Bfts	Annuitized Benefits
All	11,619	12,330	8,881	3,449	100.0	100.0	100.0	100.0
Gender								
Female	10,549	11,158	8,257	2,902	48.4	48.2	49.5	44.8
Male	12,841	13,667	9,594	4,073	51.6	51.8	50.5	55.2
Marital Status								
Married	11,371	12,007	8,864	3,143	62.6	62.3	63.8	58.3
Widowed	12,963	13,996	9,165	4,832	8.9	9.0	8.2	11.1
Divorced	11,763	12,452	9,009	3,443	16.4	16.3	16.4	16.1
Never married	11,883	12,812	8,612	4,199	12.2	12.4	11.6	14.5
Gender and Marital Status								
Female: Married	9,831	10,318	7,994	2,324	27.0	26.7	28.8	21.5
Female: Widowed	12,968	13,930	9,438	4,492	6.9	7.0	6.6	8.1
Female: Divorced	10,997	11,661	8,369	3,293	9.1	9.0	9.0	9.1
Female: Never married	11,273	12,113	8,277	3,835	5.4	5.4	5.2	6.2
Male: Married	12,913	13,700	9,736	3,964	35.6	35.6	35.1	36.8
Male: Widowed	12,942	14,237	8,177	6,059	1.9	2.0	1.6	3.0
Male: Divorced	12,877	13,601	9,940	3,661	7.3	7.3	7.4	7.0
Male: Never married	12,411	13,417	8,903	4,514	6.8	7.0	6.4	8.4
Race/Ethnicity								
White	11,934	12,645	9,154	3,491	77.1	77.0	77.4	76.0
Black	9,881	10,532	7,469	3,064	9.0	9.1	8.9	9.4
Hispanic	10,938	11,667	8,298	3,368	9.7	9.8	9.6	10.1
Other	12,059	12,871	8,997	3,875	4.2	4.2	4.1	4.5
Education								
No high school degree	9,114	9,516	7,651	1,865	7.8	7.6	8.5	5.4
High school graduate	11,005	11,584	8,751	2,833	54.1	53.6	56.2	46.9
College graduate	13,421	14,452	9,473	4,979	38.1	38.7	35.2	47.7
Years in Labor Force								
<20	6,910	7,123	6,137	985	5.2	5.0	6.0	2.5
20-29	9,458	9,853	7,911	1,942	13.4	13.2	14.7	9.3
30-34	11,237	11,781	9,031	2,750	14.1	13.9	14.8	11.6
35+	13,124	14,048	9,588	4,460	68.1	68.7	65.1	77.9
Shared AIME Quintile								
1	7,854	8,186	6,667	1,520	10.3	10.2	11.5	6.7
2	10,022	10,534	8,110	2,425	17.2	17.1	18.2	14.0
3	11,551	12,198	9,067	3,131	21.0	20.9	21.5	19.1
4	12,940	13,751	9,779	3,971	24.0	24.0	23.7	24.8
5	14,428	15,543	10,050	5,493	27.4	27.8	25.0	35.1
Birth Year								
1940-1944	9,441	9,495	8,852	644	7.5	7.1	9.2	1.7
1945-1949	9,974	10,104	8,971	1,133	10.0	9.5	11.7	3.8
1950-1954	10,626	10,877	9,110	1,767	12.1	11.7	13.6	6.8
1955-1959	10,811	11,244	8,679	2,565	13.6	13.4	14.3	10.9
1960-1964	11,337	12,033	8,481	3,552	14.1	14.1	13.8	14.9
1965-1969	12,603	13,675	8,772	4,903	14.1	14.4	12.9	18.5
1970-1974	13,628	15,048	8,955	6,093	13.8	14.3	11.8	20.7
1975-1979	14,408	16,013	9,342	6,671	12.5	13.1	10.6	19.6
1980-1984	14,651	16,329	9,332	6,996	2.4	2.5	2.0	3.9

Source: Authors' projections using DYNASIM3.
Note: Initial benefits reflect values as of the age of first Social Security receipt. The projection model assumes that the personal account program begins in 1992 and follows the SSA Office of the Actuary's assumption that personal accounts yield a 4.6 percent real rate of return. In exchange, monthly Social Security benefits are reduced by the annuity value of the account contributions accumulated at a 3.5 percent real rate of return. See the text for more details on the projection methods.

Table 4. Percent of Social Security Recipients With Incomes Below the Povertly Level , Under Current Social Security System and
and Commission Model 1, 1940-1980 Birth Cohorts

	Current Social Security System			Commission Model 1 Baseline Annuitization			Commission Model 1 No Annuitization		
	At NRA	At Age 75	At Age 85	At NRA	At Age 75	At Age 85	At NRA	At Age 75	At Age 85
All	2.4	2.3	2.4	2.2	2.1	2.3	2.4	2.5	2.8
Gender									
Female	3.0	3.0	3.0	2.7	2.8	2.9	3.1	3.4	3.7
Male	1.7	1.4	1.3	1.6	1.3	1.3	1.6	1.3	1.3
Marital Status									
Married	1.1	0.5	0.5	1.0	0.4	0.5	1.1	0.5	0.6
Widowed	2.5	2.2	1.7	2.3	2.0	1.6	2.7	2.6	2.4
Divorced	5.6	5.7	5.3	5.1	5.3	5.3	5.7	6.1	5.9
Never married	5.2	7.1	8.8	4.7	6.5	8.3	5.1	7.1	8.8
Gender and Marital Status									
Female: Married	0.9	0.3	0.4	0.9	0.3	0.4	0.9	0.4	0.5
Female: Widowed	2.8	2.4	1.8	2.6	2.2	1.7	3.1	3.0	2.7
Female: Divorced	7.5	7.5	6.4	6.8	6.9	6.3	7.8	8.1	7.3
Female: Never married	7.0	9.4	12.1	6.5	8.8	11.6	7.4	10.0	12.6
Male: Married	1.2	0.6	0.6	1.2	0.6	0.5	1.2	0.7	0.7
Male: Widowed	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.5	1.5
Male: Divorced	2.6	2.2	2.4	2.4	2.1	2.4	2.4	2.2	2.3
Male: Never married	3.6	4.8	4.5	3.1	4.2	4.1	3.1	4.2	3.9
Race/Ethnicity									
White	1.8	1.6	1.6	1.7	1.5	1.5	1.8	1.8	1.9
Black	5.5	6.4	6.9	5.1	6.1	6.7	5.4	6.7	7.5
Hispanic	3.9	3.5	4.5	3.5	3.1	4.4	3.9	3.8	5.4
Other	2.0	1.5	1.4	1.9	1.3	1.2	2.2	1.6	1.8
Education									
No high school degree	8.1	7.5	8.2	7.7	7.1	7.9	8.1	7.9	9.1
High school graduate	2.6	2.6	2.6	2.4	2.4	2.5	2.6	2.8	3.1
College graduate	0.4	0.2	0.4	0.4	0.2	0.3	0.5	0.4	0.4
Years in Labor Force									
<20	10.4	8.7	8.6	9.9	8.2	8.5	10.6	9.4	9.6
20-29	4.9	4.7	3.9	4.6	4.4	3.7	5.0	4.9	4.7
30-34	1.8	1.9	2.1	1.6	1.8	2.0	1.9	2.3	2.4
35+	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.7
Shared AIME Quintile									
1	11.9	12.6	13.5	11.1	11.8	13.1	12.0	13.6	15.4
2	2.0	1.7	1.4	1.8	1.5	1.3	2.1	1.9	2.1
3	0.7	0.4	0.5	0.6	0.4	0.5	0.7	0.4	0.5
4	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2
5	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1
Birth Year									
1940-1944	4.7	4.0	3.8	4.7	4.0	3.7	4.8	4.3	3.9
1945-1949	4.3	4.1	3.9	4.2	4.0	3.9	4.4	4.2	4.2
1950-1954	3.1	3.0	2.6	3.1	2.9	2.4	3.2	3.3	3.0
1955-1959	2.9	2.5	1.6	2.6	2.2	1.6	2.9	2.8	2.2
1960-1964	1.9	1.6	1.2	1.6	1.4	1.1	2.0	1.7	1.7
1965-1969	1.0	0.9	0.6	0.8	0.7	0.3	1.0	1.0	1.1
1970-1974	1.0	0.7		0.7	0.5		0.9	0.9	
1975-1979	0.7	0.2		0.4	0.1		0.6	0.1	
1980-1984	0.7			0.6			0.7		

Source: Authors' projections using DYNASIM3.
Note: The projection model assumes that the personal account program begins in 1992 and follows the SSA Office of the Actuary's assumptions
that personal accounts yield a 4.6 percent real rate of return. In exchange, monthly Social Security benefits are reduced by the annuity value
of the account contributions accumulated at a 3.5 percent real rate of return. See the text for more details on the projection methods.

Table 5. Money's Worth Ratios Projected Under Commission Model 1, by Annuitization Scenario, 1940-1980 Birth Cohorts

| | Percent of Sample | | Annuitization Scenario | | | | | | |
	Scenarios 1-6	Scenario 7	Scenario 1: Baseline	Scenario 2: Single Life	Scenario 3: No COLA	Scenario 4: Cash Refund	Scenario 5: 10-Year Certain	Scenario 6: Gender Specific	Scenario 7: Poverty Level
All	100.0	100.0	1.00	1.000	1.000	1.000	1.000	1.000	1.000
Gender									
Female	53.3	66.5	1.03	1.04	1.02	1.02	1.02	1.00	0.99
Male	46.7	33.5	0.98	0.97	0.98	0.98	0.98	1.00	1.01
Marital Status									
Married	64.0	61.5	1.00	1.01	1.00	1.02	1.00	1.00	1.02
Widowed	8.0	12.1	1.02	1.01	1.02	0.99	1.02	1.00	1.03
Divorced	16.2	15.6	0.99	0.99	1.00	0.96	0.99	0.99	0.97
Never married	11.9	10.8	0.98	0.97	0.99	0.95	0.99	0.99	0.90
Gender and Marital Status									
Female: Married	32.0	39.7	1.02	1.05	1.01	1.04	1.01	1.00	0.96
Female: Widowed	6.2	10.3	1.05	1.04	1.04	1.02	1.04	1.00	1.04
Female: Divorced	9.6	11.1	1.03	1.02	1.03	1.00	1.02	0.99	1.00
Female: Never married	5.5	5.5	1.02	1.01	1.02	0.99	1.01	0.98	0.95
Male: Married	32.0	21.8	0.99	0.98	0.99	1.01	0.99	1.01	1.06
Male: Widowed	1.7	1.8	0.95	0.94	0.96	0.92	0.97	1.00	0.99
Male: Divorced	6.6	4.5	0.94	0.94	0.96	0.91	0.96	0.99	0.91
Male: Never married	6.4	5.3	0.95	0.94	0.96	0.92	0.97	1.00	0.87
Race/Ethnicity									
White	75.1	71.5	0.99	0.99	1.00	0.99	0.99	0.99	0.99
Black	10.6	13.0	0.98	0.97	0.98	0.97	0.98	0.98	1.03
Hispanic	10.3	11.5	1.03	1.04	1.02	1.03	1.03	1.03	1.01
Other	4.0	4.0	1.07	1.09	1.05	1.08	1.07	1.08	1.03
Education									
No high school degree	9.9	13.7	0.95	0.92	0.96	0.94	0.96	0.95	0.98
High school graduate	57.1	60.7	0.98	0.98	0.99	0.98	0.99	0.98	0.97
College graduate	33.0	25.5	1.02	1.03	1.02	1.02	1.02	1.02	1.04
Shared AIME Quintile									
1	15.3	26.3	0.97	0.96	0.97	0.96	0.98	0.96	1.00
2	20.0	24.1	0.99	0.98	0.99	0.98	0.99	0.98	0.91
3	21.1	18.3	0.99	0.99	0.99	0.99	0.99	0.99	0.97
4	21.6	15.8	1.00	1.00	1.00	1.00	1.00	1.00	1.01
5	22.1	15.6	1.01	1.02	1.01	1.02	1.01	1.02	1.06

Source: Authors' projections using DYNASIM3.
Note: Money's worth ratios compare the present value of annuity payments to the account balance that was annuitized. A money's worth ratio of greater than 1.00 implies that the present value of the annuity payments exceeds the account balance, whereas a money's worth ratio below 1.00 implies that the present value of the annuity payments falls below the account balance. Unless otherwise noted, the projections assume that all account balances are fully annuitized. The baseline scenario reflects a CPI-indexed joint and survivor annuity. See the text for more details on the projection methods.

Table 6. Personal Account Annuity Payments and Total Social Security Benefits Projected Under Commission Model 1, by Annuitization Scenario, for 1940-1965 Birth Cohorts

	Annuitization Scenario				
	Scenario 1: Baseline	Scenario 2: Single Life	Scenario 3: No COLA	Scenario 4: Cash Refund	Scenario 5: 10-Year Certain
Personal Account Annuity Payments, at Age 67					
All	2,181	2,329	2,575	2,181	2,137
Gender and Marital Status					
Female: Married	1,364	1,508	1,602	1,393	1,344
Female: Widowed	2,533	2,375	2,890	2,480	2,532
Female: Divorced	1,982	1,972	2,309	1,909	1,904
Female: Never married	2,313	2,295	2,725	2,222	2,218
Male: Married	2,682	3,038	3,223	2,736	2,641
Male: Widowed	3,558	3,566	4,165	3,493	3,485
Male: Divorced	2,339	2,328	2,716	2,253	2,248
Male: Never married	2,810	2,787	3,288	2,701	2,697
Personal Account Annuity Payments, at Age 85					
All	2,654	2,410	1,846	2,663	2,599
Gender and Marital Status					
Female: Married	1,495	1,656	1,038	1,524	1,472
Female: Widowed	2,885	1,911	1,981	2,909	2,834
Female: Divorced	2,046	2,014	1,408	1,973	1,968
Female: Never married	2,475	2,455	1,716	2,377	2,373
Male: Married	2,846	3,218	2,015	2,897	2,799
Male: Widowed	3,899	3,508	2,752	3,956	3,840
Male: Divorced	2,458	2,482	1,699	2,369	2,370
Male: Never married	2,976	2,952	2,040	2,862	2,858
Total Social Security Benefit Payments (Including Personal Account Annuities), at Age 67					
All	13,407	13,431	13,475	15,219	13,399
Gender and Marital Status					
Female: Married	10,115	10,139	10,156	11,272	10,111
Female: Widowed	14,615	14,592	14,681	16,659	14,613
Female: Divorced	11,671	11,669	11,728	13,243	11,657
Female: Never married	11,808	11,805	11,885	13,612	11,791
Male: Married	16,308	16,366	16,398	18,605	16,302
Male: Widowed	16,109	16,109	16,217	18,986	16,095
Male: Divorced	15,113	15,111	15,176	16,986	15,098
Male: Never married	14,052	14,048	14,142	16,242	14,032
Total Social Security Benefit Payments (Including Personal Account Annuities), at Age 85					
All	15,185	15,145	15,050	17,398	15,176
Gender and Marital Status					
Female: Married	10,995	11,023	10,917	12,260	10,991
Female: Widowed	16,135	15,978	15,986	18,555	16,126
Female: Divorced	13,514	13,509	13,407	15,137	13,501
Female: Never married	12,286	12,282	12,149	14,211	12,267
Male: Married	17,091	17,151	16,955	19,520	17,083
Male: Widowed	17,374	17,301	17,182	20,665	17,365
Male: Divorced	16,213	16,216	16,089	18,177	16,198
Male: Never married	14,808	14,804	14,642	17,138	14,787

Source: Authors' projections using DYNASIM3.
Notes: The projection model assumes that the personal account program begins in 1992 and follows the SSA Office of the Actuary's assumptions that personal accounts yield a 4.6 percent real rate of return. In exchange, monthly Social Security benefits are reduced by the annuity value of the account contributions accumulated at a 3.5 percent real rate of return. Unless otherwise noted, the projections assume that all account balances are fully annuitized. See the text for more details on the projection methods. The baseline scenario reflects a CPI-indexed joint and survivor annuity.

Appendix Table A1. Summary of Core Processes Modeled in DYNASIM3

Process	Data	Form and predictors
Birth	*Estimation:* NLSY (1979-94); VS; *Target:* OCACT	7 equation parity progression model; varies based on marital status; predictors include age, marriage duration, time since last birth; uses vital rates after age 39; sex of newborn assigned by race; probability of multiple birth assigned by age and race
Death	*Estimation:* NLMS (1979-81); VS (1982-97); *Target:* OCACT	3 equations; time trend from Vital Statistics 1982-97; includes socioeconomic differentials; separate process for the disabled based on age, sex, age of disability onset, and disability duration derived from Zayatz (1999)
Schooling	NLSY (1979-94), CPS (Oct. 1995)	10 cross-tabulations based on age, race, sex, and parents' education
Leaving Home	NLSY (1979-94)	3 equations; family size, parental resources, and school and work status are important predictors
First Marriage	NLSY (1979-93)	8 equations; depends on age, education, race, earnings, presence of children (for females); use vital rates at older ages
Spouse Selection		Closed marriage market (spouse must be selected from among unmarried, opposite-sex persons in the population); match likelihood depends on age, race, education
Remarriage	VS (1990)	Table-lookups, separate by sex for widowed and divorced
Divorce	PSID (1985-93)	Couple level outcome; depends on marriage duration, age and presence of children, earnings of both spouses
Labor Supply and Earnings	*Estimation:* PSID (1980-93); NLSY (1979-89); *Target:* OCACT (LFP, wage/price growth)	Separate participation, hours decisions, wage rates for 16 age-race-sex groups; all equations have permanent and transitory error components; some wage equations correct for selection bias; key predictors include age splines, marital status, number and ages of children, job tenure, education level, region of residence, disability status, schooling status, unemployment level, and age spline-education level interactions
Disability (Any)	SIPP (1990)	Separate entry (by sex)/exit (pooled) equations for a health condition limiting amount or type of work; include socio-economic differences (education, marital status, earnings history)
Disability (Severe)	SIPP (1990-93)	2 equations (by sex) predict more severe disability (expected to last several years and/or end in death); key predictors include age, disability status, education, marital status, recent earnings

Process	Data	Form and predictors
Pensions (Defined benefit, defined contribution, IRAs, Keoghs)	BLS (1999-2000); EBRI/ICI; SIPP (1990-93); PENSIM (PSG) and PIMS models (PBGC)	Uses SIPP self-reports for initial values; simulates job changes and future pensions using PENSIM; uses PIMS for defined benefit formulas (with separate procedure for DBs from government jobs); uses EBRI/ICI data for defined contribution plans, including asset allocation
Wealth	PSID (1984-94); SIPP (1990-93)	4 random-effects models for ownership/value given ownership separately for housing and non-housing wealth; additional models for spenddown after first OASDI receipt; key predictors include age, race, marital status, family size, birth cohort, dual-earner status, pension coverage, recent earnings
OASI Take-up/ Retirement	SIPP (1990-93)	OASI eligibility is deterministic; 3 separate equations (separate for workers, by lagged earnings, and auxiliary beneficiaries) predict take-up of those eligible for retired worker and auxiliary benefits (ages 62 and older); key predictors include age, disability status, education, marital status, recent earnings, and, for retired workers, pensions, lifetime earnings, and spouse characteristics; take up of survivor benefits at 60 and 61 is deterministic (i.e., mandatory if earnings are below the exempt amount)
OASDI Benefits	Rule-based	Sophisticated calculator incorporates entire work and marriage histories, the retirement earnings test, and auxiliary benefits
SSI Benefits	SIPP (1990-93)	Eligibility is deterministic; 2 equations predict take-up of the aged; key predictors include demographics, state supplement, resources
Living Arrange- ments of the Aged	SIPP (1990-93)	Logistic regression that considers health, resources, and kin availability (number of children ever born); resources of co-residing family members are imputed using donor families sampled from current co-residing aged individuals in SIPP
Immigra- tion	SIPP (1990-93)	Replicate historical distribution of immigrant life histories, using target levels from Dowhan and Duleep (2002), which are based on sex, country of origin, and age at immigration

Abbreviations: BLS: Bureau of Labor Statistics; CPS: Current Population Survey; EBRI: Employee Benefits Research Institute; NLMS: National Longitudinal Mortality Study; NLSY: National Longitudinal Survey of Youth; OCACT: Intermediate assumptions of the OASDI Trustees; PBGC: Pension Benefit Guarantee Corporation; PIMS: Pension Insurance Modeling System; PSG: Policy Simulation Group; PSID: Panel Study of Income Dynamics; VS: Vital Statistics

RECENT WORKING PAPERS FROM THE

CENTER FOR RETIREMENT RESEARCH AT BOSTON COLLEGE

Can Unexpected Retirement Explain the Retirement-Consumption Puzzle? Evidence for Subjective Retirement Explanations
Melvin Stephens Jr. and Steven J. Haider, August 2003

Employment, Social Security and Future Retirement Outcomes for Single Mothers
Richard W. Johnson, Melissa M. Favreault, and Joshua H. Goldwyn, July 2003

The Outlook for Pension Contributions and Profits in the U.S.
Alicia H. Munnell and Mauricio Soto, June 2003

Social Security Reform and the Exchange of Bequests for Elder Care
Meta Brown, June 2003

Annuities and Individual Welfare
Thomas Davidoff, Jeffrey Brown, and Peter Diamond, May 2003

Becoming Oldest-Old: Evidence for Historical U.S. Data
Dora Costa and Joanna Lahey, May 2003

The Evolution of Social Security Disabled Widow(er)s' Benefits
Eric R. Kingson, Margaret Morse, and Gary Calhoun, May 2003

Health Shocks and Couples' Labor Supply Decisions
Courtney Coile, May 2003

Whose Money is It Anyhow?: Governance and Social Investment in Collective Investment Funds
R. Kent Weaver, May 2003

The Politics of Public Pension Reform
R. Kent Weaver, May 2003

Fiscal Effects of Social Security Reform in the United States
Courtney Coile and Jonathan Gruber, April 2003

Retirement Incentives and Couples' Retirement Decisions
Courtney Coile, March 2003

All working papers are available on the Center for Retirement Research website (http://www.bc.edu/crr) and can be requested by e-mail (crr@bc.edu) or phone (617-552-1762).